The University of Mississippi School of Law

The National Center for Remote Sensing, Air, and Space Law

Informational resources on the legal aspects of human activities using aerospace technologies

Space Law: Selected Documents 2011

Volume 1: National Space Law Documents

Compiled by P.J. Blount
P.J. Blount, editor
Joanne Irene Gabrynowicz, editor

A supplement to the Journal of Space Law

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National Center for Remote Sensing, Air, and Space Law

Founded in 1999, the National Center for Remote Sensing, Air, and Space Law is a reliable source for creating, gathering, and disseminating objective and timely remote sensing, space, and aviation legal research and materials. The Center serves the public good and the aerospace industry by addressing and conducting education and outreach activities related to the legal aspects of aerospace technologies to human activities.

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Dedicated to

To all the men and women who served in the U.S.
Space Shuttle program.
1976-2011

"Law must precede man into space."
- Andrew G. Haley, *Space Age Presents Immediate Legal Problems,* 1 PROCEEDINGS OF THE FIRST COLLOQUIUM ON THE LAW OF OUTER SPACE 5 (1959)

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Foreword

by

Joanne Irene Gabrynowicz

This compilation of space law documents for the year 2011 was gathered primarily from postings placed on the aerospace law blog, *Res Communis* from 1 January through 31 December 2011. *Res Communis* is hosted by the National Center for Remote Sensing, Air, and Space Law (Center) at the University of Mississippi School of Law. The postings are supplemented with materials from other sources that were published during 2011, but which were not published on *Res Communis*.

The blog's name, *Res Communis*, is taken from the Latin legal term or art that means, in part, "things common to all; that is, those things that are used and enjoyed by everyone." Res Communis is also a fundamental principle that provides a major part of the foundation of the international space law regime. The name was chosen because of its specific relevance to space law and to express the Center's intent that the blog provide the aerospace law community with a reliable, timely source of legal materials.

The annual compilation is a special supplement to the Journal of Space Law, the world's oldest law review dedicated to space law. The Journal of Space Law, beginning with the first volume published in 1973, is available on line at the Center's website, http://spacelaw.olemiss.edu/, and through HeinOnline, http://heinonline.org/.

This year's compilation is again in two volumes: national space law documents and international documents. The body of space law continues to grow in size and complexity. During 2011, the U.S. space law corpus was integrated into the United States Code as Title 51, *National and Commercial Space Programs*. This was the first time in 83 years that a new Title was added to the Code.[1] It can be expected that space law will continue to change for the practitioner, academic, and government lawyer. The reader can find updated material on an on-going basis at http://rescommunis.olemiss.edu/.

[1] The Journal of Space Law published a complete reference guide to Title 51 in a special issue, 37 J. Space L. (2011). Due to the historic nature of Title 51, the Journal has made the electronic version the entire volume available at no cost. See, http://www.spacelaw.olemiss.edu/jsl/back-issues/jsl-37-1.html.

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BUNDESGESETZBLATT
FÜR DIE REPUBLIK ÖSTERREICH

Jahrgang 2011 Ausgegeben am 27. Dezember 2011 Teil I

132. Bundesgesetz: Weltraumgesetz
(NR: GP XXIV RV 1466 AB 1585 S. 135. BR: AB 8628 S. 803.)

132. Bundesgesetz über die Genehmigung von Weltraumaktivitäten und die Einrichtung eines Weltraumregisters (Weltraumgesetz)

Der Nationalrat hat beschlossen:

Anwendungsbereich

§ 1. (1) Dieses Bundesgesetz ist auf Weltraumaktivitäten anzuwenden, die

1. auf österreichischem Staatsgebiet,
2. auf in Österreich registrierten Schiffen oder Flugzeugen oder
3. von einem Betreiber, der österreichischer Staatsbürger oder eine juristische Person mit Sitz im Inland ist,

durchgeführt werden.

(2) Auf privatrechtliche Ansprüche ist dieses Bundesgesetz nur anzuwenden, wenn nach den Regeln des internationalen Privatrechts österreichisches Recht maßgebend ist.

Begriffsbestimmungen

§ 2. Im Sinne dieses Bundesgesetzes bedeutet, sofern nicht anders bezeichnet

1. „Weltraumaktivität“: Start, Betrieb oder Kontrolle eines Weltraumgegenstandes oder der Betrieb einer Anlage zum Start von Weltraumgegenständen;
2. „Weltraumgegenstand“: Gegenstand, der in den Weltraum gestartet wurde oder gestartet werden soll, einschließlich seiner Bestandteile;
3. „Betreiber“: natürliche oder juristische Person, die Weltraumaktivitäten durchführt oder durchführen lässt.

Genehmigungspflicht

§ 3. Weltraumaktivitäten bedürfen der Genehmigung der Bundesministerin/des Bundesministers für Verkehr, Innovation und Technologie. Genehmigungspflichten nach anderen Vorschriften als nach diesem Bundesgesetz bleiben davon unberührt.

Voraussetzungen für die Genehmigung

§ 4. (1) Die Genehmigung nach § 3 ist zu erteilen, wenn

1. der Betreiber die nötige Zuverlässigkeit, Leistungsfähigkeit und Fachkenntnis besitzt, um die Weltraumaktivität durchzuführen,
2. die Weltraumaktivität keine unmittelbare Gefahr für die öffentliche Ordnung, die Sicherheit von Personen und Sachen und für die Gesundheit darstellt,
3. die Weltraumaktivität der nationalen Sicherheit, völkerrechtlichen Verpflichtungen oder außenpolitischen Interessen Österreichs nicht zuwiderläuft,
4. entsprechende Vorkehrungen für die Vermeidung von Weltraummüll im Sinne des § 5 getroffen wurden,
5. die Weltraumaktivität keine schädliche Verunreinigung des Weltraums oder von Himmelskörpern und keine schädliche Veränderung der Umwelt hervorruft,
6. der Betreiber die Vorgaben über Orbitalposition und Frequenzzuteilung der Internationalen Fernmeldeunion (ITU) erfüllt,
7. der Betreiber eine Haftpflichtversicherung gemäß Abs. 4 abgeschlossen hat und

8. der Betreiber Vorsorge für die planmäßige Beendigung der Weltraumaktivität getroffen hat.

(2) Der Betreiber der Weltraumaktivität hat alle Unterlagen, die die Überprüfung des Vorliegens der Voraussetzungen nach Abs.1 ermöglichen, beizubringen.

(3) Die Genehmigung kann Bedingungen und Auflagen enthalten. Die Bundesministerin/Der Bundesminister für Verkehr, Innovation und Technologie entscheidet über den Antrag auf Genehmigung ohne unnötigen Aufschub, spätestens aber sechs Monate nach dessen Einlangen.

(4) Der Betreiber hat zur Deckung seiner Haftpflicht für Personen- oder Sachschaden eine Haftpflichtversicherung über eine Mindestversicherungssumme von 60 000 000 Euro für jeden Versicherungsfall, ohne Ausschluss oder zeitliche Begrenzung der Nachhaftung, abzuschließen. Die Bundesministerin/Der Bundesminister für Verkehr, Innovation und Technologie kann mit Bescheid aufgrund des öffentlichen Interesses an der Weltraumaktivität unter Berücksichtigung des von ihr ausgehenden Risikos und der Finanzkraft des Betreibers eine niedrigere Versicherungssumme für die vom Betreiber abzuschließende Haftpflichtversicherung festsetzen oder den Betreiber gänzlich von der Versicherungspflicht befreien. Im öffentlichen Interesse liegen Weltraumaktivitäten, die der Wissenschaft, Forschung oder Ausbildung dienen. Eine Versicherung ist nicht abzuschließen, wenn der Bund selbst Betreiber der Weltraumaktivität ist.

Vermeidung von Weltraummüll

§ 5. Der Betreiber hat dem Stand der Technik entsprechend und unter Berücksichtigung der international anerkannten Richtlinien zur Vermeidung von Weltraummüll Vorkehrungen zur Vermeidung von Weltraummüll zu treffen. Insbesondere sind Vorkehrungen zur Vermeidung von Missionsrückständen zu treffen.

Änderung oder Beendigung der Weltraumaktivität

§ 6. (1) Der Betreiber ist verpflichtet, alle Ereignisse, welche die Durchführung der gemäß § 4 genehmigten Weltraumaktivität verzögern oder unmöglich machen oder eine Abänderung oder einen Widerruf der Genehmigung gemäß § 7 erfordern würde, unverzüglich anzuzeigen.

(2) Der Betreiber hat das geplante oder das auf Grund zwingender Umstände bevorstehende Ende der Weltraumaktivität der Bundesministerin/dem Bundesminister für Verkehr, Innovation und Technologie unverzüglich anzuzeigen. Die Bundesministerin/Der Bundesminister für Verkehr, Innovation und Technologie kann dem Betreiber Anordnungen im Hinblick auf eine sichere Beendigung der Weltraumaktivität erteilen.

Widerruf und Abänderung der Genehmigung

§ 7. (1) Die Genehmigung ist zu widerrufen, wenn die Voraussetzungen nach § 4 Abs. 1 nicht mehr vorliegen oder Bedingungen und Auflagen nach § 4 Abs. 3 nicht eingehalten werden.

(2) Die Genehmigung kann in den in Abs. 1 bezeichneten Fällen auch inhaltlich abgeändert werden.

(3) Im Falle des Widerrufs der Genehmigung können dem Betreiber Maßnahmen für die vorübergehende Weiterführung oder sichere Beendigung der Weltraumaktivität vorgeschrieben werden. Kommt der Betreiber diesen Anordnungen nicht nach, ist die Kontrolle der Weltraumaktivität durch Bescheid der Bundesministerin /des Bundesministers für Verkehr, Innovation und Technologie, an einen anderen Betreiber zu übertragen.

Übertragung

§ 8. Ein Wechsel des Betreibers bedarf der Genehmigung durch die Bundesministerin/den Bundesminister für Verkehr, Innovation und Technologie. Der Betreiberwechsel ist unter den Voraussetzungen des § 4 zu genehmigen.

Register

§ 9. (1) Die Bundesministerin/Der Bundesminister für Verkehr, Innovation und Technologie führt ein Register für Weltraumgegenstände.

(2) In dieses Register sind Weltraumgegenstände einzutragen, für die Österreich nach Art. I des Übereinkommens über die Registrierung von in den Weltraum gestarteten Gegenständen, BGBl. Nr. 163/1980, als Startstaat angesehen wird.

(3) Kommen auch andere Staaten neben Österreich als Startstaat in Betracht, ist für die Registrierung in Österreich die entsprechende Übereinkunft nach Art. II Abs. 2 des Übereinkommens über die Registrierung von in den Weltraum gestarteten Gegenständen ausschlaggebend.

(4) Ein in dieses Register einzutragender Weltraumgegenstand und sein gesamtes Personal unterliegen während seiner Anwesenheit im Weltraum oder auf einem Himmelskörper der Jurisdiktion und Kontrolle Österreichs.

Eintragung und Information

§ 10. (1) In das Register sind folgende Informationen einzutragen:

1. Name des Startstaates oder der Startstaaten;
2. eine geeignete Bezeichnung des Weltraumgegenstandes, seine Registernummer und seine ITU-Bezeichnung;
3. Datum und Hoheitsgebiet oder Ort des Startes;
4. grundlegende Parameter der Umlaufbahn, einschließlich
   a) Umlaufzeit,
   b) Bahnneigung,
   c) maximale Erdferne (Apogäum),
   d) minimale Erdferne (Perigäum);
5. allgemeine Funktion des Weltraumgegenstandes;
6. Hersteller des Weltraumgegenstandes;
7. Eigentümer und Betreiber des Weltraumgegenstandes;
8. weitere Informationen, die die Bundesministerin/der Bundesminister für Verkehr, Innovation und Technologie festlegen kann, soweit dies nach dem Stand der Technik, aufgrund völkerrechtlicher Verpflichtungen oder einschlägiger Beschlüsse internationaler Organisationen notwendig ist.

(2) Der Betreiber hat der Bundesministerin/dem Bundesminister für Verkehr, Innovation und Technologie die Informationen nach Abs. 1 unverzüglich nach dem Start des Weltraumgegenstandes zu übermitteln.

(3) Ebenso hat der Betreiber alle Änderungen in Bezug auf die Informationen nach Abs. 1 unverzüglich zu übermitteln.

(4) Die Informationen nach Abs. 1 Z 1 bis 5 sind von der Bundesministerin/dem Bundesminister für Verkehr, Innovation und Technologie im Wege der Bundesministerin/des Bundesministers für europäische und internationale Angelegenheiten dem Generalsekretär der Vereinten Nationen zu übermitteln. Dies gilt sinngemäß für Informationen nach Abs. 3.

Rückgriff

§ 11. (1) Hat die Republik Österreich auf Grund von völkerrechtlichen Vereinbarungen einem Geschädigten durch eine Weltraumaktivität verursachte Schäden ersetzt, so steht dem Bund ein Rückgriffsrecht gegen den Betreiber zu.

(2) Für Schäden die auf der Erdoberfläche oder in einem Luftfahrzeug im Flug oder an diesem eingetreten sind, besteht der Anspruch auf Rückersatz bis zur Höhe des versicherten Risikos, mindestens jedoch bis zu der in § 4 Abs. 4 genannten Mindestversicherungssumme.. Diese Beschränkung gilt nicht, wenn den Betreiber oder seine Leute ein Verschulden trifft oder der Betreiber gegen die Bestimmungen der §§ 3 f. verstoßen hat.

Verordnungsermächtigung

§ 12. Durch Verordnung der Bundesministerin/des Bundesministers für Verkehr, Innovation und Technologie sind näher auszuführen:

1. Voraussetzungen für die Genehmigung gemäß § 4 Abs. 1;
2. die dem Antrag auf Genehmigung nach § 4 Abs. 2 beizubringenden Unterlagen und technischen Spezifikationen;
3. kostendeckende Gebühren, für das nach diesem Bundesgesetz durchzuführende Verfahren;
4. ein Pauschalbetrag als Ersatz für die Kosten des Bundes für die Überprüfung der Zuverlässigkeit des Betreibers gemäß § 4 Abs. 1 Z 1, die sich nach den durchschnittlichen Aufwendungen der Sicherheitsbehörden richten;
5. Informationen, die nach § 10 Abs. 1 und 3 für die Registrierung erforderlich sind.

Aufsicht und Behörden

§ 13. (1) Betreiber von Weltraumaktivitäten unterliegen in Angelegenheiten dieses Bundesgesetzes der Aufsicht der Bundesministerin/des Bundesministers für Verkehr, Innovation und Technologie.

(2) Der Betreiber verpflichtet sich, den Organen der Aufsichtsbehörde, soweit dies zur ordnungsgemäßen Ausübung der Aufsicht erforderlich ist, Zutritt zu allen Betriebsräumlichkeiten und –anlagen zu ermöglichen, Einsicht in Unterlagen zu gewähren und Auskunft zu erteilen.

(3) Die Sicherheitsbehörden haben bei der Zuverlässigkeitsüberprüfung des Betreibers gemäß § 4 Abs. 1 Z 1 mitzuwirken. Soweit es sich beim Betreiber um eine juristische Person handelt, hat sich die Zuverlässigkeitüberprüfung auf deren bevollmächtigte Vertreter zu beziehen. Im Rahmen der Überprüfung der Zuverlässigkeit sind die Sicherheitsbehörden ermächtigt, personenbezogene Daten, die sie bei der Vollziehung von Bundes- oder Landesgesetzen über die Person ermittelt haben, zu verwenden, und das Ergebnis der Überprüfung der Bundesministerin/dem Bundesminister für Verkehr, Innovation und Technologie zu übermitteln.

(4) Befinden sich Betriebsräumlichkeiten und –anlagen oder Unterlagen für eine Weltraumaktivität auf einer militärischen Liegenschaft, ist im Falle des Abs. 2 der zuständige Kasernenkommandant vor dem Betreten der militärischen Liegenschaft in Kenntnis zu setzen. Dieser kann aus wichtigen militärischen Gründen den Zutritt verweigern oder die Zutrittsgenehmigung aus Gründen der militärischen Sicherheit unter Auflagen erteilen.

Strafbestimmungen

§ 14. Wer den Bestimmungen dieses Bundesgesetzes oder seinen Verordnungen zuwiderhandelt, begeht, sofern die Tat nicht den Tatbestand einer in die Zuständigkeit der Gerichte fallenden strafbaren Handlung bildet vorliegt, eine Verwaltungsübertretung und ist mit einer Geldstrafe von bis zu 100 000 Euro zu bestrafen. Wer jedoch eine Weltraumaktivität ohne Genehmigung nach § 3 oder § 7 durchführt, ist mit einer Geldstrafe von mindestens 20 000 Euro zu bestrafen.

Übergangsbestimmung

§ 15. Dieses Bundesgesetz gilt für Weltraumaktivitäten, die nach seinem Inkrafttreten durchgeführt werden.Für Weltraumaktivitäten, die vor dem Inkrafttreten des Gesetzes in Auftrag gegeben wurden, wird die Genehmigungspflicht der §§ 3 bis 5 durch eine Anzeigepflicht des Betreibers ersetzt. Der Betreiber hat alle Unterlagen beizubringen, die die Überprüfung des Vorliegens der Voraussetzungen des § 4 Abs. 1 ermöglichen. § 11 findet auf Weltraumaktivitäten, die vor dem Inkrafttreten des Gesetzes in Auftrag gegeben wurden, keine Anwendung.

Sprachliche Gleichbehandlung

§ 16. Soweit sich die in diesem Bundesgesetz verwendeten Bezeichnungen auf natürliche Personen beziehen, gilt die gewählte Form für beide Geschlechter. Bei der Anwendung dieser Bezeichnungen auf bestimmte natürliche Personen ist die jeweils geschlechtsspezifische Form zu verwenden.

Vollziehung

§ 17. (1) Mit der Vollziehung dieses Bundesgesetzes ist die Bundesministerin/der Bundesminister für Verkehr, Innovation und Technologie betraut.

(2) Mit der Vollziehung des § 4 Abs. 1 Z 2 ist die Bundesministerin/der Bundesminister für Verkehr, Innovation und Technologie im Einvernehmen mit der Bundesministerin/dem Bundesminister für Inneres betraut.

(3) Mit der Vollziehung des § 4 Abs. 1 Z 3 ist die Bundesministerin/der Bundesminister für Verkehr, Innovation und Technologie im Einvernehmen mit der Bundesministerin/dem Bundesminister für europäische und internationale Angelegenheiten und der Bundesministerin/dem Bundesminister für Landesverteidigung und Sport betraut.

(4) Mit der Vollziehung des § 4 Abs. 4 ist die Bundesministerin/der Bundesminister für Verkehr, Innovation und Technologieim Einvernehmen mit der Bundesministerin/dem Bundesminister für Justiz betraut.

(5) Mit der Vollziehung des § 11 ist die Bundesministerin/der Bundesminister für Verkehr, Innovation und Technologie im Einvernehmen mit der Bundesministerin/dem Bundesminister für Finanzen und der Bundesministerin/dem Bundesminister für Justiz betraut.

(6) Mit der Vollziehung des § 12 Abs. 3 und 4 ist die Bundesministerin/der Bundesminister für Verkehr, Innovation und Technologie im Einvernehmen mit der Bundesministerin/dem Bundesminister für Finanzen betraut.

Fischer

Faymann

China's Space Activities in 2011

Information Office of the State Council

The People's Republic of China

December 2011, Beijing

Contents

Preface

Outer space is the common wealth of mankind. Exploration, development and utilization of outer space are an unremitting pursuit of mankind. Space activities around the world have been flourishing. Leading space-faring countries have formulated or modified their development strategies, plans and goals in this sphere. The position and role of space activities are becoming increasingly salient for each active country's overall development strategy, and their influence on human civilization and social progress is increasing.

The Chinese government makes the space industry an important part of the nation's overall development strategy, and adheres to exploration and utilization of outer space for peaceful purposes. Over the past few years, China's space industry has developed rapidly and China ranks among the world's leading countries in certain major areas of space technology. Space activities play an increasingly important role in China's economic and social development.

The next five years will be a crucial period for China in building a moderately prosperous society, deepening reform and opening-up, and accelerating the transformation of the country's pattern of economic development. This will bring new opportunities to China's space industry. China will center its work on its national strategic goals, strengthen its independent innovative capabilities, further open to the outside world and expand international cooperation. In so doing, China will do its best to make the country's space industry develop better and faster. At the same time, China will work together with the international community to maintain a peaceful and clean outer space and endeavor to make new contributions to the lofty cause of promoting world peace and development.

In order to help people around the world gain a better understanding of the Chinese space industry, we herewith offer a brief introduction to the major achievements China has made since 2006, its main tasks in the next five years, and its international exchanges and cooperation in this respect.

I. Purposes and Principles of Development

The purposes of China's space industry are: to explore outer space and to enhance understanding of the Earth and the cosmos; to utilize outer space for peaceful purposes, promote human civilization and social progress, and to benefit the whole of mankind; to meet the demands of economic development, scientific and technological development, national security and social progress; and to improve the scientific and cultural knowledge of the Chinese people, protect China's national rights and interests, and build up its national comprehensive strength.

China's space industry is subject to and serves the national overall development strategy, and adheres to the principles of scientific, independent, peaceful, innovative, and open development.

-- Scientific development. China respects science and the laws of nature. Keeping the actual situation of its space industry in mind, it works out comprehensive plans and arrangement of its activities regarding space technology, space applications and space science, in order to maintain comprehensive, coordinated and sustainable development of the industry.

-- Independent development. Keeping to the path of independence and self-reliance, China relies primarily on its own capabilities to develop its space industry to meet the needs of modernization, based upon its actual conditions and strength.

-- Peaceful development. China always adheres to the use of outer space for peaceful purposes, and opposes weaponization or any arms race in outer space. The country develops and utilizes space resources in a prudent manner and takes effective measures to protect the space environment, ensuring that its space activities benefit the whole of mankind.

-- Innovative development. China's strategy for the development of its space industry is to enhance its capabilities of independent innovation, consolidate its industrial foundation, and improve its innovation system. By implementing important space science and technology projects, the country concentrates its strength on making key breakthroughs for leap-frog development in this field.

-- Open development. China persists in combining independence and self-reliance with opening to the outside world and international cooperation. It makes active endeavors in international space exchanges and cooperation on the basis of equality and mutual benefit, peaceful utilization and common development, striving to promote progress in mankind's space industry.

II. Progress Made Since 2006

Since 2006, China has made rapid progress in its space industry. Breakthroughs have been made in major space projects, including human spaceflight and lunar exploration; space technology has been generally upgraded remarkably; the economic and social benefits of space applications have been noticeably enhanced; and innovative achievements have been made in space science.

1. Space Transportation System

Since 2006, Long March rockets have accomplished 67 successful launches, sending 79 spacecraft into planned orbits and demonstrating noteworthy improvement in the reliability of China's launch vehicles. The Long March rocket series have been improved, and major progress has been made in the development of new-generation launch vehicles.

2. Man-made Earth Satellites

1) Earth observation satellites

China has developed Fengyun (Wind and Cloud), Haiyang (Ocean), Ziyuan (Resources), Yaogan (Remote-Sensing) and Tianhui (Space Mapping) satellite series, plus a constellation of small satellites for environmental and disaster monitoring and forecasting. Fengyun satellites are now capable of global, three-dimensional and multispectral quantitative observation. The Fengyun-2 geostationary Earth orbit (GEO) meteorological satellite succeeded in double satellite observation and in-orbit backup; while the Fengyun-3 polar orbit meteorological satellite succeeded in networking observation of morning and afternoon satellites. Ocean water color satellites have obtained their images of doubled width and their revisiting period reduced. The first Haiyang dynamics environmental satellite launched in August, 2011 is capable of all-weather and full-time microwave observation. The Ziyuan satellite series have seen their spatial resolution and image quality greatly enhanced. The small satellites for environmental and disaster monitoring and forecasting are now capable of disaster monitoring with medium-resolution, wide-coverage and high-revisit rate disaster monitoring. In 2010, China formally initiated the development of an important special project - a high-resolution Earth observation system.

2) Communications and broadcasting satellites

China has won successes in its high-capacity GEO satellite common platform, space-based data relays, tracking, telemetry and command (TT&C), and other key technologies, showing remarkable improvement in the technical performance of China's satellites and in voice, data, radio and television communications. The successful launch and stable operation of the Zhongxing-10 satellite demonstrated a significant increase in the power and capacity of China's communications and broadcasting satellites. Similarly, the successful launch of the Tianlian (Space Chain)-1 data relay satellite demonstrated China's preliminary capability of both space-based data relays and space-based TT&C.

3) Navigation and positioning satellites

In February 2007, China successfully launched the fourth Beidou (Bid Dipper) navigation experiment satellite, further enhancing the performance of the Beidou navigation experiment system. China has comprehensively launched the building of a Beidou regional navigation system, consisting of five GEO satellites, five inclined geosynchronous orbit (IGSO) satellites and four medium-Earth-orbit (MEO) satellites. Since April 2007, China has launched 10 such satellites and has been able to provide trial services for Asia-Pacific users.

4) Scientific satellites and technological test satellites

China has developed and launched several Shijian (Practice) satellites and small and micro satellites, providing supporting platforms for space environment exploration, space scientific test and new technology demonstration.

3. Human Spaceflight

From September 25 to 28, 2008, China successfully launched the Shenzhou-7 (Divine Ship-7) manned spaceship. China also became the third country in the world to master the key technology of astronaut space extravehicular activity, completing a space material test outside the spaceship and an experiment on deploying and accompanying flight of a small satellite. In September and November 2011, China successively launched the Tiangong-1 (Space Palace-1) and Shenzhou-8 spaceship, and accomplished their first space rendezvous and docking test, laying the foundation for the construction of future space laboratories and space stations.

4. Deep-space Exploration

On October 24, 2007, China successfully launched its first lunar probe, Chang'e-1, and achieved its objectives of "accurate orbital transfer and successful orbiting," also retrieving a great deal of scientific data and a complete map of the moon, and successfully implementing a controlled crash onto the lunar surface. The success of Chang'e-1 was another milestone for China's space industry, after man-made satellites and human spaceflight, signifying that China has become one of the countries capable of deep-space exploration.

On October 1, 2010, China successfully launched its second lunar probe, Chang'e-2, created a full higher-resolution map of the moon, and a high-definition image of Sinus Iridium, and completed several extended tests, including circling the Lagrangian Point L2, which laid the foundation for future deep-space exploration tasks.

5. Space Launch Sites

China has improved its three existing launch sites in Jiuquan, Xichang and Taiyuan, enhancing their comprehensive test capabilities and high-intensity launching capabilities. These sites have successfully launched manned spaceship, lunar probes and a variety of satellites. At present, China is building a new space launch site in Hainan to accommodate the launch of new-generation launch vehicles.

6. Space Telemetry, Tracking and Command (TT□C)

China has improved its TT&C ground stations and ships, and has established a very long baseline interferometry (VLBI) network comprising four observation stations and a data processing center, indicating that China has acquired space-based TT&C capabilities; it has also established a multi-functioning TT&C network featuring space and ground integration, complete sets of equipment and ability to complete various tasks. At present, China's TT&C network is expanding from the ground to space, and from geospace TT&C to deep-space TT&C. The network is able to not only satisfy satellite TT&C demands, but also support human spaceflight and deep-space exploration.

7. Space Applications

1) Applications of Earth observation satellites

The fields and scope in which Earth observation satellites are used have been constantly expanding; these satellites' capabilities in providing business services have also been growing and an Earth observation satellite application system has initially taken shape. China has built four new satellite data-receiving stations, enhancing its ability to receive data from meteorological, ocean and land observation satellites. China has also established, based on comprehensive planning, the ground data processing system for Earth observation satellites, extending its ability in centralized data processing, data archiving, data distribution and services provision. China has established centers for environmental satellite application, satellite disaster-relief application, satellite mapping application and other application institutes for Earth observation satellites, promoting the spread and utility of Earth observation satellite data. China has improved calibration services of remote-sensing satellite radiation calibration fields, enhancing the quantitative application level of Earth observation satellites.

Today, Earth observation satellite data has been widely used in various fields for economic and social development. Fengyun satellites have effectively monitored typhoons, floods, forest and grassland fires, droughts, sandstorms and other natural disasters; their weather forecasting and climate change monitoring capabilities have also been enhanced remarkably. The ocean satellite series have monitored China's maritime territory and the world's key waters, and their forecasting accuracy for sea ice, ocean temperatures and wind fields have increased greatly, and their time efficiency in monitoring dangerous sea conditions has also been notably enhanced. The resource satellite series have played an important role in efforts to investigate, monitor and manage the resources of land, minerals, agriculture, forestry, and water conservancy, as well as geological disasters and city planning. Remote-sensing and Tianhui satellites have played an important role in scientific experiments, land censuses, mapping and other fields. The small satellites for environmental and disaster monitoring and forecasting have provided critical technical support for surface water quality and atmospheric environmental monitoring, major pollution events addressing, and major natural disaster monitoring, assessment and relief.

2) Applications of communications and broadcasting satellites

China has steadily promoted the applications of communications and broadcasting satellites, and has brought into being a market of certain scale. It has improved its satellite radio and TV network: in 2008 China established a satellite service platform to give every village access to direct broadcast and live telecasts. It also implemented satellite broadcasting and transmissions of China National Radio and China Central Television programs, and one channel program of provincial radio and TV stations, thus greatly increasing the radio and TV program coverage. China has strengthened development of its satellite tele-education broadband network and tele-medicine network, mitigating to some extent the problem of shortage of education and medical resources in remote and border areas. China has also strengthened its satellite capacity in emergency communications, providing important support for rescue and relief work and for major disaster management.

3) Applications of navigation and positioning satellites

China's applications of navigation and positioning satellites have embarked on the road of industrialized development, and are now developing at a high speed, and important progress has been made in developing navigation- and positioning-satellite applications. Through both domestic and foreign navigation and positioning satellites, China has been applying these technologies more broadly; as a result, the market for this industry has expanded rapidly. China strives to promote the application of its Beidou satellite navigation system, and the system has been used in transportation, sea fishing, hydrological monitoring, communications and timing service, power dispatching, and disaster reduction and relief.

8. Space Science

1) Sun-Earth space exploration

China has implemented the Double Star Program to explore the Earth's magnetosphere in concert with the Cluster Program of the European Space Agency (ESA), obtaining much new data and making important progress in space physics.

2) Lunar scientific research

Through lunar exploration projects, China has studied the morphology, structure, surface matter composition, microwave properties, and near-moon space environment, further enhancing its knowledge of the moon.

3) Experiments on microgravity science and space life science

Using the Shijian satellites and Shenzhou spaceship, China has carried out space experiments in life science, materials science, fluid mechanics and other fields under conditions of microgravity and strong radiation. It has also conducted experiments on crop breeding in space.

4) Space environment exploration and forecasting

Using Shenzhou and other spacecraft, China has explored the space environment's major parameters and effects, worked on space environmental monitoring and forecasting, and studied space environmental effects.

9. Space Debris

China has monitored space debris, and given early warnings against them, ensuring safe flight of Chang'e-1 and Chang'e-2 lunar probes, and Shenzhou-7 manned spaceship. China has steadily pushed forward its work on space debris mitigation, fully inactivating Long March rockets, and moving a few aging GEO satellites out of orbit. China has also worked on protecting manned spaceship from space debris.

III. Major Tasks for the Next Five Years

In the next five years, China will strengthen its basic capacities of the space industry, accelerate research on leading-edge technology, and continue to implement important space scientific and technological projects, including human spaceflight, lunar exploration, high-resolution Earth observation system, satellite navigation and positioning system, new-generation launch vehicles, and other priority projects in key fields. China will develop a comprehensive plan for construction of space infrastructure, promote its satellites and satellite applications industry, further conduct space science research, and push forward the comprehensive, coordinated and sustainable development of China's space industry.

1. Space Transportation System

China will build a stronger space transportation system, keep improving its launch vehicle series, and enhance their capabilities of entering space.

It will enhance the reliability and adaptability of launch vehicles in service, and develop new-generation launch vehicles and their upper stages, implement the first flight of the Long March-5, Long March-6 and Long March-7 launch vehicles. The Long March-5 will use non-toxic and pollution-free propellant, and will be capable of placing 25 tons of payload into the near-Earth orbit, or placing 14 tons of payload into the GEO orbit. The Long March-6 will be a new type of high-speed response launch vehicle, which will be capable of placing not less than 1 ton of payload into a sun-synchronous orbit at a height of 700 km. The Long March-7 will be capable of placing 5.5 tons of payload into a sun-synchronous orbit at a height of 700 km.

It will conduct special demonstrations and pre-research on key technologies for heavy-lift launch vehicles.

2. Man-made Earth Satellites

China will build a space infrastructure frame composed of Earth observation satellites, communications and broadcasting satellites, plus navigation and positioning satellites, and will develop a preliminary long-term, sustained and stable service capability. China will develop new types of scientific satellites and technological test satellites.

1) Earth observation satellites

China will improve its present meteorological, oceanic, and resource satellite series and its small satellites constellation for environmental and disaster monitoring and forecasting. It aims at developing and launching new-generation GEO meteorological satellites, stereo mapping satellites, radar satellites for environment and disaster monitoring, electromagnetic monitoring test satellites, and other new-type Earth observation satellites. It will work to make breakthroughs in key technologies for interferometric synthetic-aperture radar and gravitational field measurement satellites. It will initiate a high-resolution Earth observation system as an important scientific and technological project and establish on the whole a stable all-weather, 24-hour, multi-spectral, various-resolution Earth observation system.

2) Communications and broadcasting satellites

China will improve satellites for fixed communications services, television and radio service satellites and data relay satellites; develop satellites for mobile communication service; and develop a platform of higher capacity and higher power for new-generation GEO communications and broadcasting satellites.

3) Navigation and positioning satellites

Based on "three-step" development plan - from experimental system to regional system and then to global system, China will continue building its Beidou satellite navigation system, implementing a regional Beidou satellite navigation system before 2012, whose navigation and positioning, timing and short-message services will cover the Asia-Pacific region. China aims at completing the global Beidou satellite navigation system by 2020, comprising five GEO satellites and 30 non-GEO satellites.

4) Scientific satellites and technological test satellites

China will develop and launch a Hard X-ray Modulation Telescope satellite, Shijian-9 new technology test satellite, and returnable satellites. It will begin to implement projects of quantum science test satellite and dark matter probing satellite.

3. Human Spaceflight

China will push forward human spaceflight projects and make new technological breakthroughs, creating a foundation for future human spaceflight.

It will launch the Shenzhou-9 and Shenzhou-10 spaceships and achieve unmanned or manned rendezvous and docking with the in-orbit Tiangong-1 vehicle.

China will launch space laboratories, manned spaceship and space freighters; make breakthroughs in and master space station key technologies, including astronauts' medium-term stay, regenerative life support and propellant refueling; conduct space applications to a certain extent and make technological preparations for the construction of space stations.

China will conduct studies on the preliminary plan for a human lunar landing.

4. Deep-space Exploration

China carries out deep-space exploration in stages, with limited goals.

Based on the idea of "three steps" -- orbiting, landing and returning -- for continuing lunar probe projects, China will launch orbiters for lunar soft landing, roving and surveying to implement the second stage of lunar exploration. In the third stage, China will start to conduct sampling the moon's surface matters and get those samples back to Earth.

China will conduct special project demonstration in deep-space exploration, and push forward its exploration of planets, asteroids and the sun of the solar system.

5. Space Launch Sites

China will enhance the reliability and automation level of launch site facilities and equipment, strengthen the comprehensive capability of launch of spacecraft, and satisfy the launch demands. It will also complete the construction of the Hainan space launch site and put it into service.

6. Space TT□C

China will improve its space TT&C network, build deep-space TT&C stations, develop advanced TT&C technologies, and enhance its TT&C capabilities in all respects to satisfy the demands for remote TT&C.

7. Space Applications

China will further improve its satellite application and service system, expand satellites application scope, and promote the national new strategic industries, to meet demands of national economic and social development.

1) Applications of Earth observation satellites

China will improve its ground facilities for receiving, processing, distributing and applying satellite data, and will strengthen the development of calibration fields and other facilities. It will improve the sharing and comprehensive application of data retrieved from Earth observation satellites, make more self-obtained space data, and guide social resources to actively develop market-oriented data application services. It will implement application demonstration projects, and promote the wide utilization and industrialization of Earth observation satellites.

2) Applications of communications and broadcasting satellites

China will strengthen the applications of communications and broadcasting satellites in public service and major industries of the national economy. It plans to expand value-added business in the satellite communication field, further commercialize satellite communication, and expand the industrial scale of the application of communications and broadcasting satellites.

3) Applications of navigation and positioning satellites

China will build and improve ground TT&C segments and develop a system for monitoring and assessing performance of the global satellite navigation system, strengthen technological research, product development and standardization system of navigation and positioning satellites, enhance application level, promote position-based services, expand the industrial scope, and focus on promoting further use of the Beidou satellite navigation system in various fields of China's national economy.

8. Space Science

China will strengthen the development of its space science research system, upgrade the quality of space science research, and enhance popularization of space science knowledge in the whole nation.

By the implementation of lunar exploration projects, China will make in-situ analyses, morphological and structural surveys of the lunar surface in landing and roving areas, conduct environmental surveys of the lunar surface and make moon-based astronomical observations.

By using spacecraft, China will study the properties of black holes and physical laws under extreme conditions, explore properties of dark matter particles, and test basic theories of quantum mechanics. It will also conduct scientific experiments on microgravity and space life science, explore and forecast the space environment and study their effects.

9. Space Debris

China will continue to strengthen its work on space debris monitoring and mitigation and its work on spacecraft protection.

China will develop technologies for monitoring space debris and pre-warning of collision, and begin monitoring space debris and small near-Earth celestial bodies and collision pre-warning work. It will set up a design and assess system of space debris mitigation, and take measures to reduce space debris left by post-task spacecraft and launch vehicles. It will experiment with digital simulation of space debris collisions, and build a system to protect spacecraft from space debris.

IV. Development Policies and Measures

To ensure completion of the set goals and tasks, the Chinese government has formulated policies and measures to be taken for the development of China's space industry as follows:

-- Making comprehensive plans for and prudently arrange space activities. To give priority to applied satellites and satellite applications, develop human spaceflight and deep-space exploration properly, and give active support to space science exploration.

-- Strengthening innovation capability in space science and technology. To focus on implementing important space science and technological projects and to realize leapfrog development in space science and technology by way of making new breakthroughs in core technologies and resource integration. To actively build a space technology innovative system featuring integration of the space industry, academia and the research community, with space science and technology enterprises and research institutions as the main participants; to strengthen basic research in the space field and develop multiple advanced frontier technologies to increase sustainable innovative capacity in space science and technology.

-- Vigorously promoting development of the satellite application industry. To make comprehensive plans and construct space infrastructure; promote public sharing of satellite application resources; foster enterprise clusters, industrial chains and market for satellite applications.

-- Strengthening basic capability in space science, technology and industry. To strengthen construction of infrastructure for development, production and test for spacecraft and launch vehicles. To strengthen construction of key laboratories and engineering research centers for space science and technology. And to strengthen work on informatization, intellectual property rights and standardization of space activities.

-- Strengthening legislative work. To actively carry out research on a national space law, gradually formulate and improve related laws, regulations and space industrial policies guiding and regulating space activities, and create a legislative environment favorable to the development of space activities.

-- Guaranteeing the sustainable and steady financial investment for space activities. To gradually establish a diverse, multi-channel space funding system to ensure the investment sustainable and steady, especially to provide larger amounts for important space scientific and technological projects, applied satellite and satellite applications, frontier technologies and basic researches.

-- Encouraging organizations and people in all walks of life to participate in space-related activities. To encourage scientific research institutes, enterprises, institutions of higher learning and social organizations, under the guidance of national space policies, giving full play to their advantages and taking an active part in space activities.

-- Strengthening training of professionals for the space industry. To vigorously develop a favorable environment for the development of professional personnel, fostering leading figures in the space industry and forming a well-structured contingent of highly qualified personnel in the course of conducting the important projects and basic researches. To publicize space knowledge and culture, and attract more outstanding personnel into the space industry.

V. International Exchanges and Cooperation

The Chinese government holds that each and every country in the world enjoys equal rights to freely explore, develop and utilize outer space and its celestial bodies, and that all countries' outer space activities should be beneficial to economic development, the social progress of nations, and to the security, survival and development of mankind.

International space cooperation should adhere to the fundamental principles stated in the "Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries." China maintains that international exchanges and cooperation should be strengthened to promote inclusive space development on the basis of equality and mutual benefit, peaceful utilization and common development.

1. Fundamental Policies

The Chinese government has adopted the following fundamental policies with regard to developing international space exchanges and cooperation:

-- Supporting activities regarding the peaceful use of outer space within the framework of the United Nations. Supporting all inter-governmental and non-governmental space organizations' activities that promote development of the space industry;

-- Emphasizing regional space cooperation in the Asia-Pacific area, and supporting other regional space cooperation around the world;

-- Reinforcing space cooperation with developing countries, and valuing space cooperation with developed countries;

-- Encouraging and endorsing the efforts of domestic scientific research institutes, industrial enterprises, institutions of higher learning, and social organizations to develop international space exchanges and cooperation in diverse forms and at various levels under the guidance of relevant state policies, laws and regulations;

-- Appropriately using both domestic and foreign markets and both types of resources, and actively participating in practical international space cooperation.

2. Major Events

Since 2006, China has implemented international space exchanges and cooperation in various forms. It has signed a number of cooperation agreements and memoranda on the peaceful utilization of outer space with a host of countries, space agencies and international organizations. China has taken part in relevant activities sponsored by the United Nations and other relevant international organizations and supported international space commercial cooperation. These measures have yielded positive results.

Bilateral cooperation

-- China has established a long-term cooperation plan with Russia through the mechanism of the Space Cooperation Sub-committee under the Prime Ministers' Meeting between Russia and China. The two nations have signed a number of cooperation agreements on space science, deep-space exploration and other areas, and their national space administrations have opened representative offices mutually. In the field of human spaceflight, the two nations have also carried out many cooperation projects.

-- China has undertaken extensive cooperation with Ukraine under the Space Cooperation Sub-committee mechanism of the Sino-Ukrainian Cooperation Commission, and the two sides have signed the "Sino-Ukrainian Space Cooperation Program."

-- China and the European Space Agency (ESA) have signed the "Status Quo of China-Europe Space Cooperation and the Cooperation Plan Protocol" under the mechanism of the China-Europe Joint Commission on Space Cooperation. The two sides cooperated closely during the lunar exploration missions of Chang'e-1 and Chang'e-2, and signed the "Agreement on Mutual Support for the TT&C Network and Operation" in September 2011.

-- China and Brazil, through the mechanism of the Space Cooperation Sub-committee of the Sino-Brazilian High-level Coordination Commission, have worked out a comprehensive bilateral space cooperation plan, actively promoted the research and development of the China-Brazil Earth resources satellites, continued to maintain data consistency of their Earth resources satellites and expanded the application of their data into regional and global application.

-- China has signed a cooperation framework agreement on space and marine science and technology with France under the mechanism of the Sino-French Joint Commission on Space Cooperation, aiming at developing bilateral cooperation on astronomic satellite, ocean satellite and other satellite programs.

-- China and Britain have established a joint laboratory on space science and technology, jointly organized a seminar on space science and technology, and conducted exchanges on lunar exploration, Earth observation, space science research and experiment, personnel training and other areas.

-- China has signed a framework agreement with Germany on bilateral cooperation in the field of human spaceflight. Under the framework, the two countries have carried out a cooperative experiment project on the Shenzhou-8 concerning space life science.

-- The director of the U.S. National Aeronautical and Space Administration (NASA) visited China and the two sides will continue to make dialogue regarding the space field.

-- China has signed a memorandum of understanding on technological cooperation in the peaceful utilization and development of outer space with Venezuela, and the two nations have established a technology, industry and space sub-committee under the China-Venezuela Senior Mixed Committee. Under this framework, the two nations have promoted bilateral cooperation in communications satellites, remote-sensing satellites, satellite applications and other areas.

-- China has signed the "Cooperation Agreement on the Application, Exchange and Distribution of Meteorological Satellite Data" with the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), to promote the sharing in and application of meteorological satellite data.

-- China has actively promoted the extensive applications of Earth observation satellite data with various countries. China has given to many countries free receiving stations for meteorological satellite broadcasting systems and comprehensive systems for meteorological information analysis and processing. With China's help, a data receiving station of the Sino-Brazilian Earth Resources Satellite Program was established in South Africa, and another station for receiving environmental and disaster data from Chinese satellites was set up in Thailand. China has provided related earth observation satellite data products to the above-mentioned countries.

-- China has implemented international exchanges and cooperation with a number of countries in frequency coordination, compatibility and interoperability, applications and other international exchanges and cooperation in the area of satellite navigation systems.

Multilateral cooperation

-- China has taken part in activities organized by the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) and its Scientific and Technical Sub-committee and Legal Sub-committee.

-- China has signed relevant agreements with the United Nations on disaster management and emergency response based on the space-based information platform. A Beijing office of the program has been established. Through this office, China has provided drought risk-monitoring products to the "Horn of Africa," and contributes to the regional disaster mitigation effort by offering training, capacity building, data service, disaster emergency response, QDGS (Quick Draw Graphics System) and other services.

-- China has cooperated with the space institutes of various countries through the mechanism of the "International Charter on Space and Major Disasters." Through this mechanism, satellite data support was provided to the Wenchuan earthquake, the forest fire in Australia and other major disaster relief work.

-- In 2008, the Asia-Pacific Space Cooperation Organization (APSCO) was established with the joint effort of Asia-Pacific nations. Under the APSCO frame, the Chinese government actively participates in the cooperation and study of various projects, including the development of a space data-sharing platform, its demonstration and application; an Earth-based optic space target observation network; compatible navigation terminals. China assisted APSCO in the formulation and release of its policy on small satellite data in Asia-Pacific multilateral cooperation, and has promoted space cooperation in the Asia-Pacific region.

-- China participates in activities organized by the International Committee on Global Navigation Satellite Systems, International Space Exploration Coordination Group, Inter-Agency Space Debris Coordination Committee, Group on Earth Observations, World Meteorological Organization and other inter-governmental international organizations. China has also developed multilateral exchanges and cooperation in satellite navigation, Earth observation and Earth science and research, disaster prevention and mitigation, deep-space exploration, space debris and other areas. China's Beidou satellite navigation system has become one of the world's four core system suppliers accredited by the International Committee on Global Navigation Satellite Systems, and will gradually provide regional and global navigation and positioning service as well as strengthened compatibility and interoperability with other satellite navigation systems. China will do its best to host the Seventh Meeting of the International Committee on Global Navigation Satellite Systems in 2012. The nation's independently developed space debris protective design system has also been incorporated into the protection manual of the Inter-Agency Space Debris Coordination Committee.

-- China takes part in activities organized by the International Astronautical Federation, International Committee on Space Research, International Academy of Astronautics, and other non-governmental international space organizations and academic institutes. It has also organized a series of international academic conferences, including the Global Lunar Conference, and has fostered discussion and exchanges in deep-space exploration, space debris and other issues.

Commercial activities

China actively promotes the participation of Chinese enterprises in international commercial activities in the space field. China has exported whole satellites and made in-orbit delivery of communications satellites to Nigeria, Venezuela and Pakistan; provided commercial launch services for the Palapa-D satellite of Indonesia and the W3C satellite of Eutelsat, and signed commercial satellite and ground system export contracts with Bolivia, Laos, Belarus and other countries.

3. Key Cooperation Areas

In the next five years, China's international space exchanges and cooperation will be mainly in the following areas:

-- Scientific research on space astronomy, space physics, micro-gravity science, space life science, deep-space exploration, space debris and other areas.

-- Applications of Earth observation satellites in environment and disaster monitoring, global climate change monitoring and forecasting, marine monitoring and other areas.

-- Applications of communications satellites in broadcasting and television, long-distance education, telemedicine and other areas.

-- Applied technological cooperation, research and development of terminal equipment, reinforced facility building, specific industrial services and other areas of satellite navigation systems.

-- Technological cooperation on a space lab and a space station in China's human spaceflight program; space science research and experiments and other areas.

-- Space TT&C cooperation, support and others.

-- Commercial satellite launch service, import and export of whole satellites, satellite parts and components, import and export of ground test equipment, and building and service of satellite ground TT&C and satellite application facilities as well as related services, etc.

-- Personnel exchanges and training in the field of space.

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COUNCIL OF
THE EUROPEAN UNION

Brussels, 22 March 2011

8077/11

Interinstitutional File:
2011/0054 (NLE)

TRANS 91
MAR 43
AVIATION 64
ESPACE 13
RELEX 297
USA 22

PROPOSAL

from:	European Commission
dated:	18 March 2011
Subject:	Proposal for a Council Decision on the conclusion of the Agreement on the promotion, provision and use of GALILEO and GPS satellite based navigation systems and related applications between the United States of America, of the one part, and the European Community and its Member States, of the other part

Delegations will find attached a proposal from the Commission, submitted under a covering letter from Mr Jordi AYET PUIGARNAU, Director to Mr Pierre de BOISSIEU, Secretary-General of the Council of the European Union.

Encl.: COM(2011) 124 final

EUROPEAN COMMISSION

Brussels, 17.3.2011
COM(2011) 124 final

2011/0054 (NLE)

Proposal for a

COUNCIL DECISION

on the conclusion of the Agreement on the promotion, provision and use of GALILEO and GPS satellite-based navigation systems and related applications between the United States of America, of the one part, and the European Community and its Member States, of the other part

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EXPLANATORY MEMORANDUM

The Council, on the basis of a Commission proposal of 14 July 1999, authorised the Commission on 30 September 1999 to open negotiation with the United States of America for the conclusion of an agreement concerning the development of a Civil Global Navigation System.

These negotiations have been successfully completed and the Council has authorised the signature of the agreement by Decision of 22 June 2004.

The agreement on the promotion, provision and use of GALILEO and GPS satellite-based navigation systems and related applications between the United States of America, of the one part, and the European Communities and its Member States, of the other part has been signed in Dromoland Castle, Ireland, on 26 June 2004 and entered provisionally in application on 1 November 2008.

The signatory Member States of the European Union have completed their respective internal procedures related to the entry into force of the agreement.

Bulgaria and Romania are to become parties to the agreement by the conclusion of a protocol in accordance with Art 6(2) of the Act concerning the conditions of accession of the Republic of Bulgaria and Romania and the adjustments to the treaties on which the European Union is founded.

The Council is requested to adopt the following proposal for a Decision on the conclusion of the agreement on behalf of the European Union after the approval of the European Parliament.

2011/0054 (NLE)

Proposal for a

COUNCIL DECISION

on the conclusion of the Agreement on the promotion, provision and use of GALILEO and GPS satellite-based navigation systems and related applications between the United States of America, of the one part, and the European Community and its Member States, of the other part

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Articles 171(3) 172 in conjunction with Article 218 (6) (a) thereof,

Having regard to the proposal from the Commission,

Having regard to the consent of the European Parliament[1],

Whereas:

(1) The Council authorised the Commission on 30 September 1999 to open negotiations with the United States of America for the conclusion of an agreement concerning the development of a Civil Global Navigation System

(2) In accordance with Council decision 10257/04 of 22 June 2004 , the Agreement on the promotion, provision and use of GALILEO and GPS satellite based navigation systems and related applications between the United States of America, of the one part, and the European Community and its Member States, of the other part (hereinafter referred to as the "Agreement"), was signed in Dromoland Castle, Ireland, on 26 June 2004 and is provisionally applied since 1 November 2008, pending its entry into force.

(3) The Agreement should be concluded,

HAS ADOPTED THIS DECISION:

Article 1

The Agreement on the promotion, provision and use of GALILEO and GPS satellite-based navigation systems and related applications between the United States of America, of the one part, and the European Community and its Member States, of the other part, is hereby concluded on behalf of the European Union.

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1 Opinion delivered on … (not yet published in the Official Journal).

The text of the Agreement is attached hereto.

Article 2

The President of the Council shall designate the person empowered to proceed, on behalf of the European Union, to the deposit of the instrument of approval provided for in the Agreement, in order to express the consent of the European Union to be bound by the Agreement.

Article 3

This Decision shall enter into force on the day of its adoption. It shall be published in the *Official Journal of the European Union*.

The date of entry into force of the Agreement shall be published in the *Official Journal of the European Union*.

Done at Brussels,

For the Council
The President

AGREEMENT

ON THE PROMOTION, PROVISION AND USE OF GALILEO

AND GPS SATELLITE-BASED NAVIGATION SYSTEMS

AND RELATED APPLICATIONS

THE UNITED STATES OF AMERICA,

of the one part,

and

THE KINGDOM OF BELGIUM,

THE CZECH REPUBLIC,

THE KINGDOM OF DENMARK,

THE FEDERAL REPUBLIC OF GERMANY,

THE REPUBLIC OF ESTONIA,

THE HELLENIC REPUBLIC,

THE KINGDOM OF SPAIN,

THE FRENCH REPUBLIC,

IRELAND,

THE ITALIAN REPUBLIC,

THE REPUBLIC OF CYPRUS,

THE REPUBLIC OF LATVIA,

THE REPUBLIC OF LITHUANIA,

THE GRAND DUCHY OF LUXEMBOURG,

THE REPUBLIC OF HUNGARY,

THE REPUBLIC OF MALTA,

THE KINGDOM OF THE NETHERLANDS,

THE REPUBLIC OF AUSTRIA,

THE REPUBLIC OF POLAND,

THE PORTUGUESE REPUBLIC,

THE REPUBLIC OF SLOVENIA,

THE SLOVAK REPUBLIC,

THE REPUBLIC OF FINLAND,

THE KINGDOM OF SWEDEN,

THE UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND,

CONTRACTING PARTIES to the Treaty establishing THE EUROPEAN COMMUNITY, hereinafter referred to as the "Member States", and THE EUROPEAN COMMUNITY,

of the other part,

RECOGNISING that the United States operates a satellite-based navigation system known as the Global Positioning System, a dual use system that provides precision timing, navigation, and position location signals for civil and military purposes,

RECOGNISING that the United States is currently providing the GPS Standard Positioning Service for peaceful civil, commercial, and scientific use on a continuous, worldwide basis, free of direct user fees, and noting that the United States intends to continue providing it, and similar future civil services under the same conditions,

RECOGNISING that the European Community is developing and plans to operate a civil global satellite navigation, timing and positioning system, GALILEO, which would be radio frequency compatible with GPS and interoperable with civil GPS services at the user level,

RECOGNISING that GPS signals are used worldwide for satellite-based navigation services including augmentations,

RECOGNISING that civil GPS and GALILEO, if radio frequency compatible and interoperable at the user level, could increase the number of satellites visible from any location on the Earth and aid accessibility to navigation signals for civil users worldwide,

RECOGNISING that the International Civil Aviation Organisation (ICAO) establishes international standards and recommended practices and other guidance applicable to the use of global satellite-based navigation systems for civil aviation, that the International Maritime Organisation (IMO) establishes international standards and other guidance applicable to the use of global satellite-based navigation systems for maritime navigation, and that the International Telecommunication Union (ITU) establishes multilateral regulations and procedures applicable to the operation of global radio-navigation systems, as well as to other radio communication systems,

DESIRING to provide satellite navigation users and equipment providers with a broader range of services and capabilities, leading to increased user applications, while assuring radio frequency compatibility with systems and equipment already in use, DESIRING to promote open markets and to facilitate growth in trade with respect to commerce in global navigation and timing goods, value-added services, and augmentations,

CONVINCED of the need to prevent and protect against the misuse of global satellite-based navigation and timing services without unduly disrupting or degrading signals available for civilian uses,

CONVINCED of the need to cooperate so that the benefits of this important technology are fully achieved for all relevant applications,

RECOGNISING that consultations are desirable for the purpose of avoiding or resolving any disputes that may arise under this Agreement, including those relating to the way in which the Parties discharge their respective responsibilities for the obligations within their areas of competence,

HAVE AGREED AS FOLLOWS:

ARTICLE 1

Objectives

1. The objective of this Agreement is to provide a framework for cooperation between the Parties in the promotion, provision and use of civil GPS and GALILEO navigation and timing signals and services, value-added services, augmentations, and global navigation and timing goods. The Parties intend to work together, both bilaterally and in multilateral fora, as provided herein, to promote and facilitate the use of these signals, services, and equipment for peaceful civil, commercial, and scientific uses, consistent with and in furtherance of mutual security interests. This Agreement is intended to complement and facilitate agreements in force, or which may be negotiated in the future, between the Parties related to the design and implementation of civil satellite-based navigation and timing signals and services, augmentations, or value-added services.

2. Nothing in this Agreement shall supersede, modify or derogate from standards, procedures, rules, regulations and recommended practices adopted in ICAO, or IMO. The Parties confirm their intent to act in a manner consistent with these bodies' regulatory framework and processes.

3. Nothing in this Agreement shall affect the rights and obligations of the Parties under the Marrakech Agreement Establishing the World Trade Organisation (hereinafter "the WTO Agreements").

ARTICLE 2

Definitions

For the purposes of this Agreement, the following definitions shall apply:

(a) "Augmentation" means civil mechanisms, which provide the users of satellite-based navigation and timing signals with input information, extra to that derived from the main constellation(s) in use, and additional range/pseudo-range inputs or corrections to, or enhancements of, existing pseudo-range inputs. These mechanisms enable users to obtain enhanced performance, such as increased accuracy, availability, integrity, and reliability.

(b)"Civil satellite-based navigation and timing service" means the civil satellite-based navigation or timing service provided by GPS or GALILEO, including secured governmental service.

(c)"Civil satellite-based navigation and timing service provider" means any government or other entity that provides civil satellite-based navigation or timing service.

(d) "Civil satellite-based navigation and timing signals" means the civil satellite-based navigation or timing signals provided by GPS or GALILEO, including secured governmental service signals.

(e) "Civil satellite-based navigation and timing signals provider" means any government or other entity that supplies GPS and/or GALILEO signals or augmentations.

(f) "Classified information" means official information that requires protection in the interests of national defense or foreign relations of the Parties, and is classified in accordance with applicable laws and regulations.

(g) "GALILEO" means an autonomous civil European global satellite-based navigation and timing system under civil control, developed by the European Community, its Member States, the European Space Agency and other entities. GALILEO includes an open service and one or more other services, such as a safety of life, commercial, and a secured governmental service, such as the Public Regulated Service ("PRS"), and any augmentations provided by the European Community, its Member States or other entities.

(h) "Global navigation and timing equipment" means any civil end user equipment designed to transmit, receive, or process satellite-based navigation and timing signals, to provide value-added services, or to operate with an augmentation.

(i) "GNSS" means Global Navigation Satellite System.

(j) "GPS" means the Global Positioning System Standard Positioning Service, an open service, (or future civil services) provided by the United States Government for civil use. GPS is currently provided by the United States in its exercise of governmental authority as it is neither supplied on a commercial basis nor offered in competition with one or more service suppliers. GPS includes any augmentation or improvements to that service provided directly by the United States Government.

(k) "Intellectual property" shall have the meaning found in Article 2 of the Convention Establishing the World Intellectual Property Organisation, done at Stockholm, 14 July 1967.

(l) "Interoperability at the user level" is a situation whereby a combined system receiver with a mix of multiple GPS or GALILEO satellites in view can achieve position, navigation and timing solutions at the user level that are equivalent to or better than the position, navigation or timing solutions that could be achieved by either system alone.

(m) "Measure" means any law, regulation, rule, procedure, decision, administrative action or similar binding action by the Parties at the national or supranational level.

(n) "Military satellite-based navigation and timing service" means a satellite-based navigation and timing service provided by a Party and specifically designed to meet the needs of defense forces.

(o) "Radio frequency compatibility" means the assurance that one system will not cause interference that unacceptably degrades the stand-alone service that the other system provides.

(p) "Secured governmental service" means a secured, restricted access satellite-based navigation and timing service provided by a Party and specifically designed to meet the needs of authorised governmental users.

(q) "Value-added service" means a downstream service or application, excluding augmentations, that uses civil satellite-based navigation and timing signals or services in a manner intended to provide additional utility or benefit to the user.

ARTICLE 3

Scope

Except as otherwise provided herein, this Agreement pertains to all measures established by the Parties concerning civil satellite-based navigation and timing signals and signal providers, civil satellite-based navigation and timing services and service providers, augmentations, value-added services and value-added service providers, and global navigation and timing goods.

The provision of military satellite-based navigation and timing services is outside the scope of this Agreement, except as provided in Article 4 as far as radiofrequency compatibility is concerned, Article 11 and in the Annex to this Agreement.

Secured governmental services are outside the scope of Articles 5 and 6, Article 8 paragraph 2, and Article 10, paragraph 3.

ARTICLE 4

Interoperability and Radio Frequency Compatibility

1. This Article is applicable to GPS and GALILEO as defined and, as far as radiofrequency compatibility is concerned, to all satellite-based navigation and timing services.

2. The Parties agree that GPS and GALILEO shall be radio frequency compatible. This paragraph shall not apply locally to areas of military operations. The Parties shall not unduly disrupt or degrade signals available for civil use.

3. The Parties also agree that GPS and GALILEO shall be, to the greatest extent possible, interoperable at the non-military user level. In order to achieve this interoperability and facilitate the joint use of the two systems, the Parties agree to realise their geodetic coordinate reference frames as closely as possible to the International Terrestrial Reference System. The Parties also agree to transmit the time offsets between GALILEO and GPS system times in the navigation messages of their respective services, as outlined in the document entitled "GPS/GALILEO Time Offset Preliminary Interface Definition" referred to in the Annex.

4. The Parties agree that the radio frequency compatibility and interoperability working group established pursuant to Article 13 shall continue work already underway with a view toward achieving, inter alia:

(a) radio frequency compatibility in the modernisation or evolution of either system; (The Parties need to assess further the radiofrequency compatibility of GALILEO and GPS III).

(b) enhanced signal availability and reliability through complementary system architectures for the benefit of users worldwide.

(c) interoperability at the non-military user level.

5. To further ensure radio frequency compatibility and non-military service interoperability, the Parties shall ensure that their augmentations meet the requirements of ICAO, IMO and the ITU to which such Parties are bound and such other requirements as the Parties may find mutually acceptable.

6. Nothing in this Agreement shall supersede, modify or derogate from standards, procedures, rules, regulations and recommended practices adopted in the ITU. The Parties confirm their intent to act in a manner consistent with this body's regulatory framework and processes.

ARTICLE 5

Standards, Certification, Regulatory Measures, and Mandates

(1) The Parties agree to consult with each other before the establishment of any measures: establishing, directly or indirectly (such as through a regional organisation), design or performance standards, certification requirements, licensing requirements, technical regulations or similar requirements applicable to civil satellite-based navigation and timing signals or services, augmentations, value-added services, global navigation and timing equipment, civil satellite-based navigation and timing signals or service providers, or value-added service providers; or

(2) that have the effect, directly or indirectly, of mandating the use of any civil satellite-based navigation and timing signals or services, value-added service, augmentation, or global navigation and timing equipment within its respective territory (unless the mandating of such use is expressly authorised by ICAO, or IMO).

ARTICLE 6

Non-Discrimination and Trade

1. The Parties affirm their non-discriminatory approach with respect to trade in goods and services related to civil satellite-based navigation and timing signals, augmentations, and value-added services.

2. The Parties affirm that measures with respect to goods and services related to civil satellite-based navigation and timing signals or services, augmentations, and value-added services should not be used as a disguised restriction on or an unnecessary obstacle to international trade.

3. The trade and civil applications working group established pursuant to Article 13 shall consider, inter alia, non-discrimination and other trade related issues concerning civil satellite-based navigation and timing signals or services, augmentations, value-added services, and global navigation and timing goods, including the potential for additional commitments in relevant bilateral or multilateral fora.

ARTICLE 7

Open Access to Civil Satellite-based Navigation or Timing Signals

1. Except for reasons of national security, the Parties shall not restrict either use of or access to the positioning, navigation and timing information of their respective open services by end users, including for augmentation. This provision does not preclude the ability to make access to such information by other entities, such as manufacturers of satellite based navigation and timing equipment, subject to non-discriminatory commercial arrangements.

2. The Parties shall endeavour to provide signals intended for safety of life services with the required level of safety as recognised by competent international bodies.

ARTICLE 8

Open Access to Information

1. Subject to applicable export controls, the Parties agree to make publicly available on a non-discriminatory basis, sufficient information concerning their respective unencrypted civil satellite-based navigation and timing signals and augmentations, to ensure equal opportunity for persons who seek to use these signals, manufacture equipment to use these signals, or provide value-added services which use these signals. Such information shall include, but not be limited to, signal specifications, including elements such as minimum usage conditions, radio frequency characteristics, and navigation message structure.

2. To the extent that a Party provides civil satellite-based navigation and timing signals or services, augmentation, or value-added service for civil users that is encrypted or otherwise has features that allow the global navigation service provider to deny access, the Party shall, subject to applicable export controls, afford to the other Party's manufacturers of global navigation and timing equipment or augmentation or value-added services providers, on a non-discriminatory basis, access to the information necessary to incorporate such encryption or other similar features into their equipment, through licensing of necessary information or other means at market prices.

ARTICLE 9

Intellectual Property

Nothing in this Agreement is intended to affect intellectual property rights related to global satellite-based navigation and timing signals, services or goods.

ARTICLE 10

Cost Recovery for Civil Satellite-Based Navigation and Timing Signals

1. The Parties shall each endeavour to provide open service navigation and timing signals without direct fees for end use or for augmentation.

2. To the extent that a Party pursues a system that would be used for charging fees for international aviation or maritime safety of life users, it intends to do so in a manner consistent with ICAO and IMO.

3. The Parties shall consult each other where appropriate on cost recovery policies. The Parties shall encourage practicable steps to ensure transparency and accountability for fees incurred in providing their services.

ARTICLE 11

National Security Compatibility and Spectrum Use

1. The Parties shall work together to promote adequate frequency allocations for satellite-based navigation and timing signals, to ensure radio frequency compatibility in spectrum use between each other's signals, to make all practicable efforts to protect each other's signals from interference by the radio frequency emissions of other systems, and to promote harmonised use of spectrum on a global basis, notably at the ITU. The Parties shall cooperate with respect to identifying sources of interference and taking appropriate follow-on actions.

2. The Parties intend to prevent hostile use of satellite-based navigation and timing services while simultaneously preserving services outside areas of hostilities. To this end, their respective satellite based navigation and timing signals shall comply with the National Security Compatibility criteria set forth in the documents entitled "National Security Compatibility Compliance for GPS and GALILEO Signals in the 1559-1610 MHz Band, Part 1, Part 2 and Part 3" (hereinafter "Criteria, Assumption and Methodology Documents"), referenced in the attached Annex, using the methodology and assumptions contained in the Criteria, Assumption and Methodology Documents.

3. The Parties agree that the signal structures specified in the Annex to this Agreement comply with the National Security Compatibility criteria set forth in the Criteria, Assumption and Methodology Documents.

4. In order to maintain and continuously improve the quality and security of services, the systems will need to respond effectively to unforeseen changes in technology, user needs and the spectrum environment. The Parties intend to pursue modernisation and development of their respective systems while maintaining the security and market benefits of compatible and interoperable common civil signals.

5. The Parties shall inform and consult one another on the implementation of the baseline signal structures specified in the Annex. A Party shall notify the other Party in writing through diplomatic channels if it desires in the future to change or add to the baseline signal structures specified and agreed to in the Annex.

6. Unless a Party voices concerns on the basis of National Security Compatibility, as taken into account in the Criteria, Assumption and Methodology Documents, or on the basis of radio-frequency compatibility, within a time period of three months after its receipt of the notification mentioned in paragraph 5, that Party will not oppose the adoption and implementation of the alternative signal structure specified in the notification. If a Party voices National Security or radio-frequency compatibility concerns within that time period, the Parties shall without delay enter into consultations to verify that the alternative signal structures comply with the National Security Compatibility criteria set forth in the Criteria, Assumption and Methodology Documents and with radio-frequency compatibility, using the respective Assumptions and Methodology documents referred to in the Annex for compatibility analysis.

7. The Parties agree to use the common baseline modulation for the GALILEO Open Service and the future GPS III civil signal (Standard Positioning Service) as described in the Annex. The Parties shall work together without delay toward achieving optimisation of that modulation for their respective systems. If a Party changes or adds to its modulation for the GALILEO Open Service or the future GPS III civil signal, pursuant to the process set forth in paragraphs 5 and 6, the other Party shall not be obliged to change or add to its modulation.

8. The Parties agree to study the means to protect the secured governmental service in the context of national security compatibility, under the working group on security issues established in Article 13, paragraph (2)(d).

ARTICLE 12

GPS and GALILEO Search & Rescue Services

A global search and rescue service is planned for both GALILEO and future generations of GPS satellites. The Parties agree that these services shall be radio frequency compatible and to the greatest extent possible, interoperable at the user level. The Parties will cooperate as appropriate on matters related to global search and rescue services for GALILEO and future generations of GPS satellites at the COSPAS-SARSAT Council or at any other mutually agreeable forum.

ARTICLE 13

Modalities

1. The Parties shall establish working groups for mutually agreed upon topics. Each working group will include participation, as appropriate, from the competent authorities of the Parties. Third party participation in working groups shall be only by mutual consent of the Parties.

2. The following working groups shall be established pursuant to paragraph 1.

(a) A working group on radio frequency compatibility and interoperability for civil satellite-based navigation and timing services.

(b) A working group on trade and civil applications.

(c) A working group to promote cooperation on the design and development of the next generation of civil satellite-based navigation and timing systems.

(d)A working group on security issues relating to GPS and GALILEO, including information exchange on possible applications for secured governmental services, and including interactions between their respective signals. The group shall also work towards defining the details of the notification and consultation procedure referred to in Article 11, as well as possible interfaces.

3. The Parties may establish terms of reference for working groups established pursuant to paragraph 1, as appropriate.

4. All exchanges of information, equipment, technology or other data (including that which is classified), as well as the delivery of services, pursuant to this Agreement shall be subject to all applicable laws and regulations, including export control laws and regulations. All such information, equipment, technology or other data transferred shall be used only for the purposes of this Agreement and shall not be transferred to, or used by, any third country, firm, person, organisation or government without the prior written approval of the originating party.

5. Subject to applicable laws, regulations, and official governmental policies, the Parties agree to handle as expeditiously as possible license applications for the export of goods, information, technology or other data appropriate for the development and implementation of GALILEO or GPS.

6. Classified information relating to the implementation of this Agreement may be exchanged at working groups or otherwise only in accordance with the conditions set forth in paragraph 2 of the Annex to this Agreement.

7. The Parties shall meet as needed, and in principle once a year, to assess the need for working groups, define or modify working group terms of reference, and review working group progress.

ARTICLE 14

Follow-up Activities

The Parties intend to commence discussions of a follow-on agreement regarding potential cooperation between their respective independently funded and operated civil satellite-based navigation and timing systems for the period following achievement by GALILEO of initial operational capability. In those discussions the Parties intend to explore various coordination options, such as creating a high-level interface council that would meet once or twice a year to discuss policy issues and future system planning, a small GPS-GALILEO secretariat to share interface data and provide day-to-day coordination, and liaison officers as mutually agreed.

ARTICLE 15

Activities in International Fora

To promote and implement the objectives of this Agreement, the Parties shall, as appropriate, cooperate on matters of mutual interest related to civil satellite-based navigation and timing signals and systems, value-added services, and global navigation and timing goods in ICAO, ITU, IMO, WTO and other relevant organisations and fora.

ARTICLE 16

Funding

Each Party shall bear the costs of fulfilling its respective responsibilities under this Agreement. Obligations of each Party pursuant to this Agreement are subject to the availability of appropriated funds.

ARTICLE 17

Consultation and Dispute Resolution

1. Any dispute arising under or related to the terms, interpretation or application of this Agreement shall be resolved by consultation.

2. Representatives of the Council of the European Union and the European Commission, of the one part, and of the United States, of the other part, shall meet as needed for the consultations foreseen in paragraph 1 and in Article 5, Article 10 paragraph 3, and Article 11 paragraphs 5 and 6.

3. Nothing in this Agreement shall affect the Parties' right to recourse to dispute settlement under WTO Agreements.

ARTICLE 18

Definition of the Parties

For the purpose of this Agreement, "the Parties" shall mean the European Community or its Member States or the European Community and its Member States, within their respective areas of competence, on the one hand, and the United States, on the other.

ARTICLE 19

Responsibility and Liability

1. The Parties shall have responsibility for failure to comply with obligations under this Agreement.

2. If it is unclear whether an obligation under this Agreement is within the competence of either the European Community or its Member States, at the request of the United States, the European Community and its Member States shall provide the necessary information. Failure to provide this information with all due expediency or the provision of contradictory information shall result in joint and several liability.

ARTICLE 20

Entry into Force and Termination

1. This Agreement shall enter into force on the date on which the European Community and its Member States and the United States inform the Depository through diplomatic notes that their respective internal procedures necessary for its entry into force have been completed.

2. This Agreement shall be subject to accession by States that become Members of the European Union after the date it is signed by the Parties.

3. Notwithstanding paragraph 1, the Parties agree to provisionally apply this Agreement from the first day of the month following the date on which the Parties have notified each other of the completion of the procedures necessary for this purpose.

4. The European Community shall serve as the Depository for this Agreement.

5. This Agreement shall remain in force for ten years. At least three months before the end of the initial 10-year period, the Parties shall inform each other of their intention whether to extend the Agreement for a period of five years. Thereafter, it shall be extended automatically for additional five-year periods, unless the European Community and its Member States, on the one hand, or the United States, on the other, gives notice to the Depository in writing at least three months prior to the end of any subsequent five-year period, of its intention not to extend the Agreement.

6. This Agreement may only be amended by agreement of the Parties. Any amendment to this Agreement shall be subject to approval by the Parties in accordance with their respective internal procedures.

7. The Parties shall review the implementation of this Agreement in 2008 and, may consider at that time to amend it in accordance with the procedure in paragraph 6.

8. This Agreement may be terminated at any time upon one year's written notice.

Done at Dromoland Castle, Co. Clare, on the twenty-sixth day of June 2004, in duplicate in the Danish, Dutch, English, Finnish, French, German, Greek, Italian, Portuguese, Spanish, Swedish, Czech, Estonian, Hungarian, Latvian, Lithuanian, Maltese, Polish, Slovakian and Slovenian languages. English shall be the authentic language.

ANNEX

GPS AND GALILEO SIGNAL STRUCTURES

(1) For reasons of National Security Compatibility, avoidance of unacceptable radio-frequency interference, and suitability of GNSS performance, the Parties agree to the baseline signal structures described below:

- The GALILEO secured governmental service in the 1559-1610 MHz band using a Binary Offset Carrier (BOC) cosine phased modulation with a 15.345 MHz sub-carrier frequency and a code rate of 2.5575 mega-chips per second (Mcps) centred at 1575.42 MHz (cosine phased BOC (15, 2.5)), and a signal power as specified in the document, referred to below, entitled "Reference Assumptions for GPS/GALILEO Compatibility Analyses."
- The GALILEO signal structures used for any or all other services, including the Open Service (OS), Safety-of-Life service (SoL), and Commercial Service (CS), in the 1559-1610 MHz band using a Binary Offset Carrier (BOC) modulation with a 1.023 MHz sub-carrier frequency and a code rate of 1.023 mega-chips per second (Mcps) (BOC (1,1)) centred at 1575.42 MHz, and a signal power as specified in the document, referred to below, entitled "Reference Assumptions for GPS/GALILEO Compatibility Analyses."
- The GPS signal structure in the 1559-1610 MHz band, centred at 1575.42 MHz, will be a Binary Phase Shift Key (BPSK) modulation with a code rate of 1.023 Mcps; a BPSK modulation with a code rate of 10.23 Mcps; and a BOC modulation with a 10.23 MHz sub-carrier frequency and a code rate of 5.115 Mcps, and a signal power as specified in the document, referred to below, entitled "Reference Assumptions for GPS/GALILEO Compatibility Analyses." In the future, a BOC (1, 1) modulation centred at 1575.42 MHz will be added to this signal structure.

(2) The classified assumptions and methodology used to determine the National Security Compatibility criteria, and the criteria themselves, are contained in the following documents: National Security Compatibility Compliance for GPS and GALILEO Signals in the 1559-1610 MHz Band, Part 1, Part 2 and Part 3, (hereinafter, "Part 1," "Part 2," and "Part 3," respectively) dated 9 June 2004, including any future amendments, changes or modifications to these documents as mutually agreed in accordance with paragraph 6.a. of this Annex. Access to Part 1, Part 2 and Part 3 shall be only by the United States and those Member States that are a party to a General Security of Military Information Agreement (hereinafter "GSOMIA") or a General Security of Information Agreement (hereinafter "GSOIA") with the United States, which shall apply to the access, maintenance, use and release of these classified documents. Should an applicable agreement

regarding security of information between the European Community and the United States be concluded in the future, it shall govern the access, maintenance, use and release of Part 1, Part 2 and Part 3. For the time being, representatives of the European Commission and staff members of the GALILEO Joint Undertaking and European Space Agency shall be granted oral and visual access to Part 2 for the purposes of implementation of and compliance with this Agreement, on the basis of an established security clearance with a Member State that has a GSOMIA or GSOIA with the United States, in accordance with the national security procedures and laws of the Member State, and with the GSOMIA or GSOIA with the United States. Representatives of the European Commission and staff members of the GALILEO Joint Undertaking and European Space Agency shall be granted access to Part 1 and Part 3 in accordance with applicable security rules. The classified information shall at all times be protected and handled only in facilities with an appropriate facility security clearance in accordance with the applicable security procedures, laws and the GSOMIA or GSOIA.

(3) Assumptions for radio frequency signal compatibility analyses are contained in the following document: "Reference Assumptions for GPS/GALILEO Compatibility Analyses", 9 June 2004 including any future amendments, changes or modifications to this document as mutually agreed by the Parties.

(4) Methodology for radio frequency compatibility analysis is contained in the following document: "Models and Methodology for GPS/GALILEO Radio Frequency Compatibility Analyses", dated 18 June 2004, including any future amendments, changes or modifications to this document as mutually agreed by the Parties.

(5) The provision of the time offsets between GALILEO and GPS system time in the navigation messages of their respective services is outlined in the following document: "GPS/GALILEO Time Offset Preliminary Interface Definition" dated 20 March 2003, including any future amendments, changes or modifications to this document as mutually agreed by the Parties.

(6) (a) Notwithstanding Article 20, paragraph 6, any future amendments, changes or modifications to the documents entitled "National Security Compatibility Compliance for GPS and GALILEO Signals in the 1559-1610 MHz Band, Part 1, Part 2 and Part 3" shall be decided by mutual agreement by a sub-group of the working group established under Article 13, paragraph 2 (d), composed of representatives of the United States on the one hand, and representatives of the European Commission, acting on behalf of the European Community, who have access to these classified documents in accordance with paragraph 2 of this Annex, and representatives of those

Member States who have access to these classified documents in accordance with paragraph 2 of this Annex, on the other hand. These decisions shall be binding on the Parties.

(b) Notwithstanding Article 20, paragraph 6, any future amendments, changes or modification to the following documents shall be adopted by mutual agreement between appropriate representatives of the Parties in the working group established under Article 13, paragraph 2(a), including the United States: "Reference Assumptions for GPS/GALILEO Compatibility Analyses"; "Models and Methodology for GPS/GALILEO Radio Frequency Compatibility Analyses"; "GPS/GALILEO Time Offset Preliminary Interface Definition." These decisions shall be binding on the Parties.

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COUNCIL OF
THE EUROPEAN UNION

Brussels, 24 March 2011

7725/11

Interinstitutional File:
2010/0282 (COD)

TRANS 80
MAR 37
AVIATION 57
CAB 21
ESPACE 9
CODEC 412

REPORT

from:	COREPER
to:	Council
No. prev. doc.:	7639/11 TRANS 78 MAR 35 AVIATION 49 CAB 20 ESPACE 8 CODEC 397
No. Cion prop.:	14701/10 TRANS 267 MAR 98 AVIATION 156 CAB 17 RECH 321 CODEC 996
Subject:	Proposal for a Decision of the European Parliament and of the Council on the detailed rules for access to the public regulated service offered by the global navigation satellite system established under the Galileo programme – General approach

Introduction

1. On 8 October 2010, the Commission transmitted to the Council and the European Parliament the above mentioned proposal. The purpose of this proposal is to give a legal framework to one of the five services that will be offered by the Galileo system. In fact, the annex to Regulation No 683/2008 on the further implementation of the European satellite navigation programmes (EGNOS and Galileo) contains as specific objective of the European satellite navigation programmes "to offer a public regulated service (PRS) restricted to government-authorised users, for sensitive applications which require a high level of service continuity".

2. The main objective of the above proposal is to define the modalities according to which Member States and other participants will have access to the PRS provided by Galileo. The legal basis of the Commission's proposal is Article 172 of the Treaty on the Functioning of the European Union.

Work within the Council bodies

3. The examination of the proposal by the Council preparatory bodies started under the Belgian Presidency on 20 October 2010. A progress report was presented to the TTE Council on 2 December 2010.

4. The discussion of the above proposal has been pursued under the Hungarian Presidency. Following the in-depth discussions held at various meetings of the Working Party on Transport Intermodal Questions and Networks, the Presidency has amended several provisions of the Commission proposal to take account of delegations' requests. Member States could reach an agreement on a final compromise text.

DK, FR and UK have a parliamentary scrutiny reservation on this proposal.

5. On 22 March 2011, the Permanent Representatives Committee was able to endorse the agreement reached at Working Party level, as reflected in the draft Decision which appears in the Annex.

However, the Commission could not support the Council's general approach and maintained its reservation, already expressed at Working Party level. The Commission has a different position on the following issues:

a) The way to deal with the protection of classified information concerning the PRS: the Commission, in its proposal, suggests specific provisions applicable to classified information related to the PRS and to remedy the consequences of improper disclosure of data relating to the PRS; while the Council considers that all necessary rules and measures for such protection are already included in Regulation (EC) No 683/2008.

b) The procedure to be followed for the establishment of common minimum standards (CMS) to enable the secure and efficient use of PRS: the Council and the Commission have different views on the extent to which the Commission should be empowered through delegated acts / implementing acts to establish CMS and the necessary technical requirements, guidelines and other measures in order to give effect to them. The Council considers that implementing acts are the most appropriate tool when it comes to security matters, while the Commission favours the delegation of powers for the handling of CMS.

Furthermore, in this context, Member States expect the Commission to make a statement ensuring the full involvement of the security experts of the "GNSS Security Board" set up by Commission Decision 2009/334/EC, in the framework of Regulation (EC) No 683/2008, while the Commission holds the opinion that the relevant Commission communication on the use of expert advice should apply.

c) The steps to be taken to ensure compliance with CMS and other measures which give effect to them: the Commission would like a specific provision to be added in order to be empowered to carry out audits and inspections; while The Council considers that the current security and accreditation rules already contain the necessary provisions.

d) Other issues:

- Article 11 "Joint Action": for the sake of clarity, Commission would prefer the same text as in Regulation No (EC) 683/2008 and Regulation (EU) No 912/2010 instead of the current text;
- length of the period of the delegation of power to the Commission: the Council prefers a delegation for a 3 year-period, while the Commission would prefer a delegation of power for an indeterminate period;
- date of application of some provisions of the decision: the Council agrees that some provisions shall start to apply only three years after the entry into force of the Decision, in order to grant an additional period for the establishment of all necessary provisions and measures implementing this Decision, while the Commission suggests six months.

All these issues will be further discussed in the negotiations to be carried out with the European Parliament in view of an agreement, if possible, at first reading.

Conclusions

6. The Council is invited to agree on a general approach on the text of the annexed draft Decision.

ANNEX

Proposal for a

DECISION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on the rules for access to the public regulated service provided by the global navigation satellite system established under the Galileo programme

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 172 thereof,

Having regard to the proposal from the European Commission,

After transmission of the draft legislative act to the national Parliaments,

Having regard to the opinion of the European Economic and Social Committee[1],

Acting in accordance with the ordinary legislative procedure,

Whereas:

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1 OJ C 54, 19.2.2011, p. 35.

(1) Regulation (EC) No 683/2008 of the European Parliament and of the Council of 9 July 2008 on the further implementation of the European satellite navigation programmes (EGNOS and Galileo)[2] makes provision in its Annex that the specific objectives of the Galileo programme are to ensure that the signals emitted by the system can be used in particular to offer a public regulated service (hereinafter "PRS") restricted to government-authorised users, for sensitive applications which require a high level of service continuity.

(1a) The relevant provisions of Regulation (EC) No 683/2008 apply also to the services, including the PRS service, listed in the Annex thereto, considering the inter-linkage between the system and the service from a legal, technical, operational, financial and ownership perspective. This is for example the case in respect of the rules on the governance of security matters and the application of Commission's rules on security set out in the Annex to Decision 2001/844/EC, ECSC, EURATOM[3] and by the security regulations of the Council set out in the Annex to Decision 2001/264/CE of the Council[4], as referred to in Articles 13 and 14 of Regulation (EC) No 683/2008. Thus, the development of further rules, in particular regarding handling of COMSEC/INFOSEC information and material, classification of PRS user segment information and material as well as follow-up and action in cases of unauthorised disclosure of classified information concerning the PRS are to be dealt with under the aforementioned Articles.

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2 OJ L 196, 24.7.2008, p. 1.

3 Commission Decision 2001/844/EC, Euratom of 29 November 2001 amending its internal Rules of Procedure (OJ L 317, 3.12.2001, p.1), last amended by Commission Decision 2006/548/EC of 2 August 2006 (OJ L 215, 5.8.2006, p. 38).

4 Council Decision 20001/264/EC of 19 March 2001 adopting the Council's security regulations, last amended by Council Decision 2007/438/EC of 18 June 2007 (OJ L 164, 26.6.2007, p. 24).

(1b) There is however a need to provide for additional provisions in respect of PRS specific features as provided for in this Decision.

(2) […]

(3) The Council has recalled on several occasions that the system resulting from the Galileo programme is a civilian system under civilian control, that is, it was created in accordance with civilian standards based on civilian requirements and under the control of the European Union institutions.

(4) Of the various services offered by European satellite navigation systems, the PRS is both the most secure and the most sensitive. It must ensure service continuity for its participants, even in the most serious crisis situations. The consequences of infringing the security rules when using this service are not restricted to the user concerned, but could potentially extend to other users. Use and management of the PRS is therefore the joint responsibility of Member States in order to protect the security of the European Union and their own security. Consequently, access to the PRS must be strictly limited to certain categories of user which are subject to continuous monitoring.

(5) It is therefore necessary to define the rules for access to the PRS and the rules for managing it, in particular specifying the general principles relating to access, the functions of the various management and supervisory bodies, the conditions relating to manufacturing and security, and the export monitoring system.

(6) With regard to the general principles of access to the PRS, given the actual purpose of the service and its characteristics, its use must be strictly limited, with Member States, the Council, the Commission and the European External Action Service granted discretionary, unlimited and uninterrupted access worldwide. Furthermore, each Member State must be in a position to take its own sovereign decision on which PRS users to authorise and what uses may be made of the PRS, including uses relating to security, in accordance with minimum standards.

(7) In order to promote the use of European technology worldwide, certain non-member countries and international organisations could become PRS participants through separate agreements to be concluded with them. For secure government satellite radio navigation applications, the terms and conditions under which non-member countries and international organisations may use the PRS should be laid down in international agreements, it being understood that compliance with security requirements being in all cases essential. In the context of such agreements, manufacturing of PRS receivers could be allowed, under specific conditions and requirements, being of a level at least equivalent to the conditions and requirements applying to EU Member States. However, such agreements should not include particularly security sensitive matters such as the manufacturing of security modules.

(8) Generally speaking, the European Union and the Member States must do their utmost to ensure that both the system derived from the Galileo programme and PRS technology and equipment are safe and secure, to prevent signals emitted for the PRS from being used by non-authorised natural or legal persons, and to prevent any hostile use of the PRS against them.

(9) It is important in this connection that the Member States determine the system of penalties applicable in the event of non-compliance with the obligations stemming from this Decision, and that they ensure that those penalties are applied. The penalties must be effective, proportionate and dissuasive.

(10) In the case of management and supervisory bodies, the arrangement whereby PRS participants would designate a "Competent PRS Authority" responsible for managing and supervising users would appear to be the best way of effectively managing PRS use, by facilitating relations between the various stakeholders responsible for security and ensuring permanent supervision of users (in particular national users) in compliance with the common minimum standards. However, certain flexibilities should be ensured in order to allow Member States to organise the responsibilities efficiently.

(11) Furthermore, one of the tasks of the Galileo Security Monitoring Centre referred to in Article 16(a)(ii) of Regulation (EC) No 683/2008 should be to provide an operational interface between the various stakeholders responsible for the security of the PRS.

(12) The Council and the High Representative are also called upon to play a role in managing the PRS, through the application of Council Joint Action 2004/552/CFSP of 12 July 2004 on aspects of the operation of the European satellite radio-navigation system affecting the security of the European Union[5]. The Council is also called upon to approve international agreements authorising a non-member country or an international organisation to use the PRS.

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5 OJ L 246, 20.7.2004, p. 30.

(13) With regard to receiver manufacturing and security, security requirements make it necessary for this task to be entrusted only to a Member State which has designated a Competent PRS Authority or to undertakings established on the territory of a Member State which has designated a Competent PRS Authority. Furthermore, the receiver manufacturer must have been duly accredited in advance by the Security Accreditation Board in compliance with Regulation (EU) No 912/2010[6] and must comply with the decisions of the Security Accreditation Board. It is the responsibility of the Competent PRS Authorities to continuously monitor compliance both with this accreditation requirement and those decisions and with specific technical requirements stemming from the common minimum standards.

(13a) A Member State~~s~~ which has not designated a Competent PRS Authority should in any case designate a point of contact for the management of any detected harmful electromagnetic interference affecting PRS. This point of contact is a body or individual or an address that has the role of reporting point, which the Commission can contact in case of potentially harmful electromagnetic interference in order to remedy such interference.

(14) With regard to export restrictions, exports outside the European Union of equipment or technology and software relating to PRS use and relating to the development of and manufacturing for PRS, regardless of whether that equipment, that software or that technology are listed in Annex I to Council Regulation (EC) No 428/2009 of 5 May 2009 setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items[7], must be restricted to those non-member countries which are duly authorised to access the PRS under an international agreement with the European Union. A non-member country on whose territory a reference station housing PRS equipment and forming part of the system derived from the Galileo programme is installed shall not be considered merely by virtue of that fact to be a PRS participant.

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6 OJ L 276, 20.10.2010, p. 11.
7 OJ L 134, 29/05/2009, p. 1.

(15) In order to be able to adopt non essential amendments to update the common minimum standards, as set out in the Annex, the power to adopt acts in accordance with Article 290 of the Treaty on the Functioning of the European Union should be delegated to the Commission in respect of the necessary amendments of the Annex to take account of developments in the programme. It is of particular importance that the Commission carry out appropriate consultations during its preparatory work, including at expert level.

The Commission, when preparing and drawing-up delegated acts, should ensure a simultaneous, timely and appropriate transmission of relevant documents to the European Parliament and Council.

(15a) Because of their potential impact on the security of the system, of the European Union and of its Member States, both individually and collectively, it is essential that common rules concerning access to PRS and manufacturing PRS receivers and security modules are applied uniformly in each Member State. It is therefore necessary that the Commission should be empowered to adopt detailed requirements, guidelines and other measures in order to give effect to the common minimum standards. In order to ensure uniform conditions for the implementation of this Decision, implementing powers should be conferred on the Commission. Those powers should be exercised in accordance with Regulation (EU) No 182/2011 of the European Parliament and of the Council laying down the rules and general principles concerning mechanisms for control by Member States of the Commission's exercise of implementing powers[8].

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8 OJ L 55, 28.2.2011, p. 13.

(15b) In order to ensure an efficient introduction of the rules in this Decision, provisions permitting the updating of the Annex and the adoption of implementing acts should begin to apply some time before the start of the application of the other provisions, thereby permitting the Commission to adopt the necessary measures in time for the further application.

(16) Since the purpose of this Decision – namely, to lay down the rules under which the Member States, the Council, the Commission, the European External Action Service, the European Union agencies, non-member countries and international organisations can access the PRS – cannot be sufficiently achieved by the Member States and can, by reason of the scale of the proposed action, be better achieved at European Union level, the EU may adopt measures in accordance with the subsidiarity principle enshrined in Article 5 of the Treaty on European Union. Furthermore, in accordance with the proportionality principle set out in that Article, this Decision does not go beyond what is necessary in order to achieve that purpose.

HAVE ADOPTED THIS DECISION:

Article 1

Subject

This Decision lays down the rules under which the Member States, the Council, the Commission, the EEAS, the European Union agencies**,** non-member countries and international organisations may access the PRS offered by the GNSS established under the Galileo programme.

Article 1a

Definitions

For the purposes of this Decision, the following definitions shall apply:

(a) "PRS" means Public Regulated Service.

(b) "PRS participants" means the Member States, the Council, the Commission, the EEAS as well as European Union agencies, non-member countries and international organisations, insofar as such agencies, non-member countries and organisations have been duly authorised.

(c) "PRS users" means natural or legal persons duly authorised by a PRS participant to own or use a PRS receiver.

(d) "GSMC" means the Galileo Security Monitoring Centre which is the Galileo security centre referred to in Article 16(a)(ii) of Regulation (EC) No 683/2008 and Article 6(d) of Regulation (EU) No 912/2010.

(e) "Security Accreditation Board" means the Security Accreditation Board for European GNSS systems established by Article 11 of Regulation (EU) No 912/2010.

(f) "GNSS" means Global Navigation Satellite Systems.

(g) "EEAS" means European External Action Service.

(h) "European GNSS Agency" means the Agency established by Regulation (EU) No 912/2010.

Article 2

General principles concerning access to the PRS

1. […]

2. The Member States, the Council, the Commission and the EEAS shall have unlimited and uninterrupted access to the PRS worldwide.

3. It shall be for each individual Member State, the Council**,** the Commission and the EEAS to decide whether to use the PRS within their respective competences**.**

4. […]

5. Each Member State which uses the PRS shall decide independently which categories of natural persons residing on their territory or performing official duties abroad on behalf of that Member State and legal persons established on their territory are authorised to be PRS users, as well as the uses to which it may be put, in accordance with Article 8a and point 1 (i) and (ii) of the Annex. Such uses may include security-related uses.

   The Council, the Commission and the EEAS shall decide which categories of their agents are authorised to be PRS users, in accordance with Article 8a and point 1 (i) and (ii) of the Annex.

6. European Union agencies may become PRS participants only insofar as necessary to fulfil their tasks and according to the detailed rules laid down in an administrative agreement concluded between the Commission and the agency.

7. Non-member countries or international organisations may become PRS participants only where, in accordance with the procedure provided for in Article 218 of the Treaty on the Functioning of the European Union:

   a) a security of information agreement defining the framework for exchanging and protecting classified information has been concluded between the European Union and the non-member country or international organisation, providing a degree of protection at least equivalent to that of the Member States, and

   b) an agreement laying down the terms and conditions of the detailed rules for access to the PRS by the non-member country or international organisation has been concluded between the European Union and the non-member country or international organisation. Such an agreement could include the manufacturing, under specific conditions, of PRS receivers, at the exclusion of security modules.

Article 3

[…]

Article 4

[…]

Article 5

[…]

Article 6

Competent PRS Authority

1. A Competent PRS Authority shall be designated by:

   (i) each Member State, which uses the PRS and each Member State on whose territory any of the bodies referred to in Article 8(1) are established. In such cases, the Competent PRS Authority shall be established on the territory of the Member State concerned, which shall notify the designation to the Commission without delay.

   (ii) the Council, the Commission and the EEAS, if they use the PRS. In such a case, the European GNSS Agency may be designated as a Competent PRS Authority, in accordance with appropriate arrangements.

   (iii) European Union agencies and international organisations, in accordance with the provision of the agreements referred to in Article 2(6) and (7). In such a case, the European GNSS Agency may be designated as a Competent PRS Authority.

   (iv) non-member countries, in accordance with the provision of the agreements referred to in Article 2(7).

1a. The costs for the functioning of a Competent PRS Authority shall be borne by the PRS participants who have designated it.

1aa. A Member State which has not designated a Competent PRS Authority in accordance with paragraph 1(i), shall in any case designate a point of contact for assisting as necessary in the reporting of detected potentially harmful electromagnetic interference affecting the PRS. The Member State concerned shall notify such a designation to the Commission without delay.

2. A Competent PRS Authority shall ensure that the use of PRS is in compliance with Article 8a and point 1 of the Annex and that:

(i) PRS users are grouped for the management of PRS with the GSMC;

(ii) the PRS access rights for each group or user are determined and managed;

(iii) the PRS keys and other related classified information are obtained from the GSMC;

(iv) the PRS keys and other related classified information are distributed to the users;

(v) the security of the receivers and associated classified technology and information are managed and the risks assessed;

(vi) a point of contact for assisting as necessary in the reporting of detected potentially harmful electromagnetic interference affecting the PRS is established.

3. The Competent PRS Authority of a Member State shall ensure that a body established on the territory of that Member State may only develop or manufacture PRS receivers or security modules if such a body**:**

(i) has been duly accredited by the Security Accreditation Board in accordance with Article 11(2) of Regulation (EU) No 912/2010, and

(ii) complies both with the decisions by the Security Accreditation Board, and with Article 8a and point 2 of the Annex regarding the development and manufacture of PRS receivers or security modules, insofar as these relate to its activity.

Any equipment-manufacture accreditation provided for in this paragraph shall be reviewed at least every five years.

3a. […]

3aa. In case of development or manufacturing referred to in paragraph 3, or in the case of export outside the European Union, the Competent PRS Authority of that Member State shall act as an interface to the entities competent for export restrictions of relevant equipment, technology and software regarding the use, development and manufacturing of PRS, in order to ensure that the provisions of Article 9 are applied.

3b. A Competent PRS Authority shall be connected to the GSMC in accordance with Article 8a and point 4 of the Annex regarding the links between the GSMC and a Competent PRS Authority.

3c. Paragraphs (2) and (3b) shall be without prejudice to the possibility for Member States to delegate certain specific tasks of their respective Competent PRS Authority, by mutual consent, to another Member State, excluding any tasks related to the exercise of the sovereignty over their respective territory. Tasks referred to in paragraphs (2) and (3b) as well as tasks under paragraph (3) may be carried out jointly by Member States. The Member States concerned shall notify such measures to the Commission without delay.

3d. A Competent PRS Authority may request the technical assistance of the European GNSS Agency in order to perform its tasks, subject to specific arrangements. The Member States concerned shall notify such arrangements to the Commission without delay.

4 […]

5. […]

6. […]

7. […]

8. […]

Article 7

Role of the Galileo Security Monitoring Centre

The GSMC shall provide the operational interface between the Competent PRS Authorities, the Council and the High Representative acting under Joint Action 2004/552/CFSP and the control centres. It shall inform the Commission of any event that may affect the smooth running of the PRS.

Article 8

Manufacture and security of receivers and security modules

1. A Member State may, subject to the requirements set out in Article 6(3), assign the task of manufacturing PRS receivers or the associated security modules to bodies established on its territory or on the territory of another Member State. The Council, the Commission or the EEAS may assign the task of manufacturing PRS receivers or the associated security modules for their own use to bodies established on the territory of a Member State.

2. [...]

3. [...]

4. [...]

5. The Security Accreditation Board may at any time revoke from a body referred to in paragraph 1 the authorisation it has granted to that body to manufacture PRS receivers or the associated security modules if the measures provided for in Article 6(3)(ii) have not been complied with.

Article 8a

Common minimum standards

1. The common minimum standards to be complied with by the Competent PRS Authorities referred to in Article 6 shall be as set out in the Annex.

1a. The Commission shall be empowered to adopt delegated acts in accordance with Article 12 concerning non-essential amendments updating the Annex to take account of developments in the programme, in particular with regard to technology and changes in security need.

2. The Commission shall adopt the necessary technical requirements, guidelines and other measures in order to give effect to the common minimum standards set out in the Annex. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 13a(2).

3. The Commission shall ensure that the necessary steps are taken to comply with the measures referred to in paragraphs 1a and 2 and that requirements related to the security of PRS and its users and related technology are met, taking full account of expert advice.

4. In order to assist in compliance with this Article, the Commission shall facilitate a meeting of all competent PRS authorities at least once a year.

Article 9

Export restrictions

The export outside the European Union of equipment, technology and software regarding the use, development of and manufacturing for PRS shall not be authorised other than in accordance with Article 8a and point 3 of the Annex and pursuant to the agreements referred to in Article 2(7) or under agreements regarding the detailed rules for hosting and operating reference stations.

Article 10

[…]

Article 11

Application of Joint Action 2004/552/CFSP

This Decision shall be applied without prejudice to measures decided pursuant to Joint Action 2004/552/CFSP.

Article 12

Exercise of delegation

1. The power to adopt delegated acts is conferred on the Commission subject to the conditions laid down in this Article.

2. The delegation of power referred to in Article 8a(1a) shall be conferred on the Commission for a period of 3 years from …[9] The Commission shall draw up a report in respect of the delegation of power not later than nine months before the end of the 3-year period. The delegation of power shall be tacitly extended for periods of an identical duration, unless the European Parliament or the Council opposes such extension not later than three months before the end of each period.

3. The delegation of powers referred to in Article 8a(1a) may be revoked at any time by the European Parliament or by the Council. A decision of revocation shall put an end to the delegation of the power specified in that decision. It shall take effect the day following the publication of the decision in the Official Journal of the European Union or at a later date specified therein. It shall not affect the validity of any delegated acts already in force.

4. As soon as it adopts a delegated act, the Commission shall notify it simultaneously to the European Parliament and to the Council.

5. A delegated act adopted pursuant to Article 8a(1a) shall enter into force only if no objection has been expressed either by the European Parliament or the Council within a period of 2 months of notification of that act to the European Parliament and the Council or if, before the expiry of that period, the European Parliament and the Council have both informed the Commission that they will not object. That period shall be extended by 2 months at the initiative of the European Parliament or the Council.

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[9] Date of entry into force of the basic legislative act or from any other date set by the legislator.

Article 13

[…]

Article 13a

Committee procedure

1. The Commission shall be assisted by the Committee established by Regulation (EC) No 683/2008. That Committee shall be a committee within the meaning of Regulation (EU) No 182/2011.

2. Where reference is made to this paragraph, Article 5 of Regulation (EU) No 182/2011 shall apply. Where the committee delivers no opinion, the Commission shall not adopt the draft implementing act and the third sub-paragraph of Article 5(4) of Regulation (EU) No 182/2011 shall apply.

Article 14

[…]

Article14a

Specific rules for the implementation of the Galileo Programme

Notwithstanding the other provisions of this Decision, in order to ensure that the system functions smoothly, the access to PRS technology and the ownership or use of PRS receivers shall be authorised, subject to the respect of the principles laid down in Article 8a and the Annex, as regards the following:

– the Commission, when acting as manager of the Galileo programme;

– operators of the system derived from the Galileo programme, strictly for the purposes of complying with their remit, as laid down in a specific arrangement with the Commission;

– the European GNSS Agency, in order to enable it to perform the tasks entrusted to it, as laid down in a specific arrangement with the Commission;

– the European Space Agency, strictly for the purposes of research, development and infrastructure roll–out, as laid down in a specific arrangement with the Commission.

Article 14b

Penalties

Member States shall determine what penalties are applicable when national provisions enacted pursuant to this Decision are infringed. The penalties shall be effective, proportionate and dissuasive.

Article 15

Entry into force and application

1. This Decision shall enter into force on the day following that of its publication in the Official Journal of the European Union.

2. Article 8a, paragraphs 1a to 3 and Articles 11, 12, and 13a shall apply with effect from the day following that of the publication, while the other provisions shall start to apply three years after the entry into force of this Decision.

Article 16

Addressees

This Decision is addressed to the Member States.

Annex

Common minimum standards

1. As regards Article 6(2), the common minimum standards for the use of PRS shall cover the following areas:

   (i) PRS user groups organization;

   (ii) Definition and management of access rights of the PRS users and user groups of the PRS participants;

   (iii) Distribution of PRS keys and related classified information between the GSMC and the Competent PRS Authorities;

   (iv) Distribution of PRS keys and related classified information to the users;

   (v) Security management, including security incidents, and risk assessment for PRS receivers and associated classified technology and information;

   (vi) Reporting of detected potentially harmful electromagnetic interference affecting the PRS;

   (vii) Operational concepts and procedures for PRS receivers.

2. As regards Article 6(3) the CMS for the development and manufacture of PRS receivers or security modules shall cover the following areas:

(viii) PRS user segment accreditation;

(ix) Security of PRS receiver and PRS technology during research, development, and manufacturing phases;

(x) PRS receiver and PRS technology integration;

(xi) Protection profile for PRS receivers, security modules, and material using PRS technology.

3. As regards Article 6(3aa) and Article 9 the CMS for export restrictions shall cover the following areas:

(xv) Authorised PRS participants;

(xvi) Export of PRS related material and technology.

4. As regards Article 6(3b) the CMS for the links between the GSMC and the Competent PRS Authorities shall cover the following area:

(xvii) Data and voice links.

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COUNCIL OF THE EUROPEAN UNION

Brussels, 31 May 2011

10901/11

ESPACE 41
COMPET 218
RECH 138
IND 72
TRANS 172
ENER 136
REGIO 46
ECOFIN 302
CODUN 10
ENV 403
EDUC 111
COSDP 536
PESC 699
POLMIL 28
TELECOM 85

OUTCOME OF PROCEEDINGS

From :	General Secretariat of the Council
To :	Delegations
No. prev. doc.	10086/1/11 ESPACE 28 COMPET 184 RECH 106 IND 62 TRANS 143 ENER 106 REGIO 41 ECOFIN 264 CODUN 8 ENV 359 EDUC 95 COSDP 469 PESC 597 POLMIL 23 TELECOM 66 REV 1
Subject:	Council Conclusions on "Towards a space strategy for the European Union that benefits its citizens"

Delegations will find attached the Council Conclusions on "Towards a space strategy for the European Union that benefits its citizens", as adopted by the Competitiveness Council meeting on 31 May 2011.

ANNEX

Council Conclusions on

"Towards a space strategy for the European Union that benefits its citizens"

The COUNCIL OF THE EUROPEAN UNION

HAVING REGARD TO

(1) The resolution on "Global challenges: taking full benefit of European space systems", as adopted by the Competitiveness Council meeting on 25 November 2010[1], reflecting the orientations endorsed at the Seventh Space Council;

(2) The Council conclusions on "An integrated industrial policy for the globalisation era" adopted on 10 December 2010[2] and on the Europe 2020 Flagship Initiative: "Innovation Union Accelerating the transformation of Europe through innovation in a fast changing world", adopted on 25-26 November 2010[3]; the Council conclusions on "A digital agenda for Europe" adopted 31 May 2010[4]; the Council conclusions on the "Action Plan on Global Navigation Satellite System (GNSS) Applications" adopted on 15 October 2010[5];

(3) the Communication from the Commission Europe 2020 - A strategy for smart, sustainable and inclusive growth, adopted on 3 March 2010[6];

(4) The Conclusions on Innovation adopted by the European Council on 4 February 2011[7] and the Presidency conclusions of the European Council of 11 and 12 December 2008 on the need to include space technology and services in the planned European plan for innovation;

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1 Doc. 16864/10
2 Doc. 17838/10
3 Doc. 17165/10
4 Doc. 10130/10
5 Doc. 14146/10
6 Doc. 7110/10
7 Doc. EUCO 2/1/11 REV 1 CO EUR 2 CONCL 1

(5) the orientations of the Fourth, Fifth and Sixth Space Council, subsequently adopted by the respective Competitiveness Councils on 22 May 2007[8], on 26 September 2008[9], on 29 May 2009[10];

WHEREAS

(6) These conclusions on EU space policy are without prejudice to the forthcoming decision on the next Multiannual Financial Framework reflecting the consolidation efforts being made by Member States to bring deficit and debt onto a more sustainable path and reflecting the conclusions on innovation adopted by the European Council on 4 February 2011;

(7) The EU competence in space, established by the entry into force of the Treaty on the Functioning of the European Union[11], strengthens the political dimension of space in Europe;

1. EMPHASISES that space activities and applications are vital to our society's growth and sustainable development, and constitute a significant and concrete contribution to the Europe-2020 strategy;

2. WELCOMES as a useful basis for discussion the communication from the Commission entitled "Towards a space strategy for the European Union that benefits its citizens"[12];

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8 Doc. 10037/07
9 Doc. 13569/08
10 Doc. 10500/09
11 Notably articles 4 and 189
12 Doc. 8693/11

I. PRIORITY ACTIONS

3. REAFFIRMS that the top priority for a European Union action in the European Space Policy is the timely and efficient implementation of the flagship programmes GNSS (EGNOS and Galileo) and GMES;

4. In addition CONSIDERS that climate change, security, competitiveness, innovation, space research and development (R&D) and exploration, may require specific action in order to achieve the objectives of this new policy, in an overall context of strict economy of resource;

Flagship Programmes

5. REAFFIRMS its strong commitment to the EU flagship programmes GNSS (EGNOS and Galileo) and GMES; ACKNOWLEDGES their substantial economic and social benefits for the European Union and its citizens through user-driven applications; NOTES that the Commission will elaborate a proposal for the funding of these flagship programmes as part of the next Multiannual Financial Framework; CONSIDERS that, both programmes being European programmes under EU responsibility, should continue to be financed by the EU budget; INVITES the Commission to develop appropriate measures to optimise the management of these programmes, taking particular account of the specificities of large scale and long term projects;

6. EMPHASISES the need for the Commission to encourage a development of an economically relevant European downstream market;

Galileo and EGNOS

7 RECALLS the Council conclusions of 31 March 2011 on the mid-term review of the European satellite radio navigation programmes[13]; and in particular the need for a timely deployment and exploitation of a competitive and independent Galileo constellation and its services; REITERATES that it is of utmost importance that the EGNOS coverage for the entire European Union is ensured;

GMES

8. REAFFIRMS the need for the Commission to ensure a quick and effective implementation of the GMES programme (Initial Operations) by 2014, in partnership with the Member States; INVITES the Commission to present by the end of 2011 a proposal for the operations and to clarify the governance of GMES from 2014 onwards; and RECALLS the role of ESA in respect to the GMES; RECALLS the role of EUMETSAT and other organizations**,** as appropriate, while reiterating that the participation of all EU Member States therein should be encouraged or facilitated;

9. RECOGNIZES the necessity and importance of guaranteeing continuous and long term sustainable access to earth observation data and derived Earth monitoring services provided by GMES in order to encourage the development of a European industry of well-diversified downstream services; the provisions of GMES services shall be decentralised, where appropriate, to integrate at European level existing space, in-situ and reference data inventories and capacities in Member States, thus avoiding duplication. Procurement of new data that duplicates existing sources shall be avoided unless the use of existing or upgradeable data sets, is not technically feasible or cost effective; [14]

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[13] Doc. 8395/11

[14] Text of Art. 5 (2) of Regulation (EU) n° 911/2010

10. SUPPORTS the strengthening of the contribution of GMES to climate change mitigation and adaptation in order to improve the definition and implementation of our policies; URGES the European Commission, as manager of the programme, to assess and define in close cooperation with all relevant actors the GMES climate change monitoring service specification, making use as appropriate of the GMES Users Forum;

11 URGES the Commission to develop the GMES data and information policy based on full and open access to information produced by GMES services and data collected through GMES infrastructure, subject to relevant international agreement, security restrictions and licensing conditions, including registration and acceptance of users licenses and which maximizes the use of GMES and build on a well balanced approach between free-of-charge access to certain public data and services and the need to strengthen Earth observations markets in Europe and the growth of existing and emerging European data and data service providing businesses; as well as the governance of the security of GMES components and information;

12. STRESSES the need for an appropriate European data security policy in order to protect the interests of EU;

Security

13. Considering the vulnerability of space systems and the possibility of their misuse, INVITES the Commission in close cooperation with Member States to take all the appropriate measures for the timely implementation of adequate security requirements specific to the GNSS and GMES programmes and to pay attention to security prerequisites, which are necessary for the realization of any new space systems;

14. RECOGNISES the need for an effective Space Situation Awareness (SSA) capability as an activity at European level, inter alia, in order to enhance the safety of European space assets and of its future launches from space debris and other objects in space as well as space weather phenomena; to this end, the Union should make the widest possible use of assets, competences and skills that are already existing or being developed in Member States, at European level and as appropriate internationally;

15. Recognizing the dual use nature of such a system and taking into account its particular security dimension, CALLS UPON the European Commission and EEAS, in close cooperation with ESA and Member States, which own such assets and have capacities and in consultation with all actors involved, to come forward with proposals to fully exploit and build on these assets and capacities in order to develop a Space Situational Awareness (SSA) capability as an activity at European level and in that context, to define, an appropriate governance and data policy taking care of the high sensitivity of SSA data;

16. NOTES the security dimension of GMES as a civilian system under civil control which can contribute to saving human lives and property in many different crisis and disaster situations, thus materially contributing to the security of the Union and its citizens; and INVITES the Commission in close cooperation with Member States to further define the content of the security dimension of GMES, corresponding to a clear set of security requirements, to define appropriate governance and data policy, and to speed up the development of related services;

17. INVITES the Commission, in close collaboration with Member States and after consultation with ESA and EDA to evaluate the need for improvements of the available space infrastructure to develop secure services based on the integration of global satellite communications, earth observation and positioning; ENCOURAGES the European Commission and European External Action Service (EEAS) to use the competencies already developed by all relevant actors for these purposes and to define coordination and resourcing mechanisms which would allow the exploitation of space assets and services owned or operated by the EU, other international organisations, commercial providers, or the Member States to fulfil more effectively operational needs in the areas of crisis management and external action;

Space exploration

18. INVITES the Commission in close cooperation with ESA to examine possible options for involvement in space exploration setting out cost benefit analyses, so that the Council can return to this issue in due course;

19. In this context, RECALLS the areas of critical enabling technologies (automated and robotic systems, advanced propulsion, energy systems and life support systems), utilization of the International Space Station (ISS) and space transportation;

20. WELCOMES the setting up of the high-level international platform to identify the areas of space exploration open to international cooperation, underlining its political importance;

II. COMPETITIVENESS

21. RECALLS[15] its invitation to all European institutional actors in order to maintain an independent, reliable and cost effective access to space at affordable conditions, to consider as a high priority the use of launchers developed in Europe and to explore issues relating to their possible participation in launcher-related exploitation activities;

22. CONSIDERS that a space industrial policy should be drawn up, in close cooperation with the ESA and the Member States, to promote a competitive space industry in Europe;
WELCOMES the Commission's intention to pursue a space industrial policy development, fully reflecting the specific needs of each sub-sector, and identifying concrete measures. The main objectives of this EU policy could include:
    – ensuring a steady and balanced development of the distributed capabilities of the European industrial base and the overall value chain, including SMEs,
    – enhancing competitiveness in Europe and on the world stage, with the aim of technological leadership in some sectors, and a sufficient level of autonomous capacity in other sectors, such as critical components;
    – guaranteeing security of supply for strategic sub-sectors such as e.g. satellite-based navigation, observation, telecommunication, space exploration and launchers;
    – fostering the development of the market for space products and services;
    – acknowledging the pre-commercial public procurement of innovation as an instrument for stimulating the independent development of critical technologies;

23. RECOGNIZES that the European markets could better serve the needs of European citizens in a competitive and cost effective manner, thus sustaining a self-reliant industrial capacity and boosting new job opportunities;

24. UNDERLINES that institutional programmes contribute to the development of new technologies;

[15] Text reflects point 5 of the 7th Space Council Resolution, doc. 16864/10

25. Stressing the importance for the future common strategic framework, INVITES the Commission to develop, where appropriate, Research and Innovation strategic agendas for Space, in order to ensure consistency between the R&D efforts of the EU with those undertaken by ESA and the Member States, on a voluntary basis, while avoiding duplications, especially with regard to development of critical and breakthrough technologies and downstream applications (notably those resulting from Galileo/EGNOS or GMES downstream markets);

26. SUPPORTS the Commission's and other European actors' commitment to boosting space R&D and innovation to decrease Europe's technological dependence and to foster cross-fertilisation between space and non-space industries that ultimately benefits the competitiveness of the overall European economy;

27. STRESSES the need to involve the Member States in the work for the definition and implementation of the recommendation of the joint EC-ESA-EDA taskforce on technological non dependence without delay and INVITES the taskforce to continue its efforts;

28. INVITES the Commission, the Member States, in partnership with ESA, to continue to ensure a consistent procurement approach taking into account the specificities of the space sector, considering in particular:
    – long-term commitments and stability,
    – predictability of rules and budget, systematic cost control and monitoring of-cost developments;
    – the use of European means and assets in European space activities,
    – greater involvement of SMEs in the production of space applications and the development of downstream services;
    – an effective competition in the European space sector;
    – international competitiveness of the European Space sector;
    – EU and Member States' international obligations under the WTO agreements;

29. INVITES the Commission and Member States to consider the important role of communications satellites in delivering on the Digital Agenda for Europe;

30. CONSIDERS the necessity of defining the needs and making available sufficient radio-spectrum bands for European space systems, including the communications satellites;

III. INTERNATIONAL DIMENSION

31. INVITES the Commission, in close collaboration with Member States and in consultation with ESA to work out an international cooperation strategy; to strengthen its 'space dialogues' with its strategic partners (USA and the Russian Federation) and to explore the possibility to establish similar space dialogues with other existing and emerging space powers (such as the People's Republic of China, Japan, the Republic of Korea, Brazil, India, the Republic of South Africa) in view of the important contribution successful partnerships in space can make to the overall development of international relations, and to regularly inform the Council;

32. SUPPORTS the inclusion of the space component in the EU's external policy and its promotion within international agreements, in line with the overall goals of such an international cooperation strategy and on the basis of case-by-case analysis and decisions; INVITES the Commission to further develop the ongoing space partnership with Africa and to explore the scope for developing space cooperation with Latin America and other world regions;

33. SUPPORTS the efforts of the international community to strengthen the security, safety and sustainability of activities in outer space, in particular through the international Code of Conduct for Outer Space activities proposed by the European Union;

IMPROVED GOVERNANCE

34. Recalling that the European Space Policy governance is based on three main actors, the EU, ESA and their respective Member States, UNDERLINES the fact that the Union's enhanced role in European space policy goes hand in hand with increased interaction among these three actors based on the complementarity of their roles and responsibilities; WELCOMES the Commission's commitment to strengthening the partnership with Member States and to further developing the EU-ESA relationship on the basis of the EU-ESA Framework Agreement, avoiding any unnecessary duplication of activities and improving their complementarity of efforts;

35. INVITES the European Commission and all involved stakeholders to further optimise, on the basis of lessons learned, the management of ongoing and future EU space programmes to ensure timely delivery, cost containment and the provision of robust and transparent information to the Member States;

36. INVITES the Commission to organise broad consultations on and discussion of main elements of a possible future European Space Programme.

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COMMUNICATION FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

TOWARDS A SPACE STRATEGY FOR THE EUROPEAN UNION THAT BENEFITS ITS CITIZENS

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COMMUNICATION FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

TOWARDS A SPACE STRATEGY FOR THE EUROPEAN UNION THAT BENEFITS ITS CITIZENS

1. SPACE POLICY: A RESPONSE TO THE SOCIAL, ECONOMIC AND STRATEGIC CHALLENGES THAT WE FACE

Space activities and applications are vital to our society's growth and development. They often have a direct impact on citizens' daily lives. In this context, space policy is an instrument serving the Union's internal and external policies and responds to three types of need:

– social: the citizens' well-being depends on space policy in areas such as the environment, combating climate change, public and civil security, humanitarian and development aid, transport and the information society;

– economic: space generates knowledge, new products and new forms of industrial cooperation, it is therefore a driving force for innovation and contributes to competitiveness, growth and job creation; and

– strategic: space serves to cement the EU's position as a major player on the international stage and contributes to the Union's economic and political independence.

In this regard, the space sector directly contributes to achieving the objectives of the Europe 2020 Strategy,[1] namely smart, sustainable and inclusive growth. Space policy thus forms an integral part of the "Industrial Policy" flagship initiative and the Strategy calls on the Commission to strive "to develop an effective space policy to provide the tools to address some of the key global challenges and in particular to deliver Galileo and GMES". In October 2010, the Commission thus adopted the "Communication on Industrial Policy"[2], in which the Commission proposes "measures in 2011 to implement the priorities of the space policy based on Article 189 of the TFEU [and will pursue] a Space Industrial policy developed in close collaboration with the European Space Agency and Member States". In its conclusions of December 2010, the Competitiveness Council concurred and underlined "in particular the role of the space sector in EU competitiveness and innovation." It noted "the Commission's intention to propose the necessary space policy measures and to pursue a space industrial policy."

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1 "EUROPE 2020 A strategy for smart, sustainable and inclusive growth" COM(2010) 2020.

2 "An Integrated Industrial Policy for the Globalisation Era – Putting Competitiveness and Sustainability at Centre Stage" COM(2010) 614

Europe boasts a rich heritage in space, with the achievements and expertise accumulated by the Member States and by the European Space Agency (ESA)[3]. The gradual emergence of EU competence with regard to space builds on that heritage.

Cooperation with the ESA culminated in the adoption, in 2004, of a framework agreement, which, inter alia, provided for the creation of the Space Council, the concomitant meeting of the Council of the EU (Competitiveness) and the Ministerial Council of the ESA. The European Geostationary Navigation Overlay Service (EGNOS) and Galileo satellite navigation programmes and the Global Monitoring for Environment and Security (GMES) system are results of the Union's interest in space. Since then, seven Space Council meetings have provided guidance for Europe's space initiatives. At its fourth meeting in May 2007, the Space Council welcomed the efforts made jointly by the European Commission and the ESA to implement initiatives geared towards users and those aimed at strengthening the development and operation of integrated space applications[4].

For its part, the European Parliament has always pushed for an ambitious European Space Policy[5]. In common with the other major space powers, it therefore appears that in Europe space is acknowledged at a high political level by all of the actors involved as an important factor in helping to meet the needs of citizens.

Article 189 of the TFEU, conferring on the Union a shared space competence which it pursues alongside that of the Member States, needs to be seen in this context. The Union thus has a specific mandate to draw up a European space policy, and, "to this end, it may promote joint initiatives, support research and technological development and coordinate the efforts needed for the exploration and exploitation of space". To this end, "…Parliament and the Council shall establish the necessary measures, which may take the form of a European space programme".

In this new framework, Europe's space policy is aimed at achieving the following objectives: promoting technological and scientific progress, stimulating industrial innovation and competitiveness, enabling European citizens to reap the benefits of space applications and raising Europe's profile on the international stage in the area of space. In order to achieve those goals, Europe needs to keep independent access to space. The following section sets out the priority actions designed to put those objectives into practice.

2. PRIORITY ACTIONS FOR A EUROPEAN UNION SPACE POLICY

The first priorities for this policy set out at the fourth Space Council meeting are the flagship Galileo and GMES projects. The fifth Space Council meeting approved those projects and identified further priorities. Climate change, security, competitiveness and space exploration have ever since been reaffirmed as priority areas where specific action continues to be required.

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3 The text uses the English acronym ESA. The ESA comprises 18 countries, two of which – Norway and Switzerland – are not EU Member States. Canada, Hungary, Poland and Romania take part in some cooperation projects with the ESA.

4 Outcome of the Competitiveness Council meeting of 21 and 22 May 2007, Resolution on European Space Policy, DS 417-07.

5 European Parliament Resolution of November 2008, whereby Parliament approves the European Space Policy and urges that definite action be taken on the four proposed priorities – climate change, security, innovation and exploration.

2.1. Satellite navigation: the Galileo and EGNOS programmes

Galileo is one of the Union's flagship programmes and the first satellite navigation system in the world designed for civilian use. It will enable the Union to remain independent in a strategically important field, at a time when reliance on global navigation systems continues to grow. EGNOS was the first European satellite navigation measure, and its goal is to improve the quality of the signals transmitted to European territory by global satellite navigation systems. The systems that emerged from the Galileo and EGNOS programmes represent the first major space facilities solely belonging to, and managed by, the EU.

These two programmes form an integral part of the Europe 2020 strategy, as they are intended to push the EU to the forefront by developing innovative ways of exploiting satellite navigation, boosting economic activity in the market further downstream, creating new business opportunities, facilitating the provision of humanitarian aid and enhancing the well-being of Europe's citizens (by making transport safer, increasing civil protection and developing social services for the elderly and the disabled, to give but a few examples). The benefits of these programmes for the EU cut across all sectors of the economy, such as transport, telecommunications, the environment and security.

In January 2011, the Commission adopted the Mid-term review of the European satellite radio navigation programmes, where it is stated that the GNSS applications markets are growing rapidly, and that their annual turnover worldwide is expected to reach around € 240 billion by 2020. Moreover, as a result of the advantages of Galileo and EGNOS compared with the other competing systems, they are expected to generate economic and social benefits worth around € 60-90 billion over the next 20 years.

Later in the year, the Commission will draft a proposal for legislation aimed at adapting the institutional framework that covers the Galileo and EGNOS programmes to take account of the guidelines put forward by the European Parliament and the Council. It is important to ensure that the satellite constellation required to pursue these programmes is put in place within a reasonable amount of time and that all of the provisions required for the gradual deployment of Galileo services are implemented.

2.2. Using Space for the Benefit of the Environment and to Aid the Fight against Climate Change: the GMES Programme

2.2.1. The Implementation of GMES

The purpose of the GMES programme is to guarantee continuous access to information services on the environment and security issues which are based on permanent space-based observation and in-situ infrastructures. The GMES programme plays a vital role in monitoring the sea, land and atmospheric environment, aiming to facilitate better understanding of the European and global environments as a basis for policy. It will help underpin a sustainable use of resources as well as providing better information on climate change.

It may thus be used to support policies on climate change adaptation and security, and to contribute to crisis prevention and management, with particular emphasis on humanitarian aid, development assistance and civil protection.

Beyond improving the provision of services, both to public policy-makers and to citizens, GMES has the potential to create opportunities for increased private-sector usage of information sources.

A Regulation governing the initial operations of the GMES programme 2011-2013 was adopted in 2010 by the European Parliament and the Council[6]. The GMES programme now has a legal basis that makes it more than a research activity. The current priority is to ensure that it is implemented quickly and effectively, in partnership with the Member States, and that it is fully operational by 2014.

2.2.2. Climate Change as a Challenge Facing Society

The GMES programme is a powerful tool at the Union's disposal in the fight against climate change. Space observation, along with observation from other sources, provides us with information to improve our understanding of how the climate is evolving and enables us to draw up policy to adapt to that development.

The EU and its Member States could benefit from the permanent, systematic availability of additional information that could prove useful when adapting numerous public policies, with a view, in particular, to improving the effectiveness of measures taken to prevent, or respond to, climate change. The EU would also be in a stronger position if it had reliable, independent sources of information to ensure that international commitments in the fight against climate change are being met. This monitoring capacity at EU level yields further benefits, as it can complement or replace resources that have until now been at national or regional level.

To this end, it is necessary to build on existing space monitoring infrastructure and to ensure the continuity of the infrastructure needed in order to implement and pursue policies to combat and adapt to climate change; the overall aim is to strengthen the 'climate change' component of the GMES programme. As manager and user of the GMES programme, the EU must define and facilitate the development of this European service and the necessary infrastructure.

2.3. Secure Space to Achieve Security and Defence Objectives

As regards security, space infrastructure acts as both an instrument and an asset. As an instrument it can serve the European Union's security and defence interests; as an asset it requires protection.

2.3.1. The S (Security) component of the GMES programme

The seventh meeting of the Space Council in November 2010 recommended that "within the GMES programme, additional consideration should be given on how to meet the specific needs of security policies and the services dedicated notably to maritime surveillance, border control and support for EU external actions".

The S (Security) component of the GMES programme must therefore be enhanced. Discussions are taking place to analyse how new developments affecting space technologies can contribute to effective solutions for areas such as monitoring borders, support for the European Union's external action, maritime surveillance, complex emergencies, humanitarian aid and civil protection.

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[6] Council Regulation (EEC) No 911/2010 of the European Parliament and of the Council of 22 September 2010, OJ L 276, p.1, 20 October 2010

Although GMES is a programme solely for civilian use, it is important to identify how existing dual-use observation resources – i.e. both civilian and military – can contribute to the GMES programme, for example, for the systematic surveillance of large geographical areas or the tactical surveillance of smaller areas. Different space technologies with sufficient resolution must be deployed and response times must be improved if the requirements of security missions are to be met.

2.3.2. The Security Dimension of Space Policy

The seventh meeting of the Space Council acknowledged "the reinforced EU engagement in security and defence matters embedded in the Lisbon Treaty and the setting-up of the European External Action Service". It invited the European Commission, the EU Council, assisted by the European Defence Agency (EDA), together with Member States and the ESA "to explore ways to support current and future capability needs for crisis management through cost-effective access to robust, secure and reactive space assets and services […] taking full advantage of dual-use synergies as appropriate." It also invited "the European Commission and the EU Council to propose policy solutions where necessary".

The Member States have valuable capabilities, and have acknowledged the European dimension of space for security and defence by launching the MUSIS (Multinational Space-Based Imagining System for Surveillance, Reconnaissance and Observation) project. In the spirit of the Common Security and Defence Policy, the EU's security needs may be met either by deploying national resources in a coordinated manner or by implementing shared resources.

In order to strengthen its security missions without depending on the facilities and services of non-Member States and to ensure the continuity of missions developed by the Member States, the EU must begin discussions with the Member States to look into the possible options. In the framework of the Common Security and Defence Policy, the EU could, for example, coordinate national facilities under conditions to be agreed with the owner Member States and identify additional needs in order to fulfil more effectively operational needs in the areas of crisis management and external action. To meet those needs, the EU could take part in the development of new infrastructure. The appropriateness of using commercial facilities for security missions must also form part of these discussions.

This approach must take account of related policies – such as maritime security and surveillance – pursued by the Union and the Member States.

2.3.3. Making Space Infrastructure Secure

Space infrastructure is critical infrastructure on which services that are essential to the smooth running of our societies and economies and to our citizens' security depend. It must be protected and that protection is a major issue for the EU that goes far beyond the individual interests of the satellite owners.

Such infrastructure is at risk of damage or destruction by natural phenomena, such as solar radiation and asteroids, and by other spacecraft and their debris. It is also under threat from electromagnetic interference, be it intentional or otherwise.

Some Member States have the resources to respond in part to these risks. However, these resources are inadequate because of their technical shortcomings and the absence of sufficient coordination mechanisms. Consequently, in order to ensure the protection of its space infrastructure, the EU is largely dependent on the resources and the good will of non-Member States.

In 2008, the fifth Space Council meeting confirmed that Europe must "develop a European capability for the monitoring and surveillance of its space infrastructure and of space debris". It also confirmed that the Union needs to play an active role in the implementation of the Space Situational Awareness (SSA) system and its governance mechanisms.

Implementing this system involves gathering existing resources, making good any shortfalls and maintaining and operating the system. The Industrial Policy Communication states that "the Union should define the organisation and governance of such a system taking into account its dual nature and the need to ensure its sustainable exploitation." The SSA system should be organised according to a structure, yet to be defined, that would take account of the level and extent of participation of each Member State and of the other bodies involved, depending on the missions to be accomplished and constraints to be respected.

2.4. Space Exploration

In 2008, the Space Council's resolution highlighted "the need for Europe to develop a common vision and long-term strategic planning for exploration, ensuring key positions for Europe, therefore based on its domains of excellence". Active involvement by the EU in this area would enable it to establish a closer link between space exploration and social and economic challenges by merging the interests of the different Member States and ensuring that internal resources are used effectively. There is a political dimension to space exploration that goes beyond the issues inherent in research and development.

Europe is a partner that is known for its competence and reliability in this sector, but it is not making the most of its potential because its actions are too piecemeal and because of the lack of linkage between space exploration and the political, economic and social challenges that we face.

Following consultation between the Union, the ESA, the Member States concerned and the international partners, four priorities have been identified: critical technologies, the International Space Station (ISS), access to space and setting up a high-level international forum.

Specifically, the Union seeks to identify and support the development of essential technologies for exploration, in particular in the fields of energy, health and recycling (support for life in isolated environments). These matters are not necessarily dealt with in the space sector itself and cross-fertilisation should be promoted with other sectors in order to benefit the citizens directly.

The Union could also explore options to work with the ISS, ensuring that all Member States participate in it.

The EU's independent access to space also means increased European capability to pursue independent missions from Europe's spaceport in Kourou.

Lastly, a high-level international platform should be set up in order to identify the areas of space exploration open to international cooperation, to strengthen the political dimension of international discussions on space exploration and to enhance cooperation synergies with non-Member States; in short, a platform enabling the EU to coordinate the European space effort.

3. COMPETITIVENESS: SPACE AS AN INTEGRAL PART OF THE EUROPE 2020 STRATEGY.

3.1. Space Industry Policy for the Benefit of Competitiveness

Under Article 189 of the TFEU, the Union "shall draw up a European space policy" with a view to promoting, *inter alia*, industrial competitiveness. The space industry – manufacture, launching and operating, applications and services – is a driving force for growth and innovation, generating highly qualified jobs and market opportunities for innovative products and services far beyond the space sector.

The space industry is a key sector given society's increasing dependence on space infrastructure and applications for both civilian and military use. In the space industry, there is a high degree of concentration but few SMEs. In Europe, in common with other space powers, the space sector is highly reliant on public procurement, and has to contend with increased competition on the world market.

Satellite communications (SATCOM) form a significant part of this market: orders for such equipment provide regular work for the launch sector, thereby contributing to the objective of independent access to space for the European Union and its Member States, who depend on affordable launching capacities for their programmes. The Commission believes that it is vital to quickly draw up, in close cooperation with the ESA and the Member States, a space industry policy that fully reflects the specific needs of each sub-sector. The main objectives of such a policy would be the steady, balanced development of the industrial base as a whole, including SMEs, greater competitiveness on the world stage, non-dependence for strategic sub-sectors such as launching, which require special attention, and the development of the market for space products and services.

To this end, the European Union, the Member States and the ESA must use the mechanisms available to them in a coordinated manner.

As regards the Union's space programmes it is necessary to make better use of the European regulatory framework, regarding trade in particular, and of the financial instruments to support research and innovation and to define the most appropriate type of procurement procedures and the applicable award procedures when EU funding is concerned. The option of adopting specific provisions under particular legislative acts could be examined.

3.2. Boosting Research and Innovation

Europe needs a solid technological base if it is to have an independent, competitive space industry. It must also develop the necessary resources to meet long-term needs while maintaining basic space research. In this regard, it is vital to develop key generic technologies such as advanced materials and nanotechnology.

The purpose of investment must be to increase the excellence of European research. In order to rectify current shortcomings, it is necessary to support research into critical technologies (i.e. those that are essential for the sector's strategic non-dependence) and breakthrough technologies (i.e. those that constitute genuine technological advances), including research supporting space exploration. The Community research efforts contributing to these challenges will be set out in the proposal for the Common Strategic Framework for Research and Innovation funding.

Most of the expected benefits of space investment, for the sector itself and beyond, relate to its effect on innovation. Space policy can make a decisive contribution to making the 'Innovation Union' a reality. The sixth Space Council meeting of May 2009 emphasised "the need to mobilise existing innovation support mechanisms at European, national and regional level, and consider new support instruments". Mobilising these mechanisms will make it possible to improve developing infrastructure by boosting the market for applications and services derived from the Galileo/EGNOS and GMES programmes, as well as for the telecommunications sector. In turn, the setting of ambitious space objectives will stimulate innovation.

3.3. Telecommunications Satellites Fostering Innovation

Communications satellites constitute a key space sector, generating the largest revenues in the space industry, in both Europe and the rest of the world[7].

Communications satellites offer greater access to a broad range of economic and social services such as high-speed Internet, television and radio and improved transport facilities. They also facilitate the development of services for the citizens such as public safety and emergency-response, health and home-based services. Accordingly, communications satellites have a clear role to play in delivering on the Digital Agenda for Europe objective of bringing basic broadband to all Europeans by 2013 and they also have the potential to contribute to the objective for all Europeans to have access to an Internet speed of 30 Mbps by 2020. In particular for the most remote and/or rural regions of Europe, communication satellites can bring broadband connections. These developments will parallel the implementation of the GMES and Galileo programmes.

Advanced technologies developed for communication satellites can also be integrated into navigation and earth observation applications. In particular, the re-use of public sector information (PSI) has proven instrumental in fostering a number of new services to the citizens directly. In the area of security, for instance, the Europe-wide eCall system of automatic emergency calls in vehicles relies on precise location and will therefore help reduce the number of deaths and the damage and personal injuries suffered by citizens in road accidents. In order to maintain Europe's lead in satellite communication technologies, research must be carried out at European level, given the spin-offs it can create for other application sectors. Lastly, the availability of the appropriate radio spectrum will be necessary to ensure that satellite communications and space infrastructure are operational and help achieve the European Digital Agenda and EU space policy objectives. It is crucial to take this into account in pursuing existing programmes and in defining new European space initiatives.

4. THE INTERNATIONAL DIMENSION OF THE EU'S SPACE POLICY

International cooperation is vital when it comes to space. Increasingly, space endeavours are no longer a matter for individual nations alone and in many cases can only be efficiently achieved by pooling technological and financial capacities. International cooperation should also serve as a market opener for the promotion of European technology and services in the

[7] Telecommunications satellites account for over 60% of the space industry's turnover. 90% of satellites launched by Ariane 4 and 5 are communications satellites.

space field and so help strengthen this strategic industrial sector. International cooperation in space should also support the promotion of European values through space-based projects focused on environmental protection, climate change, sustainable development and humanitarian action. The EU, in close collaboration with the ESA, will continue to maintain and strengthen its "space dialogues" with its strategic partners – i.e. the United States and Russia – with a view to increasing cooperation. These dialogues seek to identify areas where there is mutual benefit in cooperation; they cover a broad range of activities including Earth observation and Earth science, Global Navigation Satellite Systems, Space Science and space exploration. The EU will also propose that space dialogues, the scope and objectives of which will be set out in appropriate bilateral arrangements, be established with other existing and emerging space powers, in particular the People's Republic of China; the EU will seek constructive solutions to issues of cooperation and sharing open frequencies in the field of satellite navigation.

The EU must ensure that space-related matters are better integrated into the Union's external policy. The EU would, in particular, like to ensure that its expertise and infrastructure benefit Africa and to step up ongoing cooperation. Earth observation data or data obtained by satellite systems are essential for Africa, in particular for transport safety, cartography, the management of water and rivers, food resources and raw materials, biodiversity, soil use, deforestation and combating desertification. There is already active cooperation regarding space applications as part of the Africa-EU partnership on Science, Information Society and Space. In the seventh Space Council meeting, the Council insisted "that the decisions to implement the related priorities of the GMES and Africa action plan be taken without delay". It invited "the European Commission to work with the African Union Commission towards capacity building in this area […] and to determine the way a similar infrastructure to EGNOS could be implemented in Africa". As regards EGNOS, the November 2010 Europe-Africa summit approved an action plan aimed at, in particular, the secondment of staff to the entity managing the African GNSS programme, the training of African experts and the development of initial infrastructure and start-up operations.

The European Union will continue to support efforts of the international community to strengthen the security, safety and sustainability of activities in outer space, in particular through the EU proposal for a Code of Conduct for Outer Space activities.

The EU's competence in the area of space will help strengthen its role in multilateral forums. As regards earth observation, Europe is closely involved in developing the Global Earth Observation System of Systems (GEOSS) international initiative. The Commission will therefore continue to make the necessary efforts to implement mechanisms for sharing earth observation data in Europe, subject to the acceptance of such mechanisms by GEOSS members.

5. TOWARDS A WELL-STRUCTURED GOVERNANCE

The EU's increasing involvement in Europe's space policy goes hand in hand with increased interaction between the different protagonists in this area. The Union should therefore strengthen its cooperation with the Member States, examine its relations with the ESA and ensure the best possible programme management.

5.1. Strengthening the Cooperation with the Member States

The shared space competence conferred upon the EU by the TFEU goes hand in hand with a reinforced partnership with Member States in the form of policy dialogue and coordination. This is all the more necessary given that the EU competence does not prevent Member States from exercising their own.

Member States vary in the extent of their involvement, their budget and their technical capacities. In most of them, space activities are considered primarily as research activities. Even where efforts have been made to ensure complementarity and synergy, they have had limited effect.

The EU needs to strengthen the political dimension of space. Under Article 189 of the Treaty, the Union has the mandate and the capacity to coordinate the Member States' actions and to make this complementarity more effective. For this to happen, the cooperation between the Union and its Member States must be strengthened. All new actions must also based on existing resources and on identifying jointly where new resources are needed.

Recent institutional developments are the first tangible expression of that strengthened cooperation, which should foster consistency of political objectives, whilst ensuring compliance with the respective competences of the Union and its Member States. This cooperation will reinforce the synergy of the Union's space policy with other policies that use the EU's or the Member States' space resources, such as transport, environment, research and innovation.

5.2. Developing Relations between the EU and the ESA

Under Article 189 of the TFEU "the Union shall establish any appropriate relations with the European Space Agency". The EU's increasing involvement in space entails re-assessing its relations with the ESA and gradually adapting the ESA's operations so that maximum benefit can be derived from the two organisations.

The political dimension in space-related matters means that Europe's involvement must not be geared solely or mainly towards technical or scientific aspects. For its part, the EU should gather and identify the users' needs in order to ensure that space resources meet European citizens' needs in full. The Commission helps to achieve that aim by meeting the different actors on a regular basis.

Operating bodies have been set up in different areas such as operational meteorology (namely EUMETSAT, which originally stems from the ESA) with a view to serving the users more effectively. The Commission must step up contact with these bodies and could, in part, make use of them to implement the Galileo and GMES programmes.

For its part, the ESA, which implements programmes for its Member States and for the EU, has strong technical and management infrastructure and could support the development of new space facilities as regards both intergovernmental and EU-funded programmes.

Discussions are ongoing in the ESA regarding its future as an organisation. Without pre-judging the outcome of those discussions, the European Commission takes the view that developing the roles of the various actors in space in Europe should also involve the pragmatic development of the ESA, taking account of the respective roles of the ESA and the EU in terms of research, funding and operating capabilities.

As far as the Commission is concerned, the ESA should continue to develop into an organisation with an intergovernmental and an EU dimension in which military and civil programmes can coexist. As regards the implementation of the Galileo and GMES programmes, the ESA is already subject to the EU's rules. It will pursue closer ties with the EU and, according to need, will continue to have management structures geared solely towards EU programmes.

The model should be flexible enough to adapt to the level of funding that the various protagonists set aside for the different programmes in the future. A flexible membership structure should also be established in order to enable Switzerland and Norway to take part in some programmes and to offer limited participation to some Member States.

These developments mean that in due course the framework agreement between the EU and the ESA will need to be reviewed. In any case, account should be taken of their impact on the applicable legal framework, in view of the EU's international commitments.

5.3. Better Coordination and Management of Space Programmes

Space programme management remains fragmented and international investment segregated. The proliferation of protagonists – the Member States via the space agencies, the ESA, EUMETSAT and the EU – is not conducive to effective decision-making or implementation.

The Commission wishes to propose better space programming by enhancing the coordination of the programme committees (such as the Galileo and GMES programmes) and, more generally, better coordination of the different protagonists' actions in order to meet the users' and citizens' needs more consistently and ensure sound and efficient management of public resources.

6. TOWARDS A EUROPEAN SPACE PROGRAMME

Article 189 of the Lisbon Treaty gives the Union a broader legal framework that enables it to define a distinct and complementary European space programme of more sector-based actions based on other articles in the Treaty or other legal acts.

The Commission is looking into the possibility of presenting a proposal for such a programme in 2011. Taking responses to this communication into account, it will decide on its approach as part of its June proposal on the next multi-annual financial framework.

7. CONCLUSION

Article 189 of the TFEU opened up new perspectives for developing an EU space strategy. To this end, the Commission has set out practical options in this communication. The Commission thus submits it for the opinion of the Council, the European Parliament and the Union's consultative bodies, which is a necessary stage in the formation of such a strategy and of the measures to be taken for that strategy to be implemented.

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IMPACT ASSESSMENT

Accompanying document to the

COMMUNICATION FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

TOWARDS A SPACE STRATEGY FOR THE EUROPEAN UNION THAT BENEFITS ITS CITIZENS

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1. CONTEXT AND POLITICAL BACKGROUND

1.1. Context

This Impact Assessment (IA) will accompany a communication on the future involvement of the EU in space. It will look closely into the opportunities of the EU to play a future role in space policy and will set out different levels of ambition regarding thematic and financial scope for an EU Space Programme, which could come into force during the next financial perspectives from 2014-2020. The Communication does not amount to a formal proposal for the governance and funding of a European Space Programme. It will rather be the basis for a discussion that may lead to a proposal for a Regulation establishing an EU space programme to be presented alongside or including the GMES proposal Regulation referred to in the following paragraph. Any proposed Regulation would be accompanied by another impact assessment that would analyse the financial impact in a detailed manner.

This IA follows a pragmatic approach and has been drafted along the following lines:

– While Galileo must be seen as an integral part of the European Space Policy, given its complexity and the fact that it follows a decision making path of its own[1], the present impact assessment does not deal with Galileo;

– Similarly, GMES is also an integral part of the European Space Policy. However, it has been the subject of several impact assessments; the last of them was carried out prior to the adoption of the 28.10.2009 Commission Communication on the challenges and next steps for the space component[2] and is currently the subject of an IA in view of a proposal for a GMES Regulation 2014-2020. Therefore the present impact assessment does not cover GMES;

– The present IA contains some references to space research and innovation because they are intimately linked to the priority areas mentioned below. However, the impact assessment of space research and space and innovation will be dealt with as part of the preparatory work to be carried out for FP8 and for the possible successor of CIP[3] respectively;

– Since Galileo and GMES have been clearly identified as the first priorities of the EU in space, the present IA focuses on the other priority areas identified by the 2008 Space Council Resolution[4] on taking forward the European Space Policy, namely the space and security aspects not covered by GMES (protection of space infrastructure, otherwise referred to as Space Situational Awareness – SSA), and space exploration; like GMES, these actions will be based on the new Article 189 of the TFEU which provides the EU with a dedicated legal basis for action in the space domain.

– There is no programmatic or technical dependence between the actions proposed in this IA and GMES and Galileo. Any new EU activities in space will be additional to and have no

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1 Full reference documents available at http://ec.europa.eu/enterprise/policies/space/documents/galileo/index_en.htm.

2 Commission Communication "Global Monitoring for Environment and Security (GMES) – Challenges and next steps for the Space Component", COM (2009)589 final.

3 CIP is the Competitiveness and Innovation Framework Programme.

4 5th Space Council Resolution, "Taking forward the European Space Policy", 26 September 2008.

financial impact on GMES and Galileo in so far as they should only be undertaken under the condition that adequate funding for both is ensured.

1.2. Political background

The political context of the initiative is framed by the new provision of the TFEU. With Article 189 that introduces a new and clear mandate for the EU to act in space matters, space has now become an EU policy in its own right which should be developed through appropriate measures.

The concerted political will of Member States is also reflected in the Council Resolutions and orientations on the European Space Policy (ESP) jointly adopted by the EU and the European Space Agency (ESA) at the 4th, 5th and 6th Space Council meetings held in 2007, 2008 and 2009[5]. These Resolutions put public policy objectives at the centre of the ESP and set priority areas for the future such as climate change, creating global market opportunities, contributing to the security of European citizens and the need for Europe to develop a common vision and a long-term strategic planning for space exploration.

The 2009 Resolution emphasised the contribution of space to innovation, competitiveness and economic recovery in Europe. It stressed that significant investments in space, and the technological progress it generates, must work for the whole of the European economic fabric.

In its 2008 Resolution, the European Parliament endorsed the European Space Policy and asked for concrete proposals in the four priority areas identified above[6].

There are strong links between the objectives and priorities in these Council Resolutions and some of the central themes of President Barroso's political guidelines for his second mandate and with the EU2020 strategy[7]: growth and job creation, tackling climate change and the research and innovation revolution for a knowledge society.

In his guidelines, President Barroso also underlines that the EU must concentrate where it can bring the most added value. As the Council Resolutions acknowledge, there is a widely shared political view that EU involvement in space activities would offer great added value "to ESA and Member States, while respecting roles and responsibilities of each of them"[8].

President Barroso in his intervention at the conference "The ambitions of Europe in Space", held in Brussels on 15th October 2009, stated that space is one of the areas that "should progress at EU level" in the future and outlined avenues for future EU involvement in space. He highlighted that space is an "enabling" tool that should help Europe to face fundamental challenges, such as "fighting the economic crisis, ensuring the well being of our citizens; tackling climate change; finding ways to unleash the full potential for innovation and job creation; bringing about a true knowledge society and reinforcing our position in the world scene".

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5 4th Space Council Resolution, "Resolution on the European Space Policy", 22 May 2007; 5th Space Council Resolution, "Taking forward the European Space Policy", 26 September 2008; 6th Space Council Resolution, "The contribution of Space to innovation and competitiveness in the context of the European Economic Recovery Plan and further steps", 29 May 2009.

6 European Parliament resolution on the European Space Policy, "How to bring space down to Earth", 20 November 2008.

7 http://ec.europa.eu/eu2020/index_en.htm.

8 5th Space Council Resolution, "Taking forward the European Space Policy", 26 September 2008.

This initiative is related to the Commission Communication COM(2007)212 jointly developed by the European Commission and ESA and adopted in 2007, defining the strategic mission of a European Space Policy and covering all actors and key aspects of space activities in Europe.

This initiative builds on past achievements in space research under the R&D framework programmes. It is also closely linked to two other space flagship projects (Galileo and GMES) and will benefit other EU policies such as security and defence, environment or health.

2. PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

2.1. Organisation and timing

IA Steering Group

DG Enterprise and Industry set up an Impact Assessment Steering Group (IASG) to which the following Services were invited: DG SANCO, DG RTD, DG TREN, DG BUDG, DG ECFIN, DG RELEX, DG JRC, DG INFSO, DG ENV, DG EMPL, DG EAC and the Secretariat-General. The IASG met in December 2009, May 2010 and June 2010 in order to accompany the preparation of the impact assessment.

IA Board opinion

The Impact Assessment Board of the European Commission assessed a draft version of the impact assessment and issued its opinion on 16.07.2010. The impact assessment board made several comments and, in the light of those suggestions, the final impact assessment report:

– Elaborates on the present situation as regards situational awareness and space exploration, including a new annex;

– Clarifies that the suggested action would not compete for funding with Galileo and GMES;

– Clarifies that the options are incremental and therefore their final configuration depends on available funding, once funding for Galileo and GMES has been secured;

– Explains what ESA is currently doing in the fields of space situational awareness and space exploration and analyses the limits for ESA further involvement;

– Further elaborates the impact on competitiveness of EU industry, the international cooperation aspects and provides examples of spin-offs in annex;

– Clarifies further consultation of stakeholders as per the IAB recommendations.

2.2. Stakeholder consultation

DG Enterprise consulted different parties interested and involved in space affairs.

Bilateral meetings were held in 2009 with National Space Agencies of the Member States more actively involved in space activities and with the representatives of the European space industry.

Relevant target stakeholders were interviewed by an external contractor[9], in the context of a study to support the preparation of the present impact assessment.

The Space Advisory Group of the European Commission, that supports the European Commission services with strategic advice regarding the Space theme of the Framework Programme for Research, provided recommendations on Europe's role in global strategy for space exploration[10].

A Eurobarometer survey on the space activities of the European Union was conducted by Gallup in July 2009 in order to examine EU citizens' opinions and to assess: a) their awareness of space activities of Europe and the European Union, b) their perception of these activities, and c) their general attitude toward space exploration. The majority of European Union citizens regard European space activities as important from the perspective of the EU's future global role: one in five citizens considered such activities *very* important (20%) and a further 43% felt that space activities are important in this respect. In total, almost two-thirds of Europeans share the view that space activities are important for the future international position of the European Union[11]. Overall, 67% of the survey respondents consider it important to develop space based applications to improve citizens' security and 64% support greater EU involvement in space exploration. However out of the 64% supporting space exploration, 38% of the support was not unconditional (the reply was: yes, perhaps). This means that the EU has to demonstrate the added value of such undertaking.

In October 2009 the first EU-ESA conference on human space exploration marked the beginning of an intense consultation process enabling the EU, ESA and their respective Member States to define a common political vision and role in worldwide space exploration.

In the first semester of 2010 several conferences and workshops on space exploration were organised to stimulate a debate and gather feedback from space and scientific communities, from national governments, and from national and international organizations operating in the space sector. Themes ranged from scientific and educational aspects of space exploration, to the synergies between exploration, innovation, industrial competitiveness and technological progress, to future scenarios for space exploration.

In addition, under the Spanish Presidency, a conference on space and security was held to contribute to defining the role of European Institutions and centres in security programmes.

A second Presidency conference on governance of European Space Programmes involved the EU, ESA and their Member States in a reflection on future developments of the institutional framework for Space activities in Europe. This conference revealed that governance is an issue that has multiple dimensions; the discussion was therefore a step in a process that should gradually lead to each of these dimensions being addressed and eventually settled.

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9 "Study on the EU Space Programme 2014-2020", Ecorys, Draft Final Report, 18 April 2010, contract n. SI2.541751.

10 For more information on the Space Advisory Group (SAG) http://ec.europa.eu/research/fp7/pdf/advisorygroups/space-members.pdf#view=fit&pagemode=none.

11 http://ec.europa.eu/enterprise/newsroom/cf/itemlongdetail.cfm?lang=fr&item_id=3749.

A study was carried out by an external contractor (Ecorys) to examine possible space activities where the EU could be involved in the future[12]. This study is an input alongside others in preparing this impact assessment. The study has been particularly helpful in identifying and confirming possible impacts of EU action in space.

The policy options presented in this IA have been built on the outcomes of these consultations. During the consultations it was made clear that Galileo and GMES are the utmost priorities in space policy. Therefore the suggested actions should not compete for funds with these flagship projects and could only be undertaken provided, inter alia, that additional funding for space is available. Stakeholders were also consulted on the order of priority of the options, i.e. on the fact that space situational awareness should be given priority over space exploration. There is a consensus in favour of this approach.

The action suggested under Option 2, i.e. Space Situational Awareness, has been discussed at length with Member States and there is widespread support for it.

As regards space exploration, Options 3 and 4 as such have not been presented to stakeholders. However, the building blocks of these options emerge from the extensive consultations referred to above.

It is important to underline that the purpose of the Communication on the future involvement of the EU in space is itself part of the wider consultation process. It aims at triggering a debate that may help the Commission in formulating concrete proposals for a possible EU space programme.

2.3. Key issues emerging from stakeholder consultations

From the bilateral meetings held with national space agencies, with Ministries in charge of space matters and with the industry association, the following considerations can be drawn:

– The European Union has a very important role to play in space matters. Together with Member States and ESA, the EU is one of the three main players in the space field, each of them having a specific and distinct role. The EU has a political role and a political responsibility and must aggregate and represent the interest of all, when deciding its involvement in space;

– The EU needs a vision for its future involvement in space, in order to elicit public and political support;

– Stakeholders agree that the most urgent priorities for the EU are the completion of the Galileo and GMES (including reinforced security and climate change dimensions) programmes, in order to start benefiting from the services they provide;

– The next priority for stakeholders, notably Member States, is the protection of our space infrastructure (as described in option 2). Our economy and the well being of our citizens is increasingly dependent on space-based applications and we need to acquire the capacity to protect it;

[12] "Study on the EU Space Programme 2014-2020", Ecorys, Draft Final Report, 18 April 2010, contract n. SI2.541751.

– As regards space exploration (covered in options 3 and 4), Members States believe it is important to define a long-term strategy that may include both robotic and human space exploration, that considers the issue of access to space and is backed up by a programme to develop the necessary enabling technologies for short, medium and long term space exploration. Space exploration is seen as a field that offers great potential for industrial development but it does not have to be developed at the detriment of other priorities. Support for the International Space Station is to be considered as part of a wider space exploration strategy and not as an end in itself;

– Stakeholders also underline the importance of public/EU funding for the space industry (delivered mainly through public procurement); the industry association emphasises the need to stimulate competitiveness of European space industry at international level and favours the introduction of accompanying measures to ensure the involvement of new Member States' industry in public funded space procurement;

– There is also a consensus that the EU, ESA and their Member States need to work together on all of the above.

Overall there is a clear consensus among Member States in support of the development of an EU Space Situational Awareness capacity. Member States have expressed their political will and support for a stronger EU involvement in SSA in several Space Council Resolutions, particularly the one of September 2008 which asks the EU "to take an active role to set up progressively this capability and an appropriate governance structure". There is also a positive and receptive attitude towards EU further involvement and expenditure in space exploration, as a complement to ESA's and Member States' activities. However, Member States final position will depend on many factors including the concrete proposals for action that the Commission will table and the funding mechanisms for such actions.

3. WHAT ARE THE PROBLEMS?

3.1. Problem definition

3.1.1. Introduction: Member States involvement in space

It is widely acknowledged that space-based applications and services have become part of our everyday reality. Our society increasingly depends on space-based technologies. Space applications and space spin-offs play a fundamental role in improving our everyday life.[13]

Space infrastructure and services as well as space research have become critical to EU policies[14], including the furthering of technical progress and industrial innovation and competitiveness. Still the EU and the European space sector as it stands today face a number of challenges which could hinder the fulfilment of overall EU policy objectives.

[13] As regards space applications: GPS, Internet services routed by satellite, TV broadcast by satellite. For examples of spin-offs from Space R&D activities to applications used in everyday life, consult http://www.esa.int/esaCP/GGGIPLH3KCC_Improving_0.html http://www.sti.nasa.gov/tto/Spinoff2009/pdf/spinoff2009.pdf

[14] Applications from Earth observation, navigation and telecommunication satellites are important for issues such as transport, agriculture, fishery, science, environment, health and security.

Space infrastructure and activities in Europe have sprung out of individual nations' or ESA initiatives over which the EU has had limited influence up to now (with the exception of Galileo and GMES).

The space sector is heavily dependent on public funding which accounts for nearly 60% of the European space industry's turnover and 80% in the US.

The degree and nature of involvement of EU Member States in space activities, including space situational awareness and space exploration, varies considerably. Only 18 Member States have developed space activities. Of those, seven Member States represent 91.5% of the civil space activity. This varying degree of involvement among Member States is the result of policy choices made on the basis of national strategic and economic considerations. Among Member States there is a clear difference between those that joined the EU after 2004 (EU 12) and the others. Member States not active in space belong to the first group. However, over the last decade national budgets devoted to space have grown considerably (including among some EU12 Member States) demonstrating that overall the interest in space activities remains steadily on the raise.

Much of this national investment in space has been channelled through ESA. The public budget for the civilian space sector is estimated at €5.7 billion in Europe[15]. Of this, ESA accounted for about €3.6 billion in 2009. The national programmes accounted for €2.1 billion[16], while the EU civil public expenditure amounted to €750 million. Military space budgets are rather small (around € 1 billion per year in total)[17].

Despite notorious European successes in space, the different degree of involvement of Member States in space and the fact that space activities respond primarily to national interests (even when conducted through ESA[18]) have resulted in fragmentation as regards space activities in general, including space situational awareness and space exploration which is described in detail in the following sections.

3.1.2. Security of critical European space infrastructures is not ensured

3.1.2.1. Description of the security threat due to space debris, space weather and Near-Earth Objects (NEOs)

The ability to protect space assets has become essential to our society. Space-based systems enable a wide spectrum of applications critical to key areas of the economy, including those related to security. This dependence is expected to grow further in the future. It also raises serious concerns because any shutdown of even a part of the space infrastructure could have

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15 Compared to the US space budget the gap is 1:6 for civilian programmes and even worse for military space outlays (1:20). Overall government spending on space programmes (civilian and defence combined) is rising worldwide with expenditures going up 12% in 2009.

16 European Space Directory, 25th Edition.

17 Profiles of Government Space Programmes: Analysis of 60 Countries and Agencies, Euroconsult, 2010

18 Most projects developed through ESA are optional, namely funded through national subscriptions and therefore responding primarily to national interests.

significant consequences for citizens' safety and for economic activities and would impair the organisation of emergency services[19].

During the past half century objects have been launched into space regularly, reaching a peak of 140 items per year during the Cold War. Every time a vehicle boosts a satellite into space, some debris is produced. Examples of space debris are: discarded fuel tanks, satellite components and debris from collisions[20]. This material, orbiting the Earth at very high speed and in an uncontrolled manner, poses an ever increasing potential risk of collision for spacecraft in orbit.

There are different estimates at to the debris population. According to some estimates, there are between 12 600 objects orbiting Earth larger than 10 cm, which are catalogued and 300 000 objects larger than 1 cm, not catalogued. Furthermore, there are more than 300 million objects larger than 1 mm[21].

In terms of collisions with debris the average time for a collision between debris and an active satellite has been estimated by some sources at 3-4 years[22]. At a speed of 10km/s, any of these objects can cause harm to operational spacecraft, from total destruction to permanent damage to sub-systems on-board spacecraft.

According to ESA sources, there is currently 1 collision alert per month. Without any mitigation measures, other sources estimate the probability of effective collisions at 1 every 5 years[23].

The table below provided by ESA summarises ESA's own estimates on debris and possible damage to satellites.

Category	**Definition**	**Estimated population**	**Potential risk to satellites**
Traceable	Greater than 10 cm in diameter	20,000	Complete destruction
Potentially Traceable	Greater than 1 cm in diameter	600,000	Complete to partial destruction
Untraceable	Between 1 mm and 1 cm	More than 300 million	Degradation, loss of certain sensors or subsystems

Tab 1 – ESA's estimates on debris and possible damage to satellites[24].

19 For example, communication systems, electrical power grids, and financial networks all rely on satellite timing for synchronisation. The provision of satellite-based rapid mapping services is indispensible for today's crisis management.

20 On February 11 2009 about 800 pieces of debris were generated by a collision between a US and a defunct Russian satellite. A similar number of debris was generated by a Chinese anti-satellite test in 2007. Such 'accidents' can generate a chain reaction that would destroy most satellites in a given orbit, knowing that the speed of a satellite and debris is 10 km/second.

21 "Study on the EU Space Programme 2014-2020", Ecorys, Draft Final Report, 18 April 2010, contract n. SI2.541751.

22 "Study on the EU Space Programme 2014-2020", Ecorys, Draft Final Report, 18 April 2010, contract n. SI2.541751.

23 http://www.parliament.uk/documents/documents/upload/postpn355.pdf.

Modelling work has suggested that close approaches will rise from 13,000 a week in 2009 to 20,000 by 2019 and more than 50,000 by 2059, meaning satellite operators will have to make five times as many avoidance manoeuvres in 2059 as in 2019. Since each manoeuvre requires fuel, this shortens the active life of satellites, or requires additional fuel to be carried into orbit thus increasing the cost of launch[25]. The problem is that information available on the position of the objects in question is not accurate and therefore a good number of manoeuvres may not be indispensible but have to be made as a precaution generating extra costs.

On 1st April 2010, 183 out of 928 satellites in orbit had EU contractors/owners (19.71%)[26]. According to Euroconsult, the average satellite price over the next decade will be $99 million and the satellite launch price is predicted to remain flat, at $51 million[27] (not taking into account the effect of increased collision risk as described above). Assuming that the direct costs of losing a satellite would be the full cost of the launch and around 50% the cost of an average new satellite assuming that the satellite is destroyed when it reaches its mid-life, the loss would amount to some $100 million on average per satellite including launches. Ecorys has estimated that the prevention of collisions would amount to a direct cost reduction of €84 million on average per satellite[28].

The revenue produced downstream by satellite-driven services[29] is estimated to exceed $60 billion US. European industry has managed to retain a market share of about 40% of the space segment[30]. While there are not sufficient elements to estimate precisely the potential loss of revenue derived from the destruction of a satellite, the available figures suggest that this amount would be within the range of a hundred million Euros per satellite[31].

Accurate, timely and complete space situational awareness (SSA) is instrumental for the protection of critical European infrastructures in space and for the secure and safe operation of space-based services, as well as for the protection of the population in case of re-entry events[32].

Another threat to the security and functioning of spacecraft/satellites and related ground infrastructure stems from the effects of solar activity, known as 'space weather'. The EU does not currently possess appropriate knowledge of these phenomena. The Sun goes through cycles of high and low activity that repeats approximately every 11 years. The number of dark spots on the Sun (sunspots) marks this variation; as the number of sunspots increases, so does solar activity. Sunspots are sources of flares, the most violent events in the solar system. In a matter of minutes, a large flare releases a million times more energy than the largest earthquake. Episodic solar activity has a number of effects that are of interest to us. A

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24 http://www.esa.int/esaMI/Space_Debris/SEM2D7WX3RF_0.html.

25 http://www.parliament.uk/documents/documents/upload/postpn355.pdf.

26 http://www.ucsusa.org/nuclear_weapons_and_global_security/space_weapons/technical_issues/ucs-satellite-database.html.

27 "Satellites to be Built & Launched by 2018, World Market Survey", Euroconsult, http://www.euroconsult-ec.com/research-reports/space-industry-reports/satellites-to-be-built-launched-by-2018-38-29.html.

28 "Study on the EU Space Programme 2014-2020", Ecorys, Draft Final Report, 18 April 2010, contract n. SI2.541751.

29 Example of downstream services are telecommunications or TV broadcasting.

30 http://telecom.esa.int/telecom/www/object/index.cfm?fobjectid=456.

31 This amount results from calculating the EU share of revenue divided by the number of "EU" satellites.

32 There could be significant negative economic, environmental and social impact generated if debris from spacecraft fall on the surface of the Earth, notably if the spacecraft are powered by nuclear fuel, as is the case with a small number of them today.

radiation dose from energetic particles is an occasional hazard for astronauts and for electronics on satellites. Geomagnetic field disturbances may damage power systems, disrupt communications and degrade satellite-based navigation systems on the ground[33].

The following table reflects the world direct satellite losses due to space weather:

Loss type	Frequency of event	Annualised loss
Complete satellite failure	Rare (<3 per solar cycle)	~€30 to 60 million
Service outage	Frequent (up to 60 anomalies per annum)	~ €30 million
Shortened satellite lifetime	Rare (<10 per solar cycle)	~€5-10 million

Tab 2 – Assessment of financial impacts on satellites due to space weather[34].

Complete satellite failure due to space weather has been reported in 11 cases in 25 years. Taking into account the number of EU satellites (183 in 2010), the cost of a satellite and the revenue from commercial satellites, the annualised costs of complete satellite failure would amount to more than €9 million. If we add to this the likely cost for the EU of service outage and shortened satellite lifetime, the total annualised loss for the EU would be greater than €16 million.

Geomagnetic storms[35] occur with a frequency of 1 every 30 to 100 years. None occurred during the 25 year period referred to above.

Lacking information on space weather, European operators, including ESA and MS, have no reliable advice on when to shut down spacecraft operations in orbit and to identify the source of potential failures.

Space weather can have negative social impacts due, for example, to the disruption of electricity and telecommunication activities which may in turn disrupt daily life, possibly creating hazardous situations[36].

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33 http://www.swpc.noaa.gov/info/SolarEffects.html.

34 http://www.esa-spaceweather.net/spweather/esa_initiatives/spweatherstudies/ALC/WP1200MarketAnalysisfinalreport.pdf.

35 Geomagnetic storms are temporary disturbance of the Earth's magnetosphere caused by a disturbance in space weather, http://en.wikipedia.org/wiki/Geomagnetic_storm.

36 One example of space weather impact on satellites is the Canadian communication service provider Telesat's experience in 1994. On 20 January 1994, one of Telesat's satellites was disabled for about 7 hours as a result of space weather-induced damage to its control electronics. During this period, the Canadian press was unable to deliver news to 100 newspapers and 450 radio stations. In addition, telephone service to 40 communities was interrupted.

Finally, Near-Earth Objects (NEOs) [37], comets and asteroids whose orbits bring them close to the Earth, are a rare but dramatic danger for Earth and the population in case of impact threats. Predicting and preventing possible impact is paramount but Europe does not currently play a significant role in this international concern[38]. Scientists divide NEOs in several categories including Potentially Hazardous Asteroids (PHAs). PHAs are currently defined based on parameters that measure the asteroid's potential to make threateningly close approaches to the Earth[39]. There are currently 1137 known PHAs. Europe needs a capacity to monitor NEOs and in particular these PHAs, updating their orbits as new observations become available so that we are in a position to better predict the close-approach statistics and thus their Earth-impact threat.

The consequences of a NEO impact on the surface of the Earth are difficult to estimate precisely, but they could be catastrophic on the economy and society, including potential loss of life and serious disruption of the economy. Environmental damage can also occur. For example, the 1908 Tunguska Event[40] is thought to have destroyed 2 000 square kilometres of Siberian forest.

Because satellites and other space-borne assets have become instrumental to many areas of economic activity (e.g. telecommunications, satellite TV, banking, weather forecasting, to name a few), the issue of space infrastructure protection is relevant to all EU Member States and not only major owners or operators of space assets.

3.1.2.2. The current situation regarding space situational awareness

The EU does not at present have full and accurate information on satellites and debris orbiting the Earth.

EU Member States possess valuable assets with potential for SSA. These include radar sensors, optical sensors (telescopes), secure data communication networks, storage and computation as well as human expertise. There is already today a certain degree of European cooperation and sharing of resources and data as exemplified by the Franco-German cooperation on the operation of the French GRAVES surveillance radar and the German TIRA tracking radar and the coordinated operation of the ESA optical space debris telescope at Tenerife and the Swiss ZIMLAT telescope at Zimmerwald. However these systems have significant shortcomings. Many sensors need to be upgraded to become operational; others are too limited in operational availability despite a high technical performance (e.g. French ARMOR radar on the naval vessel Monge).

37 A near-Earth object (NEO) is a Solar System object whose orbit brings it into close proximity with the Earth. They include a few thousand near-Earth asteroids (NEAs), near-Earth comets, a number of solar-orbiting spacecraft, and meteoroids large enough to be tracked in space before striking the Earth. According to some estimates, the Earth is indeed hit on average annually by an object with 5 kilotonnes equivalent energy. The atomic bomb dropped on Hiroshima (which caused between 65,000 to 200,000 deaths and more than 70,000 injured) had approximately 15 kilotonnes of TNT. See http://www.nature.com/nature/journal/v420/n6913/full/nature01238.html.

38 It is estimated that a 300m-wide asteroid colliding with the Earth would wipe out a medium-size country.

39 http://neo.jpl.nasa.gov/neo/groups.html.

40 The Tunguska Event, or Tunguska explosion, was a powerful explosion which occurred close to the Podkamennaya Tunguska River in Russia. It is commonly believed that the cause of the explosion was the air bust of a large meteoroid or comet fragment.

Studies by ESA have shown that existing European resources (ground and space-based) are insufficient.

SSA is a dual-use activity by its nature. However, at present many of the existing national assets relevant for the tracking of space objects and related imagery available are under military control[41]. Inefficiencies and duplication result also from the fact that at present civil and military SSA requirements are not integrated and responded to by a single SSA system building on both civil and military assets and expertise.

Since the 1980s a series of non-binding international agreements and guidelines have been agreed[42]. The EU itself is currently working on a draft international Code of Conduct that could have a positive effect in this area.

Despite existing national capabilities and existing international arrangements, Europe is to a large extent dependent on third parties capabilities and goodwill to receive essential information on objects orbiting the Earth.

Not all data are publicly shared because they could be used to interfere with national security. Currently only the US has well established capabilities for a rather effective monitoring of these elements and provides advice to European operators on actions to take, without revealing the basis for that advice. However, these capabilities date back to the Cold War era and, it is generally acknowledged in circles where SSA is discussed that these capabilities do not perform to the standards required by present needs. The available data has not allowed avoiding satellite collisions such as the Iridium 33 and Kosmos 2251 in 2009[43].

Recently satellites owned by ESA and the French Space Agency CNES were threatened by potential collisions with debris from other satellites. Collision was avoided thanks to information made available by a non-European space power. Should it have been decided not to share this information with the EU, European assets would have been endangered.

Europe is already active in the area of space weather and capable of producing, to some extent, space weather products. There is also longstanding international cooperation in this field notably with the US National Oceanic and Atmospheric Administration (NOAA) Space Weather Prediction Center. However there is widespread recognition that a new, coordinated

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41 A synthesis of existing space tracking and surveillance assets in Europe prepared by ONERA in 2007 on behalf of ESA reveals that more than 65 % of existing sensors for the Low Earth Orbit (LEO) area are partially or fully operated by Ministries of Defence. Study on capability gaps concerning Space Situational Awareness, ONERA, 2007.

42 http://www.parliament.uk/documents/documents/upload/postpn355.pdf: "Debris mitigation principles were first put into practice by the US, starting in the 1980s. Since then, a series of voluntary, non-binding international agreements and guidelines have been agreed. The Inter-Agency Space Debris Co-ordination Committee (IADC) was founded in 1993, comprising 11 national space agencies including NASA, ESA and the British National Space Centre (BNSC). In 2002, the IADC adopted a set of recommendations for debris mitigation covering the points in the main text, which has achieved wide international recognition. The UN Committee on the Peaceful Uses of Outer Space developed these recommendations into a set of guidelines which were adopted by the UN in 2008. Several European space agencies developed a European Code of Conduct consistent with the IADC recommendations. ISO (the International Organization for Standardization) is currently transforming the recommendations into a set of International Standards, the first of which should be published in April/May 2010. BNSC chairs the ISO group responsible for developing these standards, which aim to assist the space industry in complying technically with the IADC guidelines."

43 See footnote n. 20.

approach to developing space weather applications tailored to European user needs together with the supporting research and infrastructure is necessary and would increase our capabilities in this area[44].

The European Space Agency is currently implementing a Space Situational Awareness Preparatory Programme (SSA-PP) launched on 1 January 2009 which will run until 2011. The SSA Preparatory Programme (SSA-PP) is being implemented as an Optional Programme with financial participation by 13 Member States and focuses on issues such as governance and data policy definition and designing the overall architecture of the future European SSA system.

However EU and ESA Member States, as expressed in the 2008 Council Resolution on "Taking forward the European Space Policy", consider that, taking into account the international and political nature of this capability, the European Union will take, liaising with ESA and their respective Member States, an active role to set up progressively this capability and an appropriate governance structure.

3.1.2.3. Estimated annualised losses due to collision and space weather

On the basis of available data, the table below gives only a non-exhaustive impression of quantifiable estimated loss due to collision and space weather[45]

Loss type	Annualised loss
Direct loss of satellite due to collision	~€4 million
Indirect cost (loss of revenue) due to collision	~€32 million
Satellite failure due to space weather	~€9 million
Service outage and shortened satellite life due to space weather	~€7 million
Indirect cost (loss of revenue) due to complete satellite failure	~€57 million
Geomagnetic storms impact on satellites	~€223 million
Total minimum annualised loss	**~€332million**

3.1.3. Tab 3 – Estimated loss due to collisions and space weather effects.

These costs are almost certainly a small fraction of possible non-quantified consequences and costs that may result from the absence of a European Space Situational Awareness System. For example the loss of a satellite may result in the loss of critical satellite communication capacity in emergency situation resulting in loss of life. Destruction or complete failure of a satellite can result in serious disruption of economic activity (banking relies increasingly on satellite communications) and could have an impact on client business through loss of service. The loss of Earth observation capacity could also have serious consequences in emergency and non-emergency situations. The costs related to disruption of the electricity grid due to

44 http://www.esa.int/esaMI/SSA/SEMYTICKP6G_0.html
45 Detailed explanation in annex

solar storms (which could occur once every solar cycle, i.e. 11 years) for all EU Member States could amount to $2160 million per year[46]. At present there are no reliable figures for estimating the value of such loses. Similarly, it is impossible to quantify the consequences of Near Earth Objects impacting on the Earth.

3.1.4. Europe lacks a long-term strategy and critical mass for space exploration

Space exploration is a highly political endeavour which gives nations that are involved in it a high political profile in the international arena. It is also a driver for technological innovation whose spin-offs have enhanced citizens' every day life to a scale that is not often realised by the general public.

Europe through individual Member States and ESA have already made significant contributions to spaceflight and space exploration. Prominent European achievements include the Columbus laboratory of the International Space Station, the Automated Transfer Vehicle (ATV) - the largest ever automatic cargo space vehicle, and some other essential ISS elements. European scientists have contributed to the exploration of several planets in the solar system: Venus (Venus Express), Mars (Mars Express) and the Moon (Smart-1, European instruments on Chandrayaan-1). The successful Huygens mission on Titan has marked the farthest landing in the solar system so far. These European achievements are recognised internationally.

However, the prevailing perception among stakeholders is that space exploration requires a political thrust, a vision and a strategy to carry it through that Europe lacks today. This is the overarching problem. There is a growing consensus that the current lack of a more consistent and strategic approach to space exploration is detrimental to Europe from an international standpoint and also has negative economic consequences.

Up to now, ESA and its Members States have provided the main interface with international partners. ESA communicates with partners at agency level, while major partners address the exploration, and especially human exploration issues at the highest political level (usually heads of state and government). EU Member States in isolation are not as well placed to influence strategic international exploration developments as they would be if they acted in a concerted manner.

The dispersion is reflected, for example, in the European involvement in the international forum for space exploration coordination (the International Space Exploration Coordination Group): for example, four Member States and ESA are individual members of this group, other Member States are represented through ESA and the EU is altogether absent from this international forum.

At present there are not enough streamlining or synergies between EU, national and ESA exploration initiatives. Europe has neither a high visibility nor a critical mass required for the participation in international exploration programmes at a significant level. For example, ESA

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[46] http://www.esa-spaceweather.net/spweather/esa_initiatives/spweatherstudies/ALC/wp1100_Benefits_v3.1.pdf
Since a Hydro-Quebec incident may occur once every solar cycle (11 years), the annualised loss (mostly due to unsupplied energy) is about $450 M/year for the UK alone, according to the UK National Grid estimations. This figure should be multiplied by 1.5 for France, 1.5 for Germany, 0.5 for Spain and 0.3 for Portugal. Total amount for these member states would be $2160 M/year.

was not able to maintain its leadership in the search for life programme within the ExoMars[47] project in 2013; ESA has now become dependent on US launches to place its rover on Mars in 2018.

In addition, only very few MS can afford to have a say or can be directly involved in space exploration activities. For example, only France and Germany could so far afford a significant role in non ESA-led exploration missions (e.g. DE instruments on the NASA Mars Pathfinder mission). Other Member States have also ambitions but cannot participate in non-ESA missions because they cannot financially afford to participate at a significant level. This is detrimental to European integration and international visibility. Without a high-level political commitment and a coordinated approach Europe will be unable to play any significant role at international level.

The life of the International Space Station (ISS) will be extended until 2020 and beyond. The absence of appropriate coordination mechanisms between the EU, ESA and Member States is likely to result in a inadequate representation of European interests in ISS and exploitation of the ISS as a platform for space exploration. Current arrangements prevent a good number of EU Member States from having access to the station, as only those that contribute financially individually or through ESA (8 Member States) have access to it.

At present there is no autonomous or independent transportation system to the low Earth orbit that the EU, ESA and Member States can fully rely on. Europe has not acquired the capacity to conduct autonomous manned space flight either using existing third party transportation systems or its own.

Yet, Europe has with Ariane 5 the launcher capacity to develop such transportation system. Ariane 5 was developed as a launcher for an autonomous European crew transportation system (Hermes) which was abandoned because of lack of firm European leadership to carry the project through. Today, Europe does not fully exploit the potential capacity of Ariane 5. The failure of Hermes illustrates the inadequacies of the current situation regarding space exploration.

The Automated Transfer Vehicle (ATV) which services ISS represents an extraordinary European technological achievement. Today ATV is not retrievable and burns up on re-entry. The ATV has the potential to be transformed into a retrievable vehicle and to be the basis for a future crew transportation system. The fact that such potential is not exploited is detrimental to technological progress in this field.

There is an added value in terms of innovation and competitiveness for the European economy that space exploration could bring about beyond the space sector itself and which does not fully materialise given the fragmentation of space exploration activities and their isolation from non-space sectors.

The EU can help unleash the innovative potential of the European space sector towards other, non-space areas by promoting cross-sectoral fertilisation and synergies and in this way providing a strong multiplier for the investments made.

Space exploration touches on many key space technologies of interest to other space sub-sectors such as launchers, propulsion, remote sensing, telecommunication or navigation

[47] http://www.esa.int/esaMI/ExoMars/SEMGB7MJ74G_0.html.

systems. If EU does not participate in space exploration, the European industry will fail to maintain and further expand its capabilities in developing technologies that are essential to space and partly also to non-space sectors. Not taking part in large global exploration programmes will impair the competitive positions of the European space industry in the world[48].

As recognised in recent consultations[49] the absence of a long term vision and of a strategy for securing a European role in space exploration at international level could have negative repercussions on:

– the scientific community: the potential for research that exploration could offer is not fully exploited; furthermore, there could be a significant "brain drain" of European scientists working abroad and contributing to foreign successes[50];

– industrial competitiveness: European space industry will be confronted with less critical and less innovative tasks, while at the same time becoming more dependent on commercial markets, relative to international competitors; the competitiveness of European industry would decrease compared to other space-faring nations who engage in the challenges of space exploration;

– trans-sectoral innovation: exploration needs and non-space related needs that space exploration could bring together are disconnected and therefore opportunities for trans-sectoral innovations are lost;

– education and inspiration: the absence of significant exploration challenges deprives the EU of a powerful tool that can be used to stimulate a whole new generation to embrace science and engineering careers, thus contributing to alleviate the current negative trends of students swaying away from science[51];

– European integration: EU participation in international exploration programmes could have a strong impact on a common European identity and the appreciation of EU citizens of what it means to be European.

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48 ASD-Eurospace (2009) Space exploration position paper, 12 October 2009.

49 Conclusions of the workshops "Space exploration and innovation, industrial competitiveness and technology advance" and "Science and education within space exploration", http://ec.europa.eu/enterprise/policies/space/esp/conferences_space_en.htm.

50 The problem of brain-drain notably towards the US is well documented. This article gives interesting US perspective of the problem: http://www.time.com/time/europe/html/040119/brain/story_4.html; The need to enhance the attractiveness of European higher education and research is behind a number of EC initiatives such as the European Institute of Technology (COM(2006) 77 final of 22 February 2006). On brain-drain of European researchers towards the US: ftp://repec.iza.org/RePEc/Discussionpaper/dp1310.pdf. US space programmes have attracted scientists from other countries, including those which cancelled their own programmes: http://www.thespacereview.com/article/1543/1.

51 A review on students' attitudes towards science can be found here: http://eprints.ioe.ac.uk/652/1/Osborneeta2003attitudes1049.pdf.

3.1.5. *Space policies and investments are decided at national/intergovernmental level*

The space sector is largely driven by national public funding spent either directly (often in bilateral programmes) or via a contribution to ESA[52]. As a consequence:

– Space initiatives are primarily a function of national interests and national priorities and only indirectly respond to broader European policy objectives, or to the interests of EU citizens; as an example the utilisation of the International Space Station as a research infrastructure only benefits 8 EU MS via ESA programmes and space exploration is done either at MS level or via ESA, not at EU level;

– National space policies are often aimed at the benefit of national industries. Within ESA, MS contribute to the budget in proportion to the anticipated share of contracts to be awarded to their national companies. This policy has been successful in building up a strong space industry in Europe. However, if such an approach remains the sole form of funding of European industry, in the long term it will not encourage national companies to be more competitive in the public procurement market. It would be beneficial to industry competitiveness to complement this approach, at EU level, with a public procurement approach based on best value for money. Such an approach would still recognise the specificities of the space sector but would allow at the same time for increased competition and more efficient use of European industrial competences (including SMEs and industries from Member States which are not ESA members).The absence of an EU approach could become detrimental to the competitive development of the European space industry and to its competitiveness outside Europe;

– There is a risk of overlaps, fragmentation and discontinuity of the activities in the European space sector. For example, if research efforts remain fragmented between EU, ESA and MS this may cause duplication and ineffectiveness, as investments cannot benefit from economy of scale advantages. A good example of this can be found in the field of Space Situational Awareness: there are seven radar sensors in Member States that may serve surveillance and tracking purposes; however these capacities, which have been designed to suit national needs, overlap to some extent, leave significant coverage gaps and are not connected in a way that can fully exploit their potential.

3.1.6. *National investments for dedicated space programmes cannot sufficiently address the needs of EU policies and interventions*

A limited number of individual MS cannot be expected to fund systems to meet the needs of Europe as a whole. Investment through ESA is primarily designed to focus on R&D, not to provide for maintenance and operations of space infrastructure and the delivery of services. Where the main markets are public sector and particularly where these are spread across many different users, the market mechanism alone does not support such costs.

The Member States' willingness to invest through ESA relies heavily on the assurance that the original investment is returned to national industries. Projects that cannot guarantee such return to national industry may result in a decreased motivation of Member States to invest in

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[52] The big European space powers (FR, DE, IT) contribute about half of their national space budgets to ESA, most other countries consider ESA as their space agency and contribute most or all the national space budget to ESA. The overall ESA budget is over €3,5 billion; MS cumulative individual space budget is also roughly €3 billion. NASA annual budget is in the range of $18 billion.

space. At the same time, there is wide recognition that future space developments in certain areas such as security or space exploration, the exploitation of space infrastructure and space-based applications require a coordinated funding approach.

Due to the fragmentation of national decision making channels, space governance frameworks and lack of coordination of funding mechanisms, investment in certain essential space activities such as SSA or space exploration does not always acquire the necessary critical mass. The large number of, and limited coordination between the European and national public stakeholders involved in space activities (i.e. EU, ESA, EDA, Eumetsat, national space agencies, national ministries of defence, etc.) further adds to the complexity of the decision-making process and makes the design and financing of space systems more difficult.

This fragmentation affects negatively also the connection with other EU policies. Possible synergies are not always sought in a structured manner. For example, the potential of space exploration for innovation is disconnected from the EU 2020 growth strategy as space exploration is seen primarily as a scientific undertaking with not sufficient regard to economic and societal needs.

3.2. EU right to act: subsidiarity and proportionality

Article 189 TFEU introduces a right for the EU to act in drawing up a European Space Policy, while building on past achievements at the level of ESA and Member States, and gives the European Commission a clear mandate to exercise its right of initiative. Space becomes a shared competence between the EU and its Member States.

At European level, space must be addressed as a common endeavour due to the problems described above, including the lack of coordination. The EU does not seek to replace initiatives taken by Member States individually or in the framework of ESA. It seeks to complement action taken at their level and reinforce coordination where such coordination is necessary to achieve common objectives.

The EU involvement would not only be necessary to aggregate the investment required to fund certain space projects. Above all it would be necessary to aggregate demand for operational systems and space applications that meets public sector needs and ensure the long-term availability of these applications at EU level. An EU involvement would help materialise the full benefits that Space Situational Awareness and space exploration can bring about as a tool contributing to other EU policies (such as innovation and competitiveness, health or environment), in a way that Member States or ESA alone cannot achieve. The EU involvement would be necessary to federate interests and demand of users in different Member States, including where appropriate, to represent them in negotiations at international level.

A potential EU intervention would take fully into account what has already been achieved at the level of Member States and ESA and build on these achievements. The EU would fund the development of systems that do not yet exist or that complement those existing in Member States, in this way avoiding unnecessary duplication.

A stronger EU role in either SSA or space exploration would bring substantial added value because it would help design projects that are truly European as opposed to simple prolongations of national initiatives. The EU will also be in a position to speak on behalf of all Member States and ensure that Europe is represented with one voice at the highest political level in international space cooperation fora.

In SSA the EU would be able to pool its existing capabilities (civilian and military) and reinforce them with the missing links and appropriate governance framework that ensures a robust and interoperable system benefiting all relevant European stakeholders.

The EU should refrain from action if the funding available is not sufficient to ensure its successful completion.

4. OBJECTIVES

Considering the nature of this Communication, general and specific objectives will be defined. Operational objectives will be treated in the impact assessment for a possible proposal defining a future Space Programme.

4.1. General objectives

The general objectives of this initiative are the following:

(1) to promote scientific and technical progress;

(2) to promote innovation and industrial competitiveness;

(3) to ensure citizens' well being derived from space-based applications

(4) to enhance the EU profile in space at world level.

A set of more specific objectives is defined on this general basis to address the problems identified in the previous section.

4.2. Specific objectives

The specific objectives would be as follows:

(1) Ensure the long-term availability and security of European space infrastructures and services;

(2) Ensure that the EU is in a position to fulfil the coordination role in exploration that Article 189 of the Treaty calls for and to capitalise on the space exploration potential to contribute to the objectives of the EU 2020 strategy;

(3) Ensure the conditions necessary to guarantee European access to space and on-orbit infrastructures;

(4) Ensure convergence of national and EU policies and investment in the field of SSA and space exploration as well as convergence between action in these two areas and other EU policies;

(5) Ensure a leading and strategic role for the EU in space at global level and in particular in international negotiations related to SSA and space exploration.

5. POLICY OPTIONS

This IA identifies four incremental policy scenarios based on different levels of EU intervention which will depend on (i) the role and level of ambition which the EU would like to assume in the space domain and (ii) the amount of available funding.

5.1. Option 1: Baseline scenario

Under the baseline scenario the EU would not invest in security of critical European space infrastructures and would not engage in any space exploration efforts.

This would not affect the implementation of the other EU flagships in space, Galileo and GMES, but their long-term security and sustainable exploitation could be affected.

The baseline scenario would mean that the situation described under the problem definition would be likely to remain.

Activities by ESA and Member States would continue. For example, some SSA activities are likely to continue at national level (e.g. France, Germany) and within ESA; collaboration with the US would be arranged but there would be no guarantee that such arrangements would result in a fully operational system and respond to global EU interests. The risk of likely losses identified under problem definition would be likely to remain. Europe would continue to depend on third parties for information and advice in a critical area of space activities.

Similarly, space exploration activities would continue without EU involvement. However, these activities would be limited in scope and the European position on the international scene is likely to remain weak. European involvement in exploration would remain largely in the realm of scientific cooperation and potential benefits of spill-over for innovative technologies and business opportunities that would result from an ambitious EU engagement in space exploration would be foregone.

In the absence of EU involvement, could ESA undertake the actions that are described under options 2 to 4?

The answer is: theoretically yes, but facts prove the contrary. The nature of the decision making process and funding mechanisms described under problem definition means that ESA is not well placed to guarantee that a fully operational European SSA system responding to global EU user needs be put in place. In particular, without EU involvement it is possible (and even likely) that that due to diverging industrial interests of Member States, the capability gaps identified for a complete SSA system may not be filled because the programmes necessary to acquire such capabilities are not subscribed (i.e. funded) by any or sufficient number of Member States. Similarly, without the EU it is likely that diverging interests on security matters among Member States and, by extension, within ESA, prevent the setting up of adequate coordination mechanisms and operating structures necessary for SSA.

Similarly, while involvement of Member States, individually and through ESA, in space exploration is likely to continue, the fragmented approach is also likely to persist depriving the EU of the full benefits of space exploration.

The impacts of adopting the baseline scenario are described in detail under section 6.1.

5.2. Option 2: Security in space dimension

This scenario addresses the issue of security in space and focuses on the protection of critical European space infrastructures from natural and man-made objects and phenomena such as spacecraft, space debris, near-earth objects (NEOs), space weather and sun activities. Currently only the US has such a service in place. Under this scenario, Europe would develop a capability of its own. The proposed European Space Situational Awareness system (ESSAS) would build on, and complement existing national capacities in Member States and on possible international cooperation. The purpose of the system would be not only to give the EU a level of autonomy in this area but also to fill existing gaps and bring added value through additional developments.

ESA is currently implementing a preparatory SSA programme with a budget of €55 million for the first phase (2009-2011), which envisages a series of studies on the overall system architecture and design, aggregation of user requirements, governance and data policy, as well as a limited infrastructure component and demonstration (pre-cursor) services. Assuming that development, deployment and initial operations costs until 2014 would be financed through the ESA Programme, the first indicative estimates for a fully deployed European Space Situational Awareness System as from 2014 are assessed at around €130 million per year (in 2009 prices). This envelope covers:

– the acquisition of the main components necessary to complete the European SSA system; this includes surveillance and tracking radars, telescopes; space weather and NEO instruments; data and service centres, communication networks, security layer and satellites for space weather and space surveillance; subject to a more detailed needs analysis, according to ESA estimates this would amount to some € 600 million from 2014 to 2020;

– the maintenance and operation of SSA ground systems (including radars, telescopes, space weather sensors, data centres, communications); and SSA space systems (including dedicated space weather satellites and instruments deployed on hosting platforms); according to ESA's estimates this represents € 270 million for the above period.

The implementation of this option would require that existing mechanisms for space and security cooperation, notably the so-called "Structured Dialogue on Space and Security" between the Commission, the Council Secretariat-General, the European Defence Agency and the European Space Agency be reinforced. Such mechanism is necessary given the (former) interpillar dimension of cooperation in space and security matters and the necessity to bring in the military dimension through EDA and technical expertise through ESA.

As regards implementation, while ESA would be responsible for the development of the required additional components, the operation of the ESSAS would require an adequate operational entity to be identified. Such an entity should be able to integrate and coordinate existing and new national and European assets and ensure the provision of SSA services to both civil and military users.

International cooperation would be an important element in the implementation of this option since SSA is a global issue and activities should also be shared internationally. Dialogue and cooperation particularly with the US but also with other partners would be essential to secure international data sharing and complementarity between the systems, and allow the possibility for sharing the burden (technical, financial) between the systems. By having its autonomous capacity Europe would be able to negotiate on an equal footing with other space actors and ensure that fruitful cooperation could be sustained in the long run.

5.3. Option 3: Option 2 plus limited involvement in space exploration

The main difference to Option 2 is the addition of a space exploration dimension. Under this option the EU would extend the space exploration activities and coordination in Europe, jointly with the Member States and ESA.

Space exploration should be seen as a comprehensive global endeavour. The scientific, technical and international relations aspects of this have been addressed in detail during a series of EU-ESA workshops conducted in March–May 2010[53]. The basic scenario for the next decade identifies the International Space Station (ISS) as a cornerstone and enabler for science and technology validation to prepare the way for future exploration steps, including access to space with cargo and crew.

Option 3 foresees a role for the EU in federating space exploration objectives and coordinating the European exploration programmes (undertaken by the EU, ESA and Members States).

This scenario has two main components:

– access to on-orbit infrastructures through extended participation and utilisation of the ISS to be used as a platform for exploration, including a human spaceflight programme; and

– contributing to independent access to space (for human spaceflight, payloads to the ISS and for European robotic missions) by supporting the maintenance and upgrading of the European launch infrastructures at the Guiana Space Centre (GSC) in Kourou.

5.3.1. Participation in the ISS

Participation in the ISS as considered here goes beyond support for R&D and focuses on enhanced EU human presence in the ISS through a programme to prepare for sustainable human presence in deep space.

The programme would allow enhanced EU presence in the ISS through an EU astronaut corps and increased possibilities for missions which would be placed gradually under direct European control using existing transportation systems (as opposed to the situation today, where Europeans can only fly into space as passengers of US or Russian led missions) and, ultimately, a European crew transportation system in the longer term.

This option includes testing for sustainable human presence in space beyond low Earth orbit (LEO), including protection against radiation and life support systems (e.g. water, waste recycling, health and well-being, etc.).

This programme could be run as an autonomous module fully integrated in an ESA wider space exploration programme (including integration of both ESA's and EU astronaut corps). It could also be easily integrated into a larger international space exploration endeavour to be negotiated in tandem by the EU and ESA with international partners.

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53 See workshops' conclusions in annexes.

The cost estimate for this activity is in the order of €300 million per year. This amount is an average over a seven year period. It is based on ESA estimates and would cover the astronaut programme, mission control requirements, up to a maximum of 3 launches in the second half of the financial perspectives as well as an EU human presence in ISS during that period.

5.3.2. Launch infrastructures

Access to space is a basic requirement for activities in space exploration. Today Europe has the Ariane-5 launcher as its heavy lift capability capable of launching 20 tons into Low Earth Orbit. (This mass is reduced by a factor of 10 for exploration missions which by definition need to escape from the Earth.) Such heavy lift capability is essential for deep space exploration. It is expected that the next generation of Ariane launchers may well be smaller[54] than Ariane-5 to fit the commercial satellite market needs. Should a future European launch system replace the Ariane-5 launcher on the commercial market around 2025, the justification to maintain the Ariane-5 beyond that date will be mainly to serve automatic deep space exploration missions and potential successors to the Automated Transfer Vehicle (ATV)[55] to the ISS orbit. As a consequence, the existing Ariane-5 launch infrastructure, as well as the industrial production capacity must be maintained and further upgraded at least until 2025 and possibly beyond.

Option 3 thus foresees a possibility for the EU to contribute towards the adaptation of the current launch infrastructure to accommodate the evolution of the Ariane-5 launcher (e.g. Ariane-5 mid-life evolution and human rating) and the annual costs of maintaining in operational conditions related ESA-owned launch infrastructures at the Guyana Space Centre (GSC), which would amount to €3.5 billion over 6 years[56]. The adaptation of the GSC to human spaceflight alone has been estimated at €1.5 billion for the period 2015 to 2019. Considering that funding should be shared by ESA, Member States and the EU, a reasonable assumption is that a minimum EU contribution for the corresponding launch infrastructure adaptation and operational maintenance would amount to an average of €100 million per year. This amount represents a third of the total cost of the adaptation of the GSC for 2015 to 2019. The rest would have to be covered through ESA and its Member States. The precise components to be covered by EU funding will have to be negotiated with ESA.

5.3.3. Coordination and implementation

ESA would continue acting as the technical implementing agency of exploration endeavours. This option would bring the EU into the space exploration arena beyond R&D. This would require stepping up coordination at European level. The EU together with ESA and in consultation with Member States would define a common European vision and strategy for space exploration, accompanied by a detailed roadmap and implementation plan, as foreseen in the conclusions of the first EU/ESA high-level conference on space exploration[57].

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[54] Report on future launchers (Ariane-6) issued by the French Prime Minister, available at http://www.gouvernement.fr/premier-ministre/un-nouveau-lanceur-spatial-europeen-a-l-horizon-20202025.

[55] http://www.esa.int/esaMI/ATV/index.html.

[56] Data from the European Space Agency provided during a presentation to the Commission on 25 May 2010.

[57] First EU-ESA High Level Political Conference on Human Space Exploration, 22-23 October 2009, Prague, Czech Republic.

International cooperation would be a central element to this strategy. Space exploration has become an activity of interest to a growing number of countries around the world. New actors are developing capabilities leading to the internationalisation and globalisation of the space exploration context. The European strategy would have to be firmly embedded in this evolving international context. The EU and ESA in tandem would lead the dialogue with the international partner community to ensure that the European strategy is compatible with the scenarios and priorities of other major exploration partners. The complementarity between the technical and scientific expertise of ESA and the EU's political influence would ensure that Europe could better negotiate the terms of its engagement in global exploration programmes to better suit its objectives.

5.3.4. Cost

Compared with option 2, the additional cost of this option would be € 400 million per year as explained below. Added to the €130 million of option 1, the total overall cost of option would be €530 million per year

5.4. Option 4: Option 3 plus substantial investment in space exploration

Under this scenario, the EU would be the driver of future European endeavours in space exploration and would play a leading role in defining the exploration strategy for future decades. ESA would continue playing a fundamental role in technical implementation. The EU, together with ESA, would lead robotic explorations to Mars, paving the way for future involvement in human exploration beyond LEO. A human space transportation system will be developed. As in Option 3, the EU would continue to be involved in supporting and exploiting the ISS, and supporting the launch infrastructure at GSC.

5.4.1. Fully autonomous human access to space

Under this option the European cargo transfer vehicle (ATV) would be improved to be able not only to send cargo but also return payloads safely back to Earth (i.e. Advanced Re-entry Vehicle, ARV) for better utilisation of the ISS and providing a bartering capacity[58]. In a second step the ARV would be improved and upgraded to transport crew to and back from LEO (ARV-Crew).

The development costs up to the first mission have been estimated at €9.5 billion between 2011 and 2019[59]. These costs would be broken down as follows:

Item	Cost in billions of euros	Schedule
ARV cargo	1.5	2011-2017
ARV Crew version (including Crew Escape System)	4.5	2014-2020
Ariane 5 adaptation to human rating	2	2014-2019
CSG adaptation for human spaceflight	1.5	2015-2019

[58] The ISS partnership is based on a non-exchange of funds, therefore any contribution to the ISS is in kind providing exchange possibilities for flight opportunities, hardware and services.

[59] ESA Council document ESAC (2010)48 Exploration scenarios.

Tab 4 – ESA's estimation of development costs up to the first mission[60].

This approach builds on existing European strengths, namely the fact that Ariane 5 was initially designed for crew transportation (the original project was abandoned and Ariane 5 was subsequently modified for satellite and cargo launches so it needs "re-adaptation" for human spaceflight) and the successful experience with ATV.

Europe has so far failed to acquire autonomous crew transportation capacity. The financial intervention of the EU could guarantee that the EU does develop its own crew transportation system. The EU contribution for the adaptation of CSG for human spaceflight has been considered under option 3. The additional EU contribution has been estimated at around €800 million per year in the timeframe 2014-2020. The EU would therefore be the main contributor.

5.4.2. Mars sample return mission

A first Mars sample return mission could be launched by the middle of the next decade. Such a mission would be a technological and scientific challenge for Europe and would validate key technologies for future human missions to Mars. International cooperation would be an essential condition for such a mission in order to complement some technology gaps and share the overall costs. The total cost[61] is estimated in the order of €5 billion spread over 10 years. It can be assumed that 50% of these costs would be borne by international partners. The EU Member States and ESA would contribute significantly to the European costs. The remaining expenses would only occur in the 2021-2027 timeframe (amounting to about € 200 million per year, of which about half could come from ESA). It is estimated an average EU contribution of about €100 million per year would be needed in the period 2014-2020. This funding could cover the purpose-built technical facility (referred to as "curation" facility in space jargon) to which the samples would be brought back and which gives the hosting partner a highly visible and leading role in the project.

5.4.3. Coordination and implementation

The mechanisms for coordination will be similar to those established under option 3, though the degree of EU involvement will require more intense coordination with ESA, Member States and international partners. ESA would be delegated the implementation of EU space exploration activities.

As in option 3 and for similar reasons, international cooperation is an essential dimension of this option.

5.4.4. Cost

Option 4 includes the cost of option 3 (€530 million per year) plus an additional €900 million per year. The total of Option 4 would therefore be €1.43 billion per year.

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60 Data from the European Space Agency provided during a presentation to the Commission on 25 May 2010.

61 ESA Council document ESAC (2010)48 Exploration scenarios.

5.5. Cost overrun considerations for options 2 to 4

A risk management mechanism would be built in with the objective to minimise the probability of programme cost increases. Mitigation mechanisms would be based on better cost estimation, learning from previous experience (e.g. Galileo, GMES, others) and the implementation of an incremental/modular approach to system implementation.

Options 2, 3 and 4 could be built progressively. Should cost overruns occur due to external factors outside programme management control, they could result in certain components of the options being dropped or their deployment delayed. Yet, the incremental modular approach would guarantee that action taken would still be relevant and bring added value in comparison with the present situation.

Notwithstanding the above, option 4 does represent higher risk of programme cost increases because the modular approach cannot be applied to the ARVC development, which would be the bulk of the expense under this option. Should this option be adopted, a specific cost increase mitigation approach needs to be defined beforehand, including scenarios for project cancellation.

6. ANALYSIS OF IMPACTS OF OPTIONS

6.1. Option 1: Baseline scenario

6.1.1. Economic impact

Under this option the EU would not fund either a European Space Situational Awareness System or space exploration.

Funding would be available for other initiatives but the problems connected to the absence of SSA and lack of a concerted European approach in space exploration will remain.

Without EU involvement which could guarantee an appropriate European SSA system, the risk of likely losses due to collision and space weather identified under problem definition would remain. This risk could increase exponentially if further collisions occur. Such risk could also increase if the necessary upgrades on existing capabilities are not implemented in a coordinated manner or at all. The EU would increasingly depend on third parties for information and advice in a critical area of space activities.

The problems identified in connection with the absence of the EU from space exploration will also remain. It can be argued that if funding is invested elsewhere perhaps some of the problems can be mitigated (for example in the field of innovation). However the potential of these actions to contribute to this strategy has to be weighed against the potential of space exploration to enhance the profile of the EU internationally while guaranteeing the economic impact described under the following sections.

Space exploration depends almost exclusively on public funding. The absence of EU engagement in space exploration would have a negative impact on the competitiveness of the European space manufacturing industry. Space exploration encompasses all space sub-sectors. Without the EU thrust to space exploration, all such sub-sectors would experience a negative impact. The activities proposed under space exploration have been chosen on the basis of extensive discussions with ESA, national space agencies and industries taking into consideration their potential to enhance industrial competitiveness (see for instance the recommendations of the *EU-ESA Workshop on Exploration and Innovation, Industrial Competitiveness and Technological Advance.* By not supporting them, industry would loose the possibility of developing key space technologies, which would have a spill-over effect into other space sub-sectors such as launchers[62], propulsion, remote sensing, telecommunications and navigation systems. This would have a negative impact on European industry's competitive position on the global market and hinder its capacity to fulfil its strategic mission.

It is a well documented fact that space exploration generates innovation[63]. In particular, human exploration is one of the most technologically complex activities and requires innovative solutions to the challenges it poses. Space exploration requires the development of new technologies and products that stimulate industrial innovation; the complexity of space exploration requires pooling of resources and capacities, which in turn generate new forms of economic cooperation and activities that create new jobs. The innovation generated by space exploration activities can be used to address societal challenges and result in spin offs in fields such as intelligent energy, waste and water recycling, health prevention and monitoring, and environmental control.

All of this is of critical importance during these times of economic crisis. By not engaging in space exploration, the EU will deprive itself of an important tool to stimulate short term economic recovery and to build a more robust industrial development in the long term. The EU will forgo a key instrument to improve Europe's global economic competitive position.

6.1.2. Environmental Impact

Under this scenario the environmental threats from satellite debris and NEOs referred to in the problem definition remain.

6.1.3. Social impact

Under this option the threats with social impact referred to in the problem definition remain.

6.2. Option 2

6.2.1. Economic Impact

The implementation of option 2 will have limited direct impact on the space manufacturing industry as it will mainly lead to the procurement of non-space items (including tracking radars, telescope, data and service centres, communication networks and other ground-based capabilities).

However, the results from the intervention will significantly reduce (by 90%, according to ESA estimates) the risk of economic loss due to damage (including total destruction) of spacecraft due to collision between satellites, debris and space weather and lead to improved space security. This in turn leads to prevention of future damage and the prevention of a

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62 Ariane 5 was initially developed as a launcher for European manned spacecraft (Hermes). Although the project was cancelled, Ariane 5 was transformed into a heavy lift launcher which has given Europe the competitive lead in this sector.

63 See annex on space exploration spin-offs.

domino effect: since debris cannot be removed yet, any collision will increase exponentially the risks of further collisions and will render the operations in LEO increasingly difficult and launches of satellites very risky. Space debris can also endanger human crew in space (as was the case in March 2009 when space debris threatened the ISS) and citizens on Earth. Furthermore, the intervention regarding space weather could lead to benefits in other sectors, such as e.g. the aviation and electricity sectors.

Due to the fact that space systems are essential to the availability and functioning of many economic activities (e.g. banking, telecommunication, satellite TV, etc.) protecting space infrastructure will have positive repercussions on all Member States and not exclusively those that own or operate satellite infrastructure.

Significant economic impact can also be derived from supporting space weather information services. In addition to the reduction of the losses identified in the problem definition, an ESA commissioned study on the costs and benefits of these services suggests a potential market of €1 billion over 15 years for services to mitigate threats arising from STP[64] phenomena in the ionosphere, e.g. effects on GPS and radio communications and induced currents in power grids. The analysis also identifies a smaller market for spacecraft protection – around €100 million over 15 years[65].

Another study[66] on mitigating measures to reduce the risks of space weather has identified additional benefits in terms of reduction in the cost of rerouting (polar) flights due to better prediction of radiation risks for passengers and crew or savings realised from minimising the loss of power failures caused by geomagnetic storms. Ecorys[67] has identified annual benefits derived from better space weather in the range of € 25 million.

	Annual benefit
Prevention re-routing polar flights (7 major EU airlines)	€ 10 million
Cost savings Arianespace	€ 2 million
Loss reduction power failure	€ 13 million
	€ 25 million

Tab 5 – Annual benefits derived from better knowledge of space weather[68].

Finally, activities in the area of SSA and securing space infrastructures from threats can also impact the competitiveness of the European space industry. In addition, increased security in space is to be seen as an important condition for any robotic or human exploration missions in the future.

64 Solar-terrestrial physics (STP) is the study of the physical processes through which the Sun affects the Earth and the general space environment in the solar system. The relevant solar emissions include electromagnetic radiation (especially at UV, EUV and X-ray wavelengths).

65 Solar-Terrestrial Physics in the UK. An input to the Physics Review by the UK Magnetosphere, Ionosphere and Solar-terrestrial community Mike Hapgood (2008) http://www.mist.ac.uk/stp_wakeham.pdf .

66 WMO, The Potential Role of WMO in Space Weather, April 2008.

67 "Study on the EU Space Programme 2014-2020", Ecorys, Draft Final Report, 18 April 2010, contract n. SI2.541751.

68 Ibidem.

6.2.2. *Environmental impact*

Some environmental impact may arise from the intervention. In particular, better information on space weather may result in better knowledge of climate change and Earth weather.

6.2.3. *Social impact*

Protecting space assets ensures that important societal services, communications, search and rescue operations, emergency, etc. will keep functioning even under conditions of major disruption to terrestrial systems. This benefits equally all EU MS. In this respect, a reinforced effort in space infrastructure security would have significant political and strategic impact for Europe as a whole.

The development of technologies to detect space debris, and increased surveillance and research on space weather conditions will result in skills development in these technologies. Increased coordination and collaboration will also result in wider knowledge dissemination and building up of skills.

6.3. Option 3

6.3.1. *Economic impact*

The activities foreseen under option 3 will involve expenditure on a wide range of areas, including technology demonstration and hardware or processes development, such as the ISS utilisation for scientific and technical purposes related to exploration preparation (e.g. inflatable habitats technologies, life support systems, remote medical assistance), launch pads operational maintenance, ground based infrastructures, communication systems, etc. These products and services are delivered by a wide range of public and private institutions and manufacturers, which will be affected by a future space exploration effort (or the by the lack of it).

The EU expenditure on space exploration can be expected to translate directly into turnover for the space industry, as the funds will be used for contracting out innovative technology development activities. Since the value-added shares in turnover are relatively high in the space industry, it is expected that an increase in final demand for the services of the space industry would result in an increase in added value in this industry. (For example, UK data suggest a value added share of 60 percent for upstream space industries, implying that an increase in final demand of €100 million would result in an increase in value added of €60 million in the industry.)

In terms of indirect turnover impacts, Ecorys suggests a production multiplier of 2.3, implying that spending on space exploration of €100 million will result in €230 million in supplying industries and in new products. Other sources provide different estimates. For example, a study on Norway[69] found a multiplier of 4.4 resulting from space-related spending in Norway by ESA. Similar results were found for Denmark[70], i.e. Danish spending on ESA programmes

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[69] Norwegian Space Centre (2005) Annual Report, as seen at The Space Economy at a glance (OECD, 2007), http://browse.oecdbookshop.org/oecd/pdfs/browseit/0307021E.PDF.

[70] http://en.fi.dk/publications/publications-2008/evaluation-of-danish-industrial-activities-in-the-european-space-agency-esa-2013-assessment-of-the-economic-impacts-of-the-danish-esa-membership/Evaluation%20of%20Danish%20Industrial%20Activities%20in%20ESA-pdf.pdf.

resulted in a multiplier of 4.5. In terms of sub-programmes related to space exploration, expenditures on micro-gravity resulted in a multiplier of 1.4 and expenditure on the ISS had a multiplier of 2.3.

Recent cost-benefit studies have been done for a number of potential spin-off technologies of space exploration which showed high net present values[71].

The most significant spill-over impact on non-space sectors is expected in the field of life support, health and wellbeing[72]. An example in the field of health/biotechnology is provided by the bioMerieux Inds. bacteriological detection system VITEC. The original patent was acquired from the US space industry (for the NASA Skylab programme) and used for the development of a commercial diagnostics device. The total sales of the device from 1972 to 1997 amounted to $ 500 million[73] and from 1997 to 2009 to $ 455 million[74].

Technopolis[75] demonstrates that classical spin-offs from exploration programmes give rise to valuable benefits. This study shows that targeted expenditure in space exploration (which is different from a bottom-up approach in R&D) can be a trigger for major innovations in sectors such as health, secure access to energy and renewable energy, and access to clean water. In these fields only the estimated benefits are in the order of several hundred million over the next 5 years and a few billion euros over the long term.

The world market for water and wastewater amounts to $ 350 billion in 2008[76]. Every year around $ 150 billion is spent worldwide on wastewater treatment, and this figure is expected to exceed $ 240 billion by 2016[77]. The human space exploration can trigger innovation and a technology leap in this sector[78].

Overall, space exploration will contribute to the competitiveness of the European industry and to the development of the knowledge-based society in Europe, since all activities in space exploration support increasing knowledge through science and technology demonstration missions.

6.3.2. Environmental impact

Space exploration will enhance the understanding of our own environment, which in turn will result in better definition of environmental policies. In a number of areas support of mainly human space exploration will have positive environmental effects. A few examples include:

71 “Economic Analysis to support a Study on the Options for UK Involvement in Space Exploration”, London Economics, 19 March 2009, http://www.ukspaceagency.bis.gov.uk/assets/pdf/FRER.pdf.

72 “Space exploration and innovation, industrial competitiveness and technology advance”, Workshop, 29-30 April 2010, Harwell (UK) http://ec.europa.eu/enterprise/policies/space/esp/conferences_space_en.htm.

73 Measuring the returns to NASA life sciences research and development, H. Hertzfeld, Space Policy Institute, George Washington University, 1998.

74 The Contribution of Space exploration to Innovation”, Technopolis, Draft Final Report, 11 June 2010, contract n. ENTR/2008/006.

75 Ibidem.

76 http://www.hkc22.com/watermarketsworldwide.html.

77 “Water: a market of the future”, SAM study, 2007, http://www.sam-group.com/downloads/studies/waterstudy_e.pdf.

78 http://ecls.esa.int/ecls/.

– Air quality management and regeneration; in a manned spacecraft the air must be revitalised constantly but, unlike planes, spacecraft cannot take air from the outside. Therefore advanced technologies must be developed to monitor air quality including various contaminants, regenerated (e.g. CO2 regeneration into O2) and purified. Those technologies have numerous applications.

– Energy production, storage and distribution technologies, resulting in more efficient and durable solar cells, batteries, fuel cells or fission reactors. Manned spacecrafts need an amount of energy comparable to that required by a household. Embarking chemical energy is costly and risky and the only external source is solar energy. Therefore, significant progress must be made on optimising energy production and management. Innovations in this area are essential to make the transition from a fossil-fuel based economy to one based on renewable energy and so limit the effects of climate change;

– Water must be recycled up to 100% during human spaceflight. Water for cleaning, washing and food and drinking cannot be brought for several months because of exorbitant costs for the launch (several tons would be needed). Therefore, significant progress must be made to achieve full water autonomy during future space travel by advanced recycling and quality monitoring technologies (including detection of trace contaminants). Innovations in this area offer significant potential to improve the management of Europe's water throughout the water cycle and improve the quality and quantity of drinking water in a future where water resources may be under increased pressure from population growth, urbanisation and climate change. Grey and black water recycling processes increase the potential to manage water at a local level in large-scale commercial, domestic and public buildings (offices, hospitals, schools etc.) making organisations, communities and individuals more responsible for their own water use.

6.3.3. Social impact

An EU intervention in space exploration is expected to lead to social impact in terms of employment, labour market structure and education, and health.

In the US one study reported that the Apollo budget had an employment spin-off effect of 10 (industry and university workers) to 1 NASA worker[79]. An investigation by The Space Division of Rockwell International on the relationship between NASA's Space Shuttle program and employment in the state of California estimated that the Space Shuttle program generated an employment multiplier of 2.8; that is, direct Shuttle employment of 95,300 man-years in California produced an increase of 266,000 man-years in total employment.

The space industry employs a highly qualified workforce. In the European space industry 75 percent of the employees have university level of education (53 percent 4 years and more and 22 percent up to three years) and 21 percent have vocational education. Consequently, additional spending on space exploration will have a positive impact on the demand for highly qualified workers. An inspiring endeavour like space exploration may stimulate young people's interest in science, technology, engineering and mathematics (STEM) and motivate

[79] Jerome Schnee, The Economic Impact of the US Space Programme, Rutgers University, http://er.jsc.nasa.gov/seh/economics.html.

students to engage in science and technology careers[80]. For example, it has been found that space is the second most popular factor motivating choice of physics as a degree[81].

The space environment offers also possibilities to study health problems related to various diseases, ageing or immobility, since the provision of equipment and services to manage and maintain crew health on long distance spaceflights has similar requirements. Point-of-care delivery of healthcare by intelligent and autonomous systems is essential as inter-planetary travel duration will be in the order of years and as unplanned and premature return to Earth is not an option. Furthermore, spaceflight (even short duration) creates physiological effects that are akin to accelerated ageing (reduced bone density, cardiovascular de-conditioning). Therefore improved understanding of cardiovascular and musculoskeletal systems and development of countermeasures (e.g. by specific nutrition and exercise regimens) is essential to ensure that crew remain healthy throughout a long duration mission.

Improved understanding of the conditions of ageing (osteoporosis, cardiovascular problems etc.) along with the miniaturisation of medical technologies and their integration with communications technologies will enable better and 'smarter' diagnosis and treatment to be delivered at the point-of-care, i.e. at home or in a local clinic, thereby reducing the cost of provision, enhancing healthcare delivery and ensuring ongoing quality of life (Technopolis).

EU investment in human exploration under option 3 will therefore generate direct benefits for citizens derived from areas related to human survivability in space. Other societal benefits will be derived in the fields of energy, health, biotechnology, environment or security.

Type of impact	Comments
Space industry	Spending will translate in contracts with universities, R&D institutions, hardware producers. Spending of €100m will generate €60m of value added.
Indirect effects	A multiplier of 2.3 is suggested as a conservative figure, implying that spending on space exploration of €100m will result in €230m in supplying industries and in new products.
R&D effects	Long-term effects of spending €100m will result in €70m of European GDP per year with serendipitous spin-offs and at least an order of magnitude more if new policies are put into place to promote synergetic R&D between space and non-space sectors.
Labour market	Increase in spending will result in increased employment. Most employment will be in terms of highly qualified jobs.
Health	Space exploration will have important effects on the prevention and monitoring of a range of public health problems.
Environment	The direct adverse impacts of space exploration are considered to

80 "Science and education within space exploration", Workshop, 29-30 March 2010, Strasbourg (FR), http://ec.europa.eu/enterprise/policies/space/esp/conferences_space_en.htm.

81 "Bringing space into school science", Barstow, M., Report commissioned by BNSC, 2005, http://www.stfc.ac.uk/Resources/PDF/barstow.pdf.

	be limited. Positive effects are related to comparative climatology, developments in the field of power generation and storage and water or waste recycling.

Table 6: Benefits of EU spending on space exploration[82].

6.4. Option 4

Option 4 steps up considerably the investment in space exploration and places the EU at the same level as other main international players. This investment brings in substantial economic impact and will enhance the perception of the EU as a global player both within and outside the space domain.

Option 4 will give the EU a leading role in international cooperation efforts in space exploration. The EU would join the small club of nations with human space flight capability of their own. This will be a major boost to EU visibility as well as economic and political influence.

6.4.1. Economic impact

Option 4 represents an investment in the order of €1.43 billion per year. The rationale for economic impact described under option 3 applies to option 4. The potential economic impacts will therefore be commensurate to the increased funding.

The European launcher annual development and production costs are €1300 million[83]. Today the European launcher sector has a 50% share in the international private market. As shown from the past (Ariane 5 launcher was foreseen for human spaceflight upfront[84]), space exploration programmes are an essential element in order to maintain the competitiveness of current and next generation European launchers. Without the technical challenges posed by exploration (e.g. heavy lift capability, increasing reliability of launchers, supporting institutional flights) the current leading position of Europe would fade away.

Investment in space exploration at this scale will have significant impact on technological progress and industrial competitiveness and spill-overs to other sectors. For example, the London Economics study demonstrates that investment in advanced (reusable) launch systems could lead to profitable private businesses (e.g. space tourism), as well as to reducing the costs for satellite launches.

As regards robotic exploration, the same study[85] further shows that technologies developed for exploration, such as automated deep drilling or in-situ resources utilisation (e.g. extraction technologies applied on Earth), can have a significant positive benefit/cost ratio for the oil and mining industries respectively.

Due to the various technologies needed (sample analysis, its protection, protection of personnel, of the environment and the population) a large number of high tech applications in

82 Jerome Schnee, The Economic Impact of the US Space Programme, Rutgers University, http://er.jsc.nasa.gov/seh/economics.html.
83 ASD-Eurospace, European space industry facts & figures, 2009.
84 http://www.astronautix.com/gallery/chermes.htm.
85 "Economic Analysis to support a Study on the Options for UK Involvement in Space Exploration", London Economics, 19 March 2009, http://www.ukspaceagency.bis.gov.uk/assets/pdf/FRER.pdf.

the biotechnology and pharmaceutical industry are foreseen, e.g. bio-containment, tele-operations including remote micro-robotics, automated handling and storage systems and micro-analytical systems[86].

In addition, the profile of the EU at global level will be significantly enhanced. The EU's capacity to influence negotiations in the space domain will be reinforced. From another angle, the capacity to undertake space exploration goes hand in hand with stronger international recognition; by being fully involved in space exploration and especially human exploration, the EU will benefit from greater political influence, which in turn may yield indirect economic gains.

6.4.2. Social impact

As space exploration is closely linked to space science, it will also contribute to developing global scientific leadership for Europe. The activities in preparation studies for human exploration, as well as the research onboard the ISS will support life and physical sciences and will also promote collaborative research programmes. Space exploration activities will foster the public interest in space science and technology, and will contribute further to attracting young people into science, technology, engineering and maths (STEM).

There will be a substantial positive impact on creating new, qualified jobs. ESA[87] estimates that an investment of the magnitude proposed under option 4 will lead to the creation of 3000 highly qualified direct jobs. Ecorys as well assesses the employment impact of an ambitious EU space exploration initiative in excess of 3000 direct new jobs[88]. A study referred to under the previous option[89]identified an employment factor of 2.8, which means that overall employment generated by this option could accrue to more than 8000 jobs.

6.4.3. Environmental impact

By boosting topics such as comparative planetary climatology or Earth observation from the ISS, research related to space exploration would help understand climate change on Earth.

86 "Space exploration and innovation, industrial competitiveness and technology advance", Workshop, 29-30 April 2010, Harwell (UK), http://ec.europa.eu/enterprise/policies/space/esp/conferences_space_en.htm.

87 Data provided by the European Space Agency.

88 "Study on the EU Space Programme 2014-2020", Ecorys, Draft Final Report, 18 April 2010, contract n. SI2.541751.

89 Jerome Schnee, The Economic Impact of the US Space Programme, Rutgers University, http://er.jsc.nasa.gov/seh/economics.html.

7. COMPARISON OF THE OPTIONS

Options	Effectiveness	Efficiency	Coherence
Option 1	Option 1 will not achieve the specific objectives of this action. The funding would be available for other initiatives.	Not applicable	This option is not consistent with the EU2020 growth strategy, which emphasises the key importance of innovation and the industrial competitiveness and refers to the development of space policy as instruments to achieve the goals of such strategy.
Option 2	This option achieves specific objectives (1) regarding long term availability and security of European space infrastructures and services and partly objective (4) regarding the convergence of national and EU policies and investments on SSA and the connection of these and other EU policies.	Option 2 entails an expenditure of **€ 130 million per year**. SSA An SSA system could save as a minimum over €300 million per year, although non quantified costs could be exponentially higher. This option also diminishes the risk of domino effect due to spacecraft destruction. This option has important social benefits resulting from avoiding the disruption of satellite based services, better prevention of electricity grid failure as well as the impacts of NEOs. Positive impact on environment notably by learning more from space weather.	This option is partly but not fully coherent with the EU2020 strategy growth. While SSA does represent certain potential for innovation and growth, its main purpose is the protection of space infrastructure. There is an enormous potential for innovation in space exploration, which is not addressed in this option.
Option 3	This option achieves objectives (1), (2) and (4), but only in part objective (3) and (5). It does not fully guarantee independent access to on-orbit infrastructures. Option 3 will give EU a higher profile in space matters but not the leading and strategic role that objective 5 refers to.	Option 3 entails an additional expenditure of some € 400 million per year. The **total for this option to €530 million per year**. Conservative estimates put the rate of return for investment in space exploration at 2.3 and employment factor at 2.8. Other significant impacts on Europe's visibility and innovation potential, the creation of qualified high-skilled jobs and beneficial spin-off effects.	Option 3 is fully consistent with the EU2020 strategy; it will contribute to innovation and will derive spill-over benefits in many areas and EU policies including health and environment.
Option 4	This option will achieve the five objectives identified.	The rationale described for option 3 applies to option 4. This option adds €900 million per year, **the total being €1.43 billion per year**. Option 4 represents an enormous technological challenge which will accelerate the pace of technological progress and multiply the spill-off and spill-over benefits for our economy and citizens.	From the coherence standpoint, this option is similar to option 3.

8. MONITORING AND EVALUATION

The present impact assessment will accompany a Communication on the future involvement of the EU in space and does not amount to a formal proposal for funding. The Communication could pave the way for a possible Regulation on a future European Space Programme. That Regulation will be accompanied by a follow-up Impact Assessment. Detailed provision for monitoring and evaluation will be discussed in that Impact Assessment.

As regards an evaluation, the Commission will assess the extent to which EU activities in space reach the policy objectives and the problems identified in the Communication are being tackled. The EU programme will be evaluated according to the parameters of relevance, effectiveness, efficiency, utility and sustainability.

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EUROPEAN COMMISSION

Brussels, 4.4.2011
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ANNEX 1

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Accompanying document to the

COMMUNICATION FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

TOWARDS A SPACE STRATEGY FOR THE EUROPEAN UNION THAT BENEFITS ITS CITIZENS

SEC(2011) 381 final
COM(2011) 152 final

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ANNEX 1

1. LIST OF STAKEHOLDERS CONSULTATIONS

1. Bilateral meetings held in 2009 by DG ENTR with MS actively involved in the space sector: Germany, France, UK, Spain, Italy; industry association.

2. Interviews of relevant stakeholders, conducted by Ecorys in the context of the "Study on the EU Space Programme 2014-2020" (December 2009-January 2010)

3. Eurobarometer survey on the space activities of the European Union conducted by Gallup in July 2009

4. EU-ESA workshops in spring 2010

   Workshop on Science and education within Space exploration, 29-30 March 2010, International Space University, Strasbourg, France

   Workshops on Space exploration and innovation, industrial competitiveness and technological advance, 29-30 April 2010, Harwell, United Kingdom

   Workshop on Space exploration scenarios, 20-21 May, Cira, Capua, Italy

5. Events under Spanish Presidency

   Workshop on Space and Security, 10-11 March 2010, Madrid, Spain;

   Conference on governance of European Space programmes, 3-4 May 2010 Segovia, Spain.

6. Contributions and speeches of the conference "Space policy: a powerful ambition for the EU", Brussels, 15-16 October 2009

7. Contribution and conclusions to the conference "1st EU-ESA International conference on Human Space exploration", Prague, 23 October 2009 (add conclusions)

8. Space Advisory Group contribution on an EU vision for space exploration.

9. ESA contribution to the definition of future EU space activities.

2. EC-ESA WORKSHOP: SCIENCE AND EDUCATION WITHN SPACE EXPLORATION, STRASBOURG, 29-30 MARCH, 2010

2.1. General Recommendations

Europe being ready and willing to show strong ambitions in space exploration, it must now prepare a coherent long-term programme consisting of a mix of robotic and human-related activities and strive for optimal coordination between all relevant players, in particular the European Union, the European Space Agency, their Member States and international partners. To this end, a greater synergy between scientific, technological and industrial activities is needed, as well as more efficient coordination of national, ESA and other initiatives. The EU is in an ideal situation to take up such a coordination effort in close collaboration with ESA and Member States. Whether it is science enabling exploration, or science enabled by exploration both aspects need to be adequately supported and accompanied by a significant education and outreach programme.

2.2. Main findings and recommendations (from the questions in the background document)

Overall, how can space exploration best contribute to the EU and Member State research and education policies and in particular to make the European trans-disciplinary research more competitive?

An ambitious and resilient long-term European space exploration programme is needed, with clear and visible milestones. It should in particular support **trans-disciplinary** initiatives, including the linkage of science with technology to support European research priorities and overall competitiveness. A coordinated EU-ESA exploration programme is also needed to make space exploration an integral part of **schools** curricula that will motivate the young generation to study and engage in S&T careers and therefore contribute to the development of the knowledge society.

How can space exploration engage the interest of the citizens, stimulate scientific careers and be linked to societal benefits?

Europe must have a coherent space exploration programme relying on balanced **robotic and human** activities. Space exploration can contribute to build a European **identity**, as well as to **inspire** European youth to engage in scientific and technical studies. **Benefits** for citizens should be highlighted in every mission to attract the interest of both the decision-makers and the general public alike.

What could be the European view and role in the international exploration context?

Europe should strive for a role in future space exploration ventures on par with its aspirations. European activities while fulfilling short-term European goals should be embedded in a wider international context. On scientific activities linked to space exploration, Europe must push for a leadership role in **instrumentation** for remote and surface/sub-surface studies of planetary bodies of interest to exploration, as well as for research fostering human presence in space (e.g. habitats, life support). Europe has been the largest scientific user of the **ISS** up to now and should continue to show excellence in science preparing for human exploration. It has strong expertise in space flight **analogues** or simulations and this advantage should also be further nurtured.

What would be a specific added value of the EU in this context?

The EU should take up a leading role in close relation with ESA and Member States for European space exploration initiatives. The EU should also have a substantial role in **education** policy and outreach activities.

2.3. Specific issues

<u>Exploration and Science</u>

European Martian robotic exploration should focus on life detection, drilling capabilities, network science, and sample returns. In this context safety and planetary protection issues need to be advanced and support needs to be gathered for a European sample curation facility. European missions to Mars should look for example at bio-signatures, water reservoirs and atmospheric science.

The Moon is an important target to investigate the early Solar system history and can provide a platform for space exploration. Lunar surface activities would also provide opportunities to develop new instrumentations. Other destinations such as Near Earth Objects (NEOs) and Lagrangian points provide major scientific potential as well. In particular, NEOs are repositories of solar nebula material and could therefore be an integral part of a scientific exploration programme.

ISS is acting as a Low Earth Orbit (LEO) platform for fundamental and applied research, focused on life and physical sciences, but can also contribute to other domains such as Earth observation-based science. It is a unique tool to continue to foster international cooperation for scientific research.

Space exploration provides also a unique opportunity for synergies among scientific fields such as geology, biology, planetary science and others which need to be better exploited. Furthermore, benefits for Earth and terrestrial research stemming from exploration activities exist and should be stressed, such as a better understanding and modelling of the evolution of the Earth (e.g. climate change) that require comparative planetology as a tool. In general, a European leadership role in instrumentation concerning remote and surface/sub-surface studies of planetary bodies of interest to exploration should be sought.

Space exploration can benefit from research on terrestrial environments (e.g. instrumentations and techniques). Therefore making the best use of synergies with analogue environments on Earth (e.g. for understanding the origin of life) in order to prepare the grounds for significant exploration programmes should be reinforced. Complementary elements between planetary remote sensing and in situ research should be enhanced. Ground-based research is key to prepare for human exploration. Europe has strong expertise in simulations and analogues (e.g. bed rest studies, use of Concordia Antarctic station, physical countermeasures) and this advantage should be further nurtured.

Europe has been the largest scientific user of the ISS up to now and should continue to show excellence in science preparing for human exploration. In addition, benefits for citizens on Earth (e.g. in the sectors of health, ageing, waste recycling, life support) should be emphasised in order to attract the interest of both the decision-makers and the general public.

To meet this objective, top-down calls should be issued both for ground-based and ISS research to address the most realistic short-term challenges for human exploration. Moreover, interdisciplinary teams that address new and innovative science should be promoted to fully exploit the potential of the ISS and foster user-driven research. The long-term utilisation of ISS should be optimized in cooperation with partners to sustain cutting-edge research activities and to benefit from the experience gathered by continuous human presence in LEO.

Exploration and Education

All space programmes, especially space exploration, are inspiring, but inspiration is no longer enough to justify and support those activities. Space exploration programmes must increasingly compete for the attention of the public and politicians. More public outreach must thus be done in Europe and adequate activities to promote exploration should be defined upfront. Communication must be an integral part of space exploration programmes and particularly of any related mission. Public support for space exploration needs, however, more than just increased awareness. Better and more efficient communication is as important as the science and technology (S&T) itself to sustain any long-term endeavour. The overall society has to be involved as an integral part of space exploration. There is also a necessity to engage the future generations in exploration activities (e.g. with participatory exploration) as they will enable and fund most of it.

Space exploration can help to improve Science, Technology, Engineering and Mathematics (STEM) literacy and motivate students to engage in S&T careers. It is an enabler that can be linked to many subjects and integrated with many other disciplines. School material derived from ISS utilisation and other space missions can be very useful to address diverse topics such as physics, mathematics, life sciences, international relations, humanities and social sciences. Beside governments, industry should play as well a role in education and outreach.

2.4. Conclusions

The primary goal of space exploration is to expand – for ultimate benefit of citizens – the range of human activities which requires a synergistic combination of robotic and of human exploration activities. Space exploration is driven by a combination of aspects such as science (increasing knowledge), economy (finding new opportunities), political (prestige and promoting global cooperation), education (improve the workforce and S&T literacy of society) and public engagement (raising societal support and inspiring new generations). In this context science will undoubtedly benefit as a passenger of space exploration.

There should be a common willingness for Europe and other partners to cooperate and strive toward common goals even if there might be technological and experience gaps in several areas. Moreover, stronger synergies between fundamental and applied research are needed to foster technological developments. Europe has several strengths to build on, but Europe could do more and the future European role in exploration has to be clearly identified. There is a necessity to identify the niches for European leadership.

Space exploration addresses multidisciplinary scientific questions and challenges, and to solve those, a trans-disciplinary approach must be fostered. Indeed, synergies between science and technology can allow challenges to become opportunities. Future European programmes, coordinated between ESA and the EU, should therefore encourage trans-disciplinary initiatives, including between science and technology. Future ambitious exploration missions will also require technology breakthroughs such as nuclear propulsion that will provide benefits for science.

There is a necessity to engage the general public to support space exploration, especially the younger generations. Space exploration can be a support to STEM education. The best practices throughout Europe should be shared. However, to make space exploration an integral part of schools curricula, an ambitious European space exploration programme is needed.

Space exploration can sustain the European identity. However, future major exploration ventures will be done in international cooperation as exploration is now a global project. In this global endeavour, Europe must play a key role. Indeed, Europe has the strengths and competences to become a major player in space exploration. Moreover, its experience in cooperative activities due to its very nature can be an asset for future ventures. European priorities must however be consistent and compatible with those of potential partners.

3. EC-ESA WORKSHOP, EXPLORATION AND INNOVATION, INDUSTRIAL COMPETITIVENESS AND TECHNOLOGICAL ADVANCE, HARWELL, UK, 29-30 APRIL 2010

3.1. General Recommendations

Europe needs a long-term vision on space exploration with clear objectives and intermediate milestones including short-term demonstration missions. Space exploration has a great potential as a technology and innovation catalyst because of its inherent complexity and the diversity of the challenges it faces. Therefore, the European Union, in close cooperation with ESA, should promote space exploration to meet the challenges of society's needs'.

Space exploration is undoubtedly a driver for innovation in the space sector but also outside, providing many tangible Earthly benefits.

Long-term goals and short-term technology missions will support the European space industry but also attract new players with value-added competences (e.g. regions, SMEs, entrepreneurs).

Europe should consider new procurement mechanisms to address specific exploration challenges and involve new players, including non-space actors.

Europe should establish new platforms and forums for ‘spin-in, spin-out and common R&D’ to reach out to non-space industry and remove existing barriers to innovation.

New financing tools need to be introduced to stimulate innovation to find answers to specific exploration goals (e.g, cash prizes to attract SMEs and commercial initiatives).

3.2. Specific issues (from the questions in the background document)

3.2.1. How can space exploration contribute to industrial competitiveness and innovation?

How can space exploration unleash the innovative potential of Europe?

This will not happen unless Europe establishes a clear long-term vision with a clear roadmap and identified targets and milestones including short-term technology demonstration missions and short-term preparatory missions. New actors including regions, SMEs, entrepreneurs, non-space actors should also be involved in exploration initiatives.

How can space exploration promote innovation for societal needs?

Earthly challenges should be used as drivers (e.g. improving citizens' life) and dedicated platforms should be funded by the European Commission, to integrate space R&D activities into larger multidisciplinary activities.

Are there new ways of financing space exploration programmes?

To enable a resilient European space exploration programme robust and continuous financial commitments will be needed. The European Commission could promote linkages among various areas of its R&D framework programmes, for example with thematic areas such as health, information and communication technology, aeronautics, environment, or materials sciences. Different procurement schemes could be investigated (e.g. cash prizes for specific goals) to foster innovation. As well as triggering innovation, common R&D could facilitate the identification of additional financing.

How to strengthen European technology and industrial base?

To optimise R&D developments Europe should better exploit synergies with other domains (space and non-space). Furthermore, administrative simplification and a faster allocation of resources are needed to attract new firms.

How to reconcile cooperation and competition or technological advance and international cooperation?

Space exploration can undoubtedly be a boost for industrial competitiveness, but Europe should avoid unnecessary duplication of activities and a fragmentation of its research programmes. The space sector has to open itself more to other ideas and other actors; space exploration could represent a perfect opportunity to do so.

3.2.2. Space exploration at 'system' level – innovation prospects for robotic and human spaceflight

How to support and engage the European space industry in exploration activities?

Europe should have a clear and long-term commitment for exploration, which in turn would allow European space industry to maintain its capacities and competitiveness. It should also concentrate its investment in specific and selected niches of excellence to enable Europe to make critical contributions to targeted challenges. Europe should support enabling technologies and capabilities by using small missions "to derisk" technologies (reduce the risk through demonstration and validation).

What areas of technical excellence need to be nurtured or acquired?

Two main domains emerged as being important for Europe, as well as being strong domains for European industry and instrumental for the success of exploration: sustainable life technologies (including power generation), and advanced propulsion for interplanetary travel. They should be considered as priority domains along with robotic systems.

How to build on European expertise and competences and engage in new areas?

Strong support to ESA technology programmes should be maintained, but the European Commission should also increase its support as advances in technology for exploration will lead to advances in other domains, crucial for innovation in Europe.

How to identify technological priorities for Europe?

Strengths of European industries should be analysed and matched with the political wish to master some key technologies, in line with the Europe 2020 strategy.

How to support technology breakthrough and high risk research?

Many innovations are serendipitous or build on incremental technologies but Europe should encourage and support technology breakthrough and high-risk research by establishing clear, specific exploration goals for industry to work towards.

3.2.3. Space exploration technology challenges at 'sub-system' level – trans-disciplinary synergies for robotic and human spaceflight

Which domains of space exploration are most promising for synergies between space and non-space actors?

Areas of most promising synergies between space and non-space sectors are life-support (e.g. health and wellbeing, food and water security, recycling, waste recycling); power management (energy production and storage); robotics and automation (to replace or assist humans in dangerous environments).

Are new mechanisms needed to (better) engage the space community?

Knowledge exchange between the space and non-space sectors should be nurtured by creating dedicated forums and encouraging co-locations between space and non-space actors (e.g. innovations centres acting as hubs). In this context, the European Union should provide means to define common needs, and to set up adequate discussion networks: enabling in particular earlier involvement of actors (e.g. SMEs, entrepreneurs) at problem definition stage, promoting adaptability/flexibility and bridging organisations. A more aggressive and targeted communication activity to raise awareness about exploration ideas, realisations and challenges is also needed.

What are the incentives to connect space exploration-related research to other sectors?

Space exploration-related research could benefit from the expertise and capabilities residing in other sectors and the stringent exploration boundary conditions will be a clear driver for innovation (e.g. severe environmental conditions that imply complex and innovative answers to respect mass, volume and power limitation, answers which could later be adapted to Earthly issues). However, the space market is very small and not

What are the barriers to cross-sector technology developments?

There is often within non-space sectors a lack of awareness of the potential cooperation opportunities offered by the space market. Moreover, substantial differences in time-scales, attitude towards risks, levels of financing, expectations of return on investment, and working cultures exist between the space and non-space sectors.

Is space exploration an engine for disruptive/breakthrough technologies?

Space exploration challenges can be an engine for innovation stimulating disruptive/breakthrough technologies but in any case, Europe needs to continuously invest in technology to enable future benefits for the European industrial base.

3.3. Conclusions

Space has always been an innovative sector and space exploration in particular has a great potential to act as a catalyst for societal and economic progress because of its inherent complexity and the diversity of the challenges that it shares with many non-space areas such as the health sector, energy (e.g. nuclear energy), waste disposal, food security and water recycling. Space exploration and innovation are thus interlinked and exploration will drive further breakthroughs in traditional space domains as well as in new areas and will bring back innovation and foster economic growth.

Europe has all the capabilities and skills to engage fully into space exploration, the building bricks for this exist, but the need is to ‘operationalise’ the technology assets and existing capabilities to, among others, maintain the necessary know how in Europe. For this, Europe must set clear and specific goals (e.g. sustained 'human survival' in space; a robotic asteroid mission) towards which the space and non-space industry can direct their innovative talents. Combined research into solving linked exploration and terrestrial challenges could also be beneficial (e.g. climate change and low-carbon energy, remote health care for aging population, secure access to energy and to safe drinking water).

Continuous public support is needed to enable the private sector to develop cost-effective and efficient products and solutions. European regions could also play an increasing role in space exploration. However to better engage the industrial sector, including SMEs and entrepreneurs, new procurement mechanisms and financing tools such as cash-prizes could be investigated. Common ground with the non-space sector should be sought as well as pooling skills and funding. Existing identified barriers should be overcome.

4. EC-ESA WORKSHOP, SPACE EXPLORATION SCENARIOS, CAPUA, IT, 21 MAY 2010

4.1. Draft conclusions and recommendations

Europe has a longstanding **history** of successful exploration of space, conducted through projects managed by the European Space Agency and its Member States. Today, with the Lisbon **Treaty**, space became an EU policy in its own right. Indeed, article 189 provides that the EU shall “*coordinate the efforts needed for the exploration and exploitation of space*”.

The first space exploration conference in Prague end 2009 launched a **consultation** process that was followed by three thematic workshops co-organised by the European Commission and ESA; the next steps in 2010 will be a Commission Communication on space including a chapter on exploration, the second conference in Brussels on 21 October 2010 as well as the 7th Space Council in November.

The added value of the EU involvement in space exploration is that it can connect space exploration with many other **policy areas** over which it has responsibility. The EU contribution to space exploration can therefore make a difference compared to past and current practices. The EU contribution must be **visible** and financial resources must be used for clear projects where the EU added value is most effective.

As emphasised in the first EC-ESA workshop, **science** will best benefit from space exploration by a trans-disciplinary approach but it has been underlined that space exploration is more than science or technology. It contributes significantly to innovation and the knowledge base and above all it has a political dimension. Space exploration will thus in turn **inspire** European youth in scientific and technical education and careers.

The second EC-ESA workshop concluded that space exploration generates **innovation**. It was acknowledged that exploration should be promoted as a challenge for societal needs to attract new players with value-added competences (e.g. non-space actors, especially SMEs) while supporting the space industry to nurture its overall competitiveness. For an optimum science and innovation return Europe must however have a coherent **long-term** space exploration programme of **robotic and human** activities with clearly identified intermediate milestones including short-term **technology** demonstration missions.

As shown in the third workshop, a large consensus emerged in support of the European exploration **scenarios** elaborated by ESA which should rest on three pillars: a solid technological programme; a use of ISS assuming its extension and including the development of a common space transportation policy; a robust complementary robotic exploration programme.

It is recognised by the participants that space exploration is a matter of **global cooperation** and must be carried out within a broad international partnership. The EU in close collaboration with ESA needs to promote this global approach and raise it to the **political level**. [*The participants of the workshop identified the need for a more political level forum to discuss space exploration as a global endeavour*].

5. CONFERENCE ON SPACE AND SECURITY, MADRID 10-11 MARCH

The Workshop emphasised the relevance of space to security users as a tool with the potential to address specific needs, in particular that of timely response. Being one tool of many, space can provide the most added value when seamlessly integrated with others. To achieve this, effective integration of space technologies such as Earth observation (and especially GMES), satellite communication and navigation (Galileo with its PRS) will be required. In parallel, the way the space systems interact and network with ground based and airborne platforms needs to be further looked into.

Services of the EU Council and the European Commission, the European Defence Agency (EDA) and the European Space Agency (ESA) have been working together on the identification of security related user requirements under the umbrella of the Structured Dialogue on Space and Security. The new Crisis Management and Planning Directorate of the Council offers the potential for genuine synergies between civilian and military effort, and will continue to contribute to the ongoing developments in space and security. The expertise of the EUSC in analyzing EO data and disseminating geospatial products for security applications should be taken in due account in the implementation of GMES security services.

Concerning the security dimension of GMES, workshop participants recognised the progress made to date. Recommendations have been made on how GMES should support EU border surveillance (in particular EUROSUR), while work on the identification of user requirements for GMES to support EU External Action has begun. GMES security services to be developed on the basis of these requirements will complement the support provided by GMES to Emergency Response.

The complexity of integrating both civil and military requirements has been illustrated by the cooperation on Space Situational Awareness (SSA), which is the first European space initiative to consider dual use dimensions from the outset. ESA, in the framework of its SSA preparatory programme, has been mandated to gather civilian SSA user requirements and design the technical architecture of what could become a European capacity. The European Defence Agency is currently drafting military requirements for SSA. The EU Council and European Commission, together with potential SSA contributors, will have to define the governance model and the related data policy for an operational European SSA system. The EUSC data model could be considered in this context.

Discussions on effective synergies and the governance of GMES and SSA highlighted the importance of national assets as essential components of any European Space system responding to security objectives. These national assets could be complemented by European capabilities when needed, while avoiding unnecessary duplication. As an example, Spain presented its National Earth Observation Satellite Programme consisting of an optical and a radar satellite (PAZ) that will be operated together and have been designed to serve the needs of security and non-security users both at national and international level in the context of GMES and other cooperation programmes.

The European Space Policy highlights the need for the European Union, ESA and their Member States to increase synergies between their security and defence space activities and programmes. The Structured Dialogue has started this process. The Workshop highlighted the need to increase and expand this coordination. It also suggested the setting up of an appropriate coordination platform with Member States owning relevant assets.

These issues should be further explored during a dedicated follow-up seminar planned for summer 2010 with a view to provide input for a discussion at ministerial level in an appropriate setting.

6. CONFERENCE ON GOVERNANCE OF EUROPEAN SPACE PROGRAMMES, SEGOVIA, SPAIN, 3-4 MAY 2010

Europe needs space. It needs strategic space capabilities and efficient space-based services to ensure the wellbeing of our citizens and as a tool to support public policies. It needs to exploit these capabilities and services to their maximum potential.

Europe needs a range of activities and organisations to meet its wide range of objectives for space. How these interact in the short- and longer-term will be the key determinant of Europe's continuing success in space.

The Conference has recognised that the entry into force of the Lisbon Treaty presents an opportunity to further develop the institutional framework for Space activities in Europe. The Treaty on the Functioning of the European Union (TFEU) provides a legal basis and an explicit competence in Space for the EU. This competence, which is shared with the Member States, calls upon the EU "to coordinate the effort needed for the exploitation and exploration of space" and to "establish any appropriate relations with the European Space Agency". It then consolidates the triangle of European space actors i.e. the EU, ESA and their respective Member States.

Governance arrangements are a tool to deliver objectives. Clarity of vision and objectives must come first.

The current institutional set-up for the European Space Policy – the EC/ESA Framework Agreement which entered into force in 2004 – has provided a solid foundation for coordinating and aligning the space activities of the EU and ESA. This arrangement works well but may have to evolve at the end of the current analysis, in view of Art. 189 TFEU and in order to expand the opportunities for Space in Europe.

The Conference recognised that the existing institutional asymmetries between the two organisations (supranational v. intergovernmental) pose a number of challenges which will have to be addressed. Along with the growing EU role in space, Member States also value intergovernmental ways of working within ESA as a research and development agency. Efficient collaboration will require adaptation, including possibly through continued institutional convergence between the EU and ESA. ESA, its Member States and the EU have to explore the different scenarios for the evolution of this collaboration.

Industrial policy and technology policy are inextricably linked. The Conference recognised the importance of a coherent framework for Space Industrial policy in Europe. The peculiarities of the space sector call for a combination of measures at EU, ESA and Member States level in order to create the right environment that will nurture a competitive industry and ensure a fair and balanced participation of all industrial actors, including in particular SMEs. These measures must and will continue to evolve.

The Conference identified procurement as the major but not the only instrument driving industrial policy. Other instruments should continue to be promoted. At the EU level, examples include instruments such as FP7, CIP and structural funds, as well as EIB loans and EIF guarantees. While taking full advantage of the existing EU, ESA and Member States industrial policy instruments, other instruments could be designed as incentives for the European space industry to maintain and improve its competitiveness and develop technologies, applications and services which are innovative, sustainable, reliable, cost-effective and efficiently respond to growing societal needs in Europe.

The Conference widely recognized the technical expertise of ESA in designing and procuring European Space Programmes. Despite difficulties, the first EU flagship projects in Space, GMES and Galileo, are moving closer to fruition. Future industrial policy should allow for the development of mechanisms to enable EU-ESA cooperation in Space. Past experiences, in these programmes and also in ESA-EUMETSAT programmes, provide valuable lessons in the governance of future endeavours.

In future programmes, governance arrangements will have to be put in place, from the beginning, that should guarantee the efficiency of public investments in Space, the long-term sustainability of the programmes and their optimum utilisation as well as ensuring motivation of Member States to continue their volunteer investments in space. Continuity between the research and development and exploitation phases will have to be ensured. While it will be impossible to find 'one-size-fit-all' solution for all the programmes that could be conceived in the future, a degree of coherence will be necessary.

The EU identity in security and defence matters has been reinforced. Security and defence policy is in an evolutionary period. The EU has a competence in foreign and security policy, including the progressive framing of a common defence policy, in conformity with the TEU. Space actions may serve foreign and security (including defence) policy goals.

Governance of space activities related to security and defence needs will have to reflect that evolution.

7. EUROPEAN SPACE BUDGETS

Europe, through the activities of the European Space Agency (ESA) and its Member States[1], most of which are also EU Member States, has built significant achievements in the space domain over the past 30 years. European scientists have contributed to the exploration of several planets in the Solar system: Venus (Venus Express), Mars (Mars Express) and the Moon (e.g. SMART-1, European instruments on Chandrayaan-1). The successful Huygens mission to Titan has marked the farthest landing in the solar system so far. Building on the experience gained with Spacelab in the 1980's, Europe has recently contributed to the success of the International Space Station (ISS) through the Columbus laboratory, the Automated Transfer Vehicle (ATV) – the largest ever automatic cargo space vehicle, and other essential ISS supplies, such as the Multi-Purpose Logistics Module (MPLM) flying in the Shuttle payload bay to bring supplies to ISS. Nearly 50% of all pressurised elements on board the ISS have been manufactured in Europe by European companies. Furthermore, Europe has gained leadership role in several segments of astronomy and astrophysics covering a broad spectrum of measurements of the universe with XMM-Newton, Integral, Corot, Hubble and the James Webb Space telescopes (the last two in cooperation with NASA). More recently, the launch of Herschel and Planck have marked a new step in this quest for the understanding of the origin and evolution of the Universe.

In parallel Europe has created its own infrastructure for access to space through the European Spaceport in French Guiana and the Ariane family launchers which have been the commercial workhorses for the past three decades. The Ariane 5 launcher is able to lift 20 tons into Low Earth Orbit in the form of groundbreaking science missions and the ATV, as well as putting the most powerful telecommunications satellites into geostationary orbit.

The programmes of ESA and national space agencies have given rise to a strong space industry, which has managed to transform Europe's space ambitions into concrete successes. This industry has developed a broad spectrum of space technologies and capabilities, and is today a recognised leader in the global commercial space markets for launchers and telecommunications satellites.

But the industry is relatively small in size[2] and dependent on public sources of funding for nearly 60% of its turnover (against 80% in the US).

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1 ESA currently has 18 Member States: Austria, France, Germany, Italy, Spain, UK, Belgium, Netherlands, Luxembourg, Sweden, Finland, Denmark, Greece, Portugal, Ireland, Czech Republic, Switzerland and Norway.

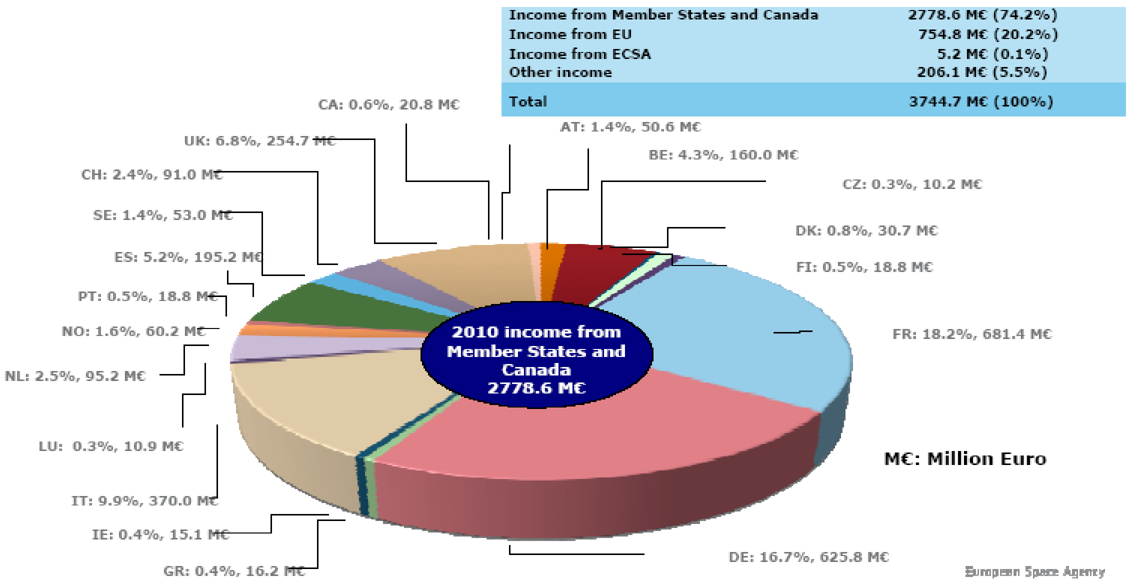
2 Around 30,000 employees and consolidated turnover of €5.9bn in 2008.

In Europe the budgets spent on space activities are divided between ESA, which accounts for nearly 2/3 of the current spending (i.e. €3.7 billion in 2010 of which €750 million are contributions from the EU) and individual Member States which together spent a total of €2.1bn in national programmes in 2009. The total European space expenditures were estimated at €6.7 billion in 2009, of which only around €1 billion in defence-related space budgets.

The US invests considerably more than Europe in space. The budget of NASA in 2009 was $17.8 billion, roughly 5 times that of ESA. The gap becomes even wider when taking into account military spending (1:20). The US has today by far the biggest space budget in the world: $48.8 billion in 2009, or 72% of the world's total government space outlays. The new US national space policy foresees a further increase in the NASA budget of $6 billion over the next five years, specifically for space exploration enabling technologies.

Other countries, including more recently emerged space nations strongly support their domestic space industries. China and India are quickly closing their technology gap and aggressively asserting their presence on the commercial space markets. Both have increased their civilian space budgets in recent years (India spent $900 million in space programmes in 2009 and China $2bn). Russia is recovering its levels of expenditure and increasing its national space outlays by 40% on average in the past five years (total of $2.8 billion in 2009). Overall, the global trend of government spending on space programmes (both civilian and defence) is rising. It amounted to $68 billion in 2009, which represented a 12% increase over the previous year, according to Euroconsult[3].

In Europe the biggest investor in space is France, followed by Germany, Italy, the UK and Spain. Countries like Belgium and the Netherlands have significant space budgets per capita as well. The following chart presents the Member States contributions to the ESA budget for 2010.



Source: European Space Agency

[3] Profiles of Government Space Programs: Analysis of 60 Countries and Agencies, Euroconsult, 2010

Outside ESA, only a few Member States have any significant national space programmes: France, Germany, Italy, Spain and the UK. These represent a mixture of national or bilateral satellite missions and programmes designed to exploit ESA missions, for example through the provision of scientific instruments. France, Italy and Spain spend more on national programmes than they contribute to ESA. Germany's contribution to ESA exceeds its spending on national programmes. Smaller countries put most, if not all of their national space funding into ESA.

National space expenditures (in M€)

Year	A	B	DK	FIN	F	D	I	NL	N	P	E	SE	CH	UK	Total
2002	29.0	20	4.0	20.0	1083.0	100.0	481.0	35.0	3.8	0.5	9.0	16.1	2.1	98.7	1902.2
2003	30.0	20	3.0	26.0	1040.0	270.0	400.0	30.0	5.5	0.5	10.1	16.0	2.0	63.8	1916.9
2004	23.2	20	3.3	27.4	690.1	340.0	436.0	24.0	6.8	0.5	14.5	17.0	2.0	99.4	1704.2
2005	18.8	20	5.0	26.4	681.5	415.0	421.1	23.7	6.2	0.5	226.0	16.0	2.0	99.0	1947.2
2006	16.6	20	5.0	27.0	691.6	416.0	420.0	24.0	6.2	0.5	311.0	16.0	2.0	100.0	2054.9
2007	17.0	25	5.0	27.0	713.2	458.0	430.0	25.0	8.0	0.5	300.0	16.0	2.0	79.9	2153.6
2008	18.0	25	5.0	27.0	856.6	460.0	400.0	25.0	8.0	0.5	300.0	16.0	2.0	80.0	2221.1
2009	18.0	25	5.0	27.0	703.5	460.0	430.0	25.0	8.0	0.5	300.0	16.0	2.0	80.0	2100.0

Source: European Space Directory, 25th Edition

Among the group of EU-12 only the Czech Republic is currently a member of ESA. Several others have cooperating states agreements with ESA (i.e. Hungary, Romania, Poland, Estonia, Slovenia). Some of these countries have had traditions in certain areas of space activity but currently lack the necessary industrial base and the means for any significant involvement. Besides, the barriers to entry in this industry are very high for newcomers. Still a few countries make their modest contributions through the ESA budget.

ESA Contributions (in M€)																						
Year	**A**	**B**	**DK**	**FIN**	**F**	**D**	**H**	**EI**	**I**	**NL**	**N**	**P**	**E**	**SE**	**CH**	**UK**	**CZ**	**L**	**GR**	**CND**[4]	**Others**	**Total**
2001	29.5	113.1	24.3	10.5	614.6	534.9		6.6	287.4	58.9	20.7	2.7	92.2	48.3	61.3	141.3	0.3			12.2	792.0	2847.3
2002	27.7	140.3	27.7	14.1	680.0	680.1		7.8	444.0	70.0	26.4	6.4	117.2	59.6	57.9	127.8	0.3	2.4		17.5		2992.7
2003	29.3	148.0	22.2	12.5	680.0	603.0	1.1	11.2	370.0	75.9	29.1	5.8	120.2	58.7	64.5	149.8	0.25	3.8	1.2	17.1		2677.1
2004	32.5	181.1	28.0	20.6	680.0	653.0	1.1	12.3	280.0	70.0	26.0	11.1	131.2	57.1	86.3	229.9	1.36	3.8	7.2	16.5		2791.8
2005	31.0	190.1	29.3	21.6	685.0	631.0	1.1	11.5	363.0	72.0	39.1	11.9	136.6	68.0	88.4	241.0	1.43	3.9	7.5	17.9		2926.0
2006	33.6	149.5	24.9	16.5	685.0	555.0	1.1	11.5	344.0	64.1	28.5	12.2	128.0	51.0	89.0	202.9	1.43	5.1	10.0	22.3		3197.4
2007	33.2	145.2	26.2	17.2	753.2	578.3	1.1	12.1	369.9	74.9	43.3	12.8	141.3	51.9	92.9	243.1	1.43	9.2	11.1	22.3		2975.3
2008	32.8	138.4	23.9	16.4	556.4	533.4	2.0	13.3	343.0	98.0	43.9	16.6	152.8	54.6	87.1	264.9	1.43	11.1	11.4	22.3		3028.3
2009	43.3	161.0	27.8	20.0	716.3	648.3	2.0	13.3	369.5	99.0	44.6	15.7	184.0	56.0	94.4	269.4	6.87	12.8	14.5	22.1	777.96	3591.7
2010	50.6	160.0	30.7	18.8	618.4	625.8		15.1	370.0	95.2	60.2	18.8	195.2	53.0	91.0	254.7	10.2	10.9	16.2	20.8	968.1	3744.7

Source: European Space Directory, 25th Edition

8. OVERVIEW OF EXISTING SSA CAPABILITIES

8.1. European assets

Activities in the area of Space Situational Awareness (SSA) are being conducted both at European and national level. A number of Member States have developed SSA capabilities, many of which – in particularly tracking and satellite imaging facilities – are owned and operated by national defence agencies. In Europe, such facilities are available in France, Germany, Norway and the UK, the latter two being part of the US anti missile defence network. Some facilities are also operated by space agencies, e.g. optical telescopes for surveying the Geostationary orbit (GEO). An overview of existing space surveillance assets in Europe prepared by ONERA[5] in 2007 on behalf of ESA[6] found that more than 65 % of existing sensors for the Low-Earth orbit (LEO) area are partially or fully operated by ministries of defence-related institutions.

Existing radar capabilities such as the GRAVES system or the Armor radar in France (see description below) are owned and operated by the Air Force. Operational since December 2005, the GRAVES radar produces surveillance and tracking data used for cataloguing space objects in the framework of a dominant military interest. More specific radars such as Armor (under the responsibility of the French Navy) have direct military uses and may contribute to the surveillance, tracking and characterisation of space objects. In Germany, the main radar equipment FGAN-TIRA is run by research teams from the High Frequency Physics and radar Techniques (FHR)[7], with a special partnership with the German Ministry of Defence, a

[4] Cooperating country
[5] Office national d'études et recherches aérospatiales.
[6] Study on capability gaps concerning Space Situational Awareness, ONERA, 2007.
[7] Under the auspices of the Research Establishment for Applied Science – FGAN.

dominant user of the radar capability for space imagery. The list attached at the end provides an overview of the main European space surveillance and tracking resources.

Since January 1, 2009 ESA has been implementing a preparatory SSA Programme as an optional programme with 13 participating Member States at present (Austria, Belgium, Finland, France, Germany, Greece, Italy, Luxembourg, Norway, Portugal, Spain, Switzerland, the UK). The programme, which runs until 2011, should lay the groundwork of a future European SSA system. It focuses mainly on the definition and architectural design of the system, its governance and data policy. A small hardware component is also foreseen (i.e. a test-model of surveillance radar) and a prototype demonstrator of user-services (so-called Pre-cursor services).

8.2. The US Space Surveillance Network

The US Department of Defence established a space surveillance network as early as 1957. The system was built up progressively by networking different observation capabilities, some of which were initially developed for ballistic missile detection. Access to this database has subsequently been made available to any (registered) user. Today, the US Space Surveillance Network (SSN) represents the reference for all space surveillance information across the world. ESA, EU and ESA Member States authorities and space agencies acting as operators of space systems as well as European commercial operators today rely to a large extent on the US SSN.

However, the US system has some aging capabilities and faces new challenges with the increasing orbital population. The US recognises today the need to widen international cooperation and in the different fields covered by SSA, and looks at earmarking potential domains for increased trans-Atlantic cooperation on SSA, in support of common civil, commercial and military requirements. The new US national space policy adopted on 28.06.2010 makes specific reference to the need for international measures to promote safe and responsible operations in space through improved information collection and sharing for space object collision avoidance.

8.3. Other space surveillance activities

The Russian federation, via the Russian military space forces, operates space surveillance capabilities independent of its ballistic missile early warning (BMEW) assets. These systems have performed various military and civil roles, including the analysis of the surface impact point of the Mir Space Station and identification of space debris[8]. Russian companies are in a position to offer or sell space surveillance data to external entities.

China, since joining the Inter-Agency Debris Committee (IADC) in 1995, also maintains its own catalogue of space objects. Space surveillance is an area of growth for China, which announced new investments in optical telescopes for debris monitoring in 2003. In 2005, the Chinese Academy of Sciences established a Space Object and Debris Monitoring and Research Center at Purple Mountain Observatory that employs researchers to develop a debris warning system for China’s space assets.

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[8] http://geimint.blogspot.com/2008/06/soviet-russian-space-surveillance.html

8.4. Space weather activities

The current working prototype of the European Space Weather data network, SWENET, supported by ESA can be considered as an embryo of the space-weather component of a future European SSA system. It is currently based on a distributed model, providing a centralised web-based access point to specialised space weather data and service products produced by several groups including SIDC (Solar Influences Data Centre of the Royal Observatory) in Belgium, SWACI (Space Weather Applications Centre - Inosphere, project of DLR) in Germany, CLS (Collecte Localisation Satellites) in France, BGS (Geomagentism Group, British Geological Survey) in the UK. A data exchange agreement has been established with the National Oceanic and Atmospheric Administration (NOAA) space weather data centre in the U.S.

8.5. International cooperation

For SSA international cooperation plays a very important role. Today international cooperation efforts in the area of space surveillance for debris monitoring and awareness are largely dominated by the existence of the US space surveillance network. This system makes non-sensitive information freely available over the internet (a subset of the US space surveillance catalogue of orbiting objects.) There is also bilateral cooperation between the US and some European states, between US agencies (NASA, NOAA) and ESA, as well as *ad hoc* cooperation with commercial and national satellite operators in case the US system detects a collision threat.

There is today a growing awareness of the desirability of enhanced cooperation between the US system and a future autonomous European SSA system. Both sides have expressed willingness to take the existing cooperation further during recent high-level meetings, including a recent EU-US space dialogue held in April 2010 in Washington, DC.

To facilitate such cooperation, the EU is already making funding available through the FP7 Space Theme: e.g. a number of projects have been selected in 2010 which include US partners (as well as partners from the Ukraine, South Africa and India). These projects address space weather as well as space surveillance and anti-collision issues.

At the level of space agencies, cooperation takes place in the context of the Inter-Agency Space Debris Co-ordination Committee established in 1993. IADC comprises 11 national space agencies including NASA, ESA and some of the European space agencies (CNES, BNSC, ASI, and DLR). Its primary purposes are to exchange information on space debris research activities between member space agencies, to facilitate opportunities for cooperation in space debris research, to review the progress of ongoing cooperative activities, and to identify debris mitigation options. In 2002, the IADC adopted a set of recommendations for debris mitigation, which has achieved wide international recognition (*Space Debris Mitigation Guidelines, IADC, 2002*). The UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS) developed these recommendations into a set of guidelines, which were adopted by the UN in 2008. These guidelines for good conduct in space are voluntary and non-binding. At technical and commercial level, the recommendations are translated into international engineering standards, such as International Organisation for Standardisation (ISO) or European Cooperation for Space Standardisation (ESS).

In the space weather segment, international cooperation is more advanced and is currently implemented through the International Solar Energy Society (ISES), the World

Meteorological Organisation (WMO) and other organisations that support the development and use of space weather service provision standards. Other major international cooperation venues include the International Space Environment Service (ISES) – a permanent service of the Federations of Astronautical and Geophysical Data Analysis Services; the International Solar Terrestrial Physics Science Initiative; the International Astronomical Union, which has a working group dedicated to international collaboration on space weather, and the Scientific and Technical sub-committee of the UN-COPUOS which also currently considers an International Space Weather Initiative.

8.6. Examples of existing European capabilities for space surveillance and tracking

8.6.1. Optical sensors[9]:

Tenerife: ESA operates a space debris telescope on Tenerife that covers a sector of 120° of the GEO ring. From single observations, initial orbits can be derived which are generally adequate for re-acquisition of the object within the same night, and which can then be successively improved. The Optical Ground Station (OGS), installed in the Teide observatory 2400 m above the sea level, was built as part of ESA long-term efforts for research in the field of inter-satellite optical communications. The original purpose of the station, equipped with a telescope (1m aperture), is to perform the in-orbit test of laser telecommunications terminals on board of satellites in Low Earth Orbit and Geostationary Orbit. Since 2001, the ESA survey of Space Debris in the Geostationary Orbit and the Geostationary Transfer Orbit is also being carried out with a devoted wide field camera to determine the orbital parameters of debris objects. The Optical Ground Station was inaugurated in 1995. The Instituto de Astrofísica de Canarias participated in the integration of the station instruments and has since then been in charge of the station operation. This is the contribution of ESA to the worldwide common efforts on this task with NASA and NASDA (National Aerospace and Defense Agency of Japan).

TAROT: CNES uses observation time of the TAROT telescope (Télescope à Action Rapide pour les Objets Transitoires) in France to survey the GEO ring. TAROT's primary mission is to detect the optical afterglow of gamma-ray bursts. A companion telescope, TAROT-S has been deployed in Chile. Since 2004, CNES observes satellites in the geostationary orbit with this network of robotic ground based fully automated telescopes. The system makes real time processing and its wide field of view is useful for detection, systematic survey and tracking both catalogued and uncatalogued objects.

Starbrook: The British National Space Centre (BNSC) has sponsored the Starbrook wide-field telescope as an experimental survey sensor since 2006. The telescope is located at Troodos/Cyprus, It can detect GEO objects down to 1.5 m sizes (visual magnitude of +14).

ZIMLAT/ZimSMART: The Astronomical Institute of the University of Bern (AIUB) operates a ZIMLAT telescope. From its location in Zimmerwald/Switzerland, the telescope covers a sector of 100° of the GEO ring. The primary applications of ZIMLAT are astrometry and laser ranging. However, up to 40% of its night-time observations are used for follow-ups of GEO objects discovered by the ESA telescope at Tenerife. ZIMLAT was complemented in 2006 by the 20 cm ZimSMART telescope (Zimmerwald Small Aperture Robotic Telescope).

9 Optical telescopes suitable for observation of the Geostationary (GEO) ring at 36000 km altitude and (Medium Earth Orbit) MEO at 23000 km where Galileo satellites will be placed.

SPOC and ROSACE: SPOC (Systeme Probatoire d'Observation du Ciel) is part of the French DGA network of target tracking systems. The ROSACE and TAROT telescopes are used by CNES for observation of GEO objects > 50 cm. TAROT detects the objects, ROSACE determines their orbit.

PIMS: The PIMS telescope (Passive Imaging Metric Sensor) is owned by the UK Ministry of Defence. They monitor objects in GEO > 1m. They are stationed in Gibraltar, Cyprus and Herstmonceux (East Sussex, UK).

8.6.2. Radar sensors[10]:

Fylingdales: A most powerful space surveillance sensor located in Fylingdales (UK) and operated by the British/US armed forces. Most of the activities are geared to the US Space Surveillance Network (SSN) early warning and space surveillance mission.

Globus II: A second facility associated with the US SSN is the Norwegian Globus II radar. It is located in Vardø, at the northernmost tip of Norway. Due to special bilateral agreements between the US SSN and the operators of Fylingdales and Globus II, data from these sites have so far not been available for unclassified use within Europe.

GRAVES: The French GRAVES system (Grand Réseau Adapté à la Veille Spatiale) is presently the only European installation outside the US SSN that can perform space surveillance in the classical sense. GRAVES is owned by the French Ministry of Defence and operated by the French air force. GRAVES started operational tests in 2001. Routine operations started in 2005. The system produces a 'self-starting' catalogue which can be autonomously built up and maintained. It is limited to objects of typically 1 m size and larger in low Earth orbits (LEO) up to an altitude of 1000 km. The object catalogue contains currently about 2500 objects. Object data of GRAVES are used for target allocation of other radars.

TIRA: The German FGAN Radar belongs to the Research Establishment for Applied Science at Wachtberg (organisational arrangements are currently changed to create a legal position, to be able to use the radar operationally for SSA and not only for research). In its tracking mode, the TIRA system determines orbits from direction angles, range, and Doppler for single targets. The modes include target tracking and imaging (for identification). The detection size threshold is about 2 cm at 1000 km range, 40 cm in GEO orbit. For statistical observations this sensitivity can be enhanced to about 1 cm, when operating TIRA and the nearby Effelsberg 100 m radio telescope in a bistatic beam-park mode with TIRA as transmitter and Effelsberg as receiver.

FS Monge: DGA/DCE, the Systems Evaluation and Test Directorate of the French Ministry of Defence, is operating several radar and optical sensors throughout France. The most powerful of these systems, Armor, is located on the tracking ship Monge. The two radars are dedicated to tracking tasks, based on high resolution angular and range data.

Chilbolton: The Chilbolton radar is located in Winchester, UK, operated by the Radio Communications Research Unit (RCRU) of the Rutherford Appleton Laboratory (RAL). It is mainly used for atmospheric and ionospheric research. With a planned upgrade the radar will be able to track LEO objects down to 10 cm sizes at 600 km altitude.

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[10] Radar stations suited for observation of the Low Earth Orbit (LEO) region up to 2000 km.

8.6.3. *In-situ sensors*[11]

SODAD (Orbital System for the Active Detection Of. Debris) are French space debris detectors currently in orbit (1 on ISS and 3 on satellite SAC-D) measuring the flux of micrometeriods (natural) and microorbital debris (manmade).

9. EXAMPLES OF SPIN-OFFS FROM SPACE EXPLORATION

Since 1976, NASA has created new technologies with direct benefit to the private sector, supporting global competition and the economy. The resulting commercialisation has contributed to over 1800 recorded developments in products and services in the fields of health and medicine, industry, consumer goods, transportation, public safety, computer technology, and environmental resources.

The following list provides some lasting and wide spread examples from the Apollo programme:

– Freeze drying technologies for food preservation have led to innovations in the food market (e.g. production of corn flakes);

– Computation for automatic checkout of space equipment has led to improvements in retail checkout and banking transactions;

– Space suit fabrics have led to development of environment-friendly building materials and fire resistant materials.

Some more recent examples include:

– Image processing used in automatic space exploration missions has led to applications in medical imagery (tele-medicine);

– Insulation of cryogenic fuel tanks has direct applications in acoustic and thermal insulation;

– Mobile communication platforms for robotic exploration have led to development of explosives detection devices.

Although ESA has invested significantly less into space exploration compared to NASA, a technology transfer programme has been successfully put in place. Pertinent ESA examples include:

– Automatic space craft docking technology (e.g. for ATV) has led to innovations in the car assembly systems;

– Smart suits technologies are now being used for medical monitoring devices;

– Aero braking algorithms are used for crisps packaging;

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[11] Sensors that measure flow of small objects such as micrometeriods and microdebris. Such sensors are mounted on space craft (ISS, Space shuttle, satellites)

– Developing ISS information systems has led to applications in fire fighter emergency planning.

References:

– NASA Hits – how NASA improves our quality of life http://www.nasa.gov/externalflash/hits2_flash/hits1.pdf

– NASA SpinOff, 2009, http://www.sti.nasa.gov/tto/Spinoff2009

– Technology Transfer from Space Spin-off; ESA, NSO, NIVR, April 2010

GLOSSARY

ARV, Advanced Re-entry Vehicle

Space Transportation system for cargo, comprising two main modules: a service module, derived from the ATV spacecraft and a re-entry module. Unlike the ATV, which is destroyed during its return to Earth after supplying the International Space Station, the ARV may make a re-entry to Earth.

ATV, Automated Transfer Vehicle

Unmanned re-supply spacecraft developed by ESA and designed to supply the International Space Station with propellant, water, air, and various other payloads including experiments.

CNES, Centre Nationale d'Etudes Spatiales

The French Space Agency.

ESA, European Space Agency

Inter-governmental organisation established in 1975 to provide for and to promote, for exclusively peaceful purposes, co-operation among European States in space research and technology and their space applications. Today, 18 European Countries are ESA Member States: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

GMES, Global Monitoring for Environment and Security

European initiative for the implementation of information services dealing with environment and security. GMES is based on observation data received from Earth Observation satellites and ground based information. These data are coordinated, analysed and prepared for end-users. It develops a set of services for European citizens helping to improve their quality of life regarding environment and security. GMES plays a strategic role in supporting major EU policies by its services.

GSC, Guyana Space Centre in Kourou

Launch site created in 1964 by France. Since 1977, the site has been exclusively devoted to the Ariane launchers, developed by the European Space Agency and commercially operated by Arianespace. By end 2010 – early 2011 the Soyuz and Vega launchers will also make their first flight from GSC.

ISS, International Space Station

Permanently inhabited space station orbiting the Earth at 400 km altitude for peaceful purposes. Its design, development, operation and utilisation are based on the Inter Governmental Agreement signed in 1998 between the 15 International Partners. The ISS is managed by the following space agencies: ESA (Europe), NASA (USA), Roscosmos (Russia), CSA (Canada) and JAXA (Japan).

Launchers

Rocket-based systems that deliver payloads (satellites, manned vehicles, etc.) into space. They can be heavy, medium and small, according to the relative weight of payloads that a particular launcher can carry into space.

LEO, Low Earth Orbit

Generally considered to be an orbit at an altitude of 400 to 1000 km.

Meteor

Brief streak of light seen in the night sky when a speck of dust burns up as it enters the upper atmosphere. Also known as a shooting star or falling star.

Meteorite

A fragment of rock that survives its fall to Earth from space. Usually named after the place where it fell.

Meteoroid

A piece of rock or dust in space with the potential to enter Earth's atmosphere and become a meteor or meteorite.

NEO, Near Earth Objects

Asteroids or comets whose orbit brings them into close proximity with the Earth (less than 1.3 astronomical unit a unit defined by the Earth – Sun distance).

Payload

Equipment carried by a spacecraft. A product becomes a payload once it is intended to fly on board a spacecraft.

Satellite

A man-made object (such as a spacecraft) placed in orbit around the Earth, another planet or the Sun.

Soyuz Launcher

A launcher system developed by the Soviet Union now also being adapted for use as a medium-lift launcher for Europe.

Solar flare

Sudden violent explosion on the sub-surface of the Sun which occurs above complex active regions in the photosphere. They usually last only a few minutes, but their temperatures may reach hundreds of millions of degrees. Most of their radiation is emitted as X-rays, but they can also be observed in visible light and radio waves. Charged particles ejected by flares can cause aurorae when they reach the Earth a few days later.

Solar storm

Violent outburst of explosive activity on the Sun.

Solar wind

Stream of plasma, mainly electrons and protons, which flows from the Sun's corona at up to 900 km/s. It is found throughout the Solar System as far away as the heliopause.

Spacecraft

Artificial satellite. Term often used before a satellite is placed in orbit around the Earth, when it is transporting something or when it is being sent into deep space.

Space weather

The changing conditions in interplanetary space caused by fluctuations in the solar wind.

SSA, Space Situational Awareness

Comprehensive knowledge, understanding and maintained awareness of the population of space objects (spacecraft such as satellites or space debris), of the space environment, and of the existing threats/risks to space operations. SSA systems rely on ground or space based tracking and monitoring sensors.

The Space Situational Awareness (SSA) Preparatory Programme is a new initiative of ESA, accepted at the November 2008 Ministerial Conference in The Hague. SSA includes activities in three main domains: space surveillance, space weather and Near Earth Objects (NEOs).

CALCULATION METHODOLOGY

The impact assessment provides quantitative estimates of the impact of proposed SSA activities on the basis of available data. The present note explains the methodology followed.

The parameters taken into consideration are the following:

– On 1st April 2010, 183 out of 928 satellites in orbit had EU contractors/owners (19.71%)[12]; it is assumed that the proportion is the same for Low Earth Orbit as for Geosynchronous Orbit;

– There are twice as many commercial satellites in GEO (253) as there are in LEO (130)[13];

– According to Euroconsult, the average satellite price over the next decade will be $99 million and the satellite launch price is predicted to remain flat, at $51 million[14];

– The annual revenue produced downstream by satellite-driven services[15] is estimated to exceed $60 billion US. European industry has managed to retain a market share of about 40% of the space segment[16];

– Nowadays, around half of satellites on orbit are operated commercially and half by governments and the military[17];

– The average number of catastrophic collisions during the next 40 years is one every 5 years[18] in Low Earth Orbit;

– The average number of catastrophic collisions at GEO is 1 every 155 years[19], therefore negligible for the purpose of our calculations; the risk in Medium Earth Orbits is also considered negligible;

– World direct satellite losses due to space weather[20]:

Loss type	Frequency of event	Annualised loss

12 http://www.ucsusa.org/nuclear_weapons_and_global_security/space_weapons/technical_issues/ucs-satellite-database.html

13 http://www.ucsusa.org/assets/documents/nwgs/quick-facts-and-analysis-4-13-09.pdf

14 "Satellites to be Built & Launched by 2018, World Market Survey", Euroconsult, http://www.euroconsult-ec.com/research-reports/space-industry-reports/satellites-to-be-built-launched-by-2018-38-29.html

15 Example of downstream services are telecommunications or TV broadcasting

16 http://telecom.esa.int/telecom/www/object/index.cfm?fobjectid=456

17 http://www.parliament.uk/documents/documents/upload/postpn355.pdf

18 http://www.parliament.uk/documents/documents/upload/postpn355.pdf Page 2 Chart 2

19 http://www.mcgill.ca/files/iasl/Session_5_William_Ailor.pdf

20 http://www.esa-spaceweather.net/spweather/esa_initiatives/spweatherstudies/ALC/WP1200MarketAnalysisfinalreport.pdf

Complete satellite failure	Rare (<3 per solar cycle)	~€30 to 60 million
Service outage	Frequent (up to 60 anomalies per annum)	~ €30 million
Shortened satellite lifetime	Rare (<10 per solar cycle)	~€5-10 million

- Complete satellite failure due to space weather has occurred 11 times in the 25 years[21];
- It is assumed that the average lifetime of a satellite is around10 years;
- For the purpose of calculation we assume that collision take place at satellite's mid life and its cost at this stage would be 50% of its average cost ($99 million), namely $49,5 million;
- For the purpose of this calculation $1 = € 1;
- Damages caused by debris smaller than 10 cm have not been considered.

Calculation of annual direct loss due to collision:

Number of collisions concerning the total satellite population over 40 years in LEO (at one collision every 5 years) = 8 collisions;

Number of EU satellites affected by collisions in the next 40 years [8 collisions x (19.71% of EU satellites over the total satellite population] = 1.57;

Annualised cost of satellite loss over a 40 year period in LEO 1.57 x (satellite cost at midlife, i.e. $49.5 million + cost of launch, i.e. $51 million)/40 years = ~$4 million.

Calculation of annual indirect (revenue) loss due to collision:

Annual revenue produced by EU satellite-driven services ($60 billion x 40%) = $24 billion;

Annual revenue loss per destroyed satellite in LEO [$24 billion / 3 (only 1/3 of commercial satellites are in LEO)] x (19,71% of the 130 commercial satellites in LEO are considered to be EU) = ~$0.32 billion;

Number of EU commercial satellites destroyed over a period of 40 years (1.57 x 50%) = ~0.8;

The total annual revenue losses: [($320 million x 0.8)/40] x 5 (assuming satellite is hit at midlife) = ~$32 million.

Calculation of annualised cost per EU satellite due to space weather

[21] http://www.esa-spaceweather.net/spweather/esa_initiatives/spweatherstudies/RAL/TR110v2_1.pdf-a.pdf

Direct cost due to complete satellite failure is calculated on the basis of the mean value according to table under point 6, which is €45 million x 19.71% EU share of world satellites = ~€9 million;

Annual cost due to Service outage ($30 million) and shortened satellite lifetime ($5 million) as per table under point 6: €35 million x 19.71% = ~€7 million;

Annual revenue loss due to complete failure: [(11 satellites destroyed / 25 years) x 19.71% EU satellites] x € 262 million x 50% commercial satellites x 5 (assuming satellite is lost at midlife) = ~€57 million.

Calculation of annualised cost for satellites due to geomagnetic storms

Severe geomagnetic storms occur at a 1 in 30 year to 1 in 100 year frequency[22]. Potential economic loss has been estimated at more than $70 billion, including lost revenue (~$44 billion) and satellite replacement for GEO satellites (~$24 billion)[23]. Considering a 1 in a 100 years event, world-wide annualised losses would account for $700 million. Assuming that the EU has a 40% share of annual satellite revenue and that EU owns 19,71% of all satellites, the total annualised losses would amount to $223 million.

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22 http://www.ofcm.gov/swef/2009/Booklet%20FINAL%20for%20PDF-website%2020090522.pdf

23 http://www.economics.noaa.gov/?goal=weather&file=events/space&view=benefits

EUROPEAN COMMISSION

Brussels, 4.4.2011
SEC(2011) 380 final
VOLUME 3

ANNEX 2

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Accompanying document to the

COMMUNICATION FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

TOWARDS A SPACE STRATEGY FOR THE EUROPEAN UNION THAT BENEFITS ITS CITIZENS

SEC(2011) 381 final
COM(2011) 152 final

EN EN

EUROBAROMETER

Flash Eurobarometer

European Commission

Space activities of the European Union

Summary

Fieldwork: July 2009

Publication: October 2009

This survey was requested by the Directorate General Enterprise and Industry and coordinated by Directorate General Communication.

This document does not represent the point of view of the European Commission. The interpretations and opinions contained in it are solely those of the authors.

Flash Eurobarometer 272 – The Gallup Organisation

EN

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Flash EB Series #272

Space activities of the European Union

Conducted by
The Gallup Organisation, Hungary
upon the request of Directorate General
Enterprise and Industry

EUROBAROMETER

Survey co-ordinated by
Directorate General Communication

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The interpretations and opinions contained in it are solely those of the authors.

THE GALLUP ORGANISATION

Web-site for downloading the document:
http://ec.europa.eu/public_opinion/index_en.htm

At a glance

The Flash Eurobarometer *Space activities of the European Union* (Flash N° 272) was conducted in order to examine EU citizens' opinions and to assess: a) their awareness of space activities of Europe and the European Union, b) their perception of these activities, and c) their general attitude toward space exploration.

The survey fieldwork was conducted between 3 and 7 July 2009. Over 25,000 randomly selected citizens aged 15 years and over were interviewed in the 27 EU Member States. Interviews were predominantly carried out by fixed-line telephone, reaching ca. 1,000 EU citizens in each country (the size of the sample was 500 in Luxembourg, Malta and Cyprus).

Although interviews were predominantly carried out by telephone via fixed-lines, interviews were also conducted via mobile telephones and by face-to-face (F2F) interviews as appropriate. This methodology ensures that results are representative of the EU27 Member State population. In most of the countries where a large share of residents could not be contacted by fixed-line telephones (as many do not subscribe to such service), a mixed-mode methodology was employed to ensure that these individuals were questioned and this was done either through F2F interviews or by including mobile telephones in the sampling frame. For this survey, mobile telephone interviews were conducted in Austria, Belgium, Finland, Italy, Portugal and Spain, and some F2F interviews in the Czech Republic, Lithuania, Hungary, Slovakia, Latvia, Romania, Estonia, Bulgaria and Poland.

To correct sampling disparities, a post-stratification weighting of the results was implemented, based on key socio-demographic variables.

Key findings include:

- The majority of European Union citizens regard European space activities as important from the perspective of the EU's future global role: one in five citizens considered such activities *very* important (20%) and a further 43% felt that space activities are important.

- When asked about the importance of developing various space-based applications for Europe, EU respondents were most keen on (further) developing environmental/natural monitoring systems: 58% found this *very* important. Regarding other services the mood remained generally positive; the proportion considering these *very* important remains in the one-quarter to one-third range (satellite-based communications, positioning system and satellite-based monitoring to improve citizens' security)

- EU citizens generally acknowledged that there may be various benefits related to space exploration (it may add to human knowledge, it may help to protect our planet, it may help to find new raw materials and energy sources and it may boost economy through technological innovations), and showed a widespread support to extend EU activities in space exploration.

- 26% of all Europeans thought that the EU should *definitely* do more in the field of space exploration, and 38% felt that it should *perhaps* put more emphasis on this field. 30% provided a negative response to this question (28% opposed more involvement and 2% indicated that it does not matter for them whether or not the EU is more active in space exploration).

- Generally speaking there is balance between EU citizens that – in these times of economic and financial crisis – support and do not support an increase in the EU budget devoted to space activities. The 20% who felt that more budgetary resources should be allocated to space activities were outweighed – although only by a slim margin – by those who felt that the EU should reduce such spending (23%). The plurality (43%) felt that the current budget should be maintained. Overall there is strong support for EU funding of space activities at its current level (43%) or at increased level (20%).

At a glance

The Flash Eurobarometer *Space activities of the European Union* (Flash N° 272) was conducted in order to examine EU citizens' opinions and to assess: a) their awareness of space activities of Europe and the European Union, b) their perception of these activities, and c) their general attitude toward space exploration.

The survey fieldwork was conducted between 3 and 7 July 2009. Over 25,000 randomly selected citizens aged 15 years and over were interviewed in the 27 EU Member States. Interviews were predominantly carried out by fixed-line telephone, reaching ca. 1,000 EU citizens in each country (the size of the sample was 500 in Luxembourg, Malta and Cyprus).

Although interviews were predominantly carried out by telephone via fixed-lines, interviews were also conducted via mobile telephones and by face-to-face (F2F) interviews as appropriate. This methodology ensures that results are representative of the EU27 Member State population. In most of the countries where a large share of residents could not be contacted by fixed-line telephones (as many do not subscribe to such service), a mixed-mode methodology was employed to ensure that these individuals were questioned and this was done either through F2F interviews or by including mobile telephones in the sampling frame. For this survey, mobile telephone interviews were conducted in Austria, Belgium, Finland, Italy, Portugal and Spain, and some F2F interviews in the Czech Republic, Lithuania, Hungary, Slovakia, Latvia, Romania, Estonia, Bulgaria and Poland.

To correct sampling disparities, a post-stratification weighting of the results was implemented, based on key socio-demographic variables.

Key findings include:

- The majority of European Union citizens regard European space activities as important from the perspective of the EU's future global role: one in five citizens considered such activities *very* important (20%) and a further 43% felt that space activities are important.

- When asked about the importance of developing various space-based applications for Europe, EU respondents were most keen on (further) developing environmental/natural monitoring systems: 58% found this *very* important. Regarding other services the mood remained generally positive; the proportion considering these *very* important remains in the one-quarter to one-third range (satellite-based communications, positioning system and satellite-based monitoring to improve citizens' security)

- EU citizens generally acknowledged that there may be various benefits related to space exploration (it may add to human knowledge, it may help to protect our planet, it may help to find new raw materials and energy sources and it may boost economy through technological innovations), and showed a widespread support to extend EU activities in space exploration.

- 26% of all Europeans thought that the EU should *definitely* do more in the field of space exploration, and 38% felt that it should *perhaps* put more emphasis on this field. 30% provided a negative response to this question (28% opposed more involvement and 2% indicated that it does not matter for them whether or not the EU is more active in space exploration).

- Generally speaking there is balance between EU citizens that – in these times of economic and financial crisis – support and do not support an increase in the EU budget devoted to space activities. The 20% who felt that more budgetary resources should be allocated to space activities were outweighed – although only by a slim margin – by those who felt that the EU should reduce such spending (23%). The plurality (43%) felt that the current budget should be maintained. Overall there is strong support for EU funding of space activities at its current level (43%) or at increased level (20%).

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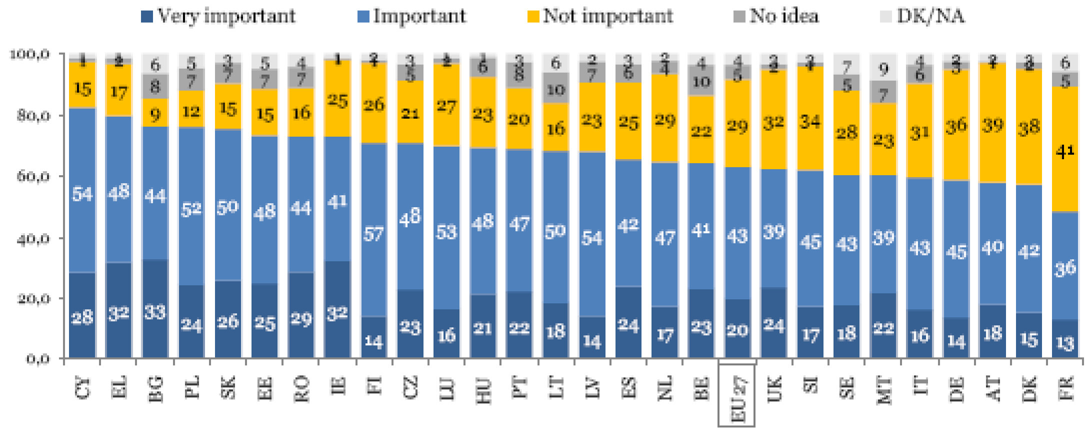
Strategic importance of space research in Europe

The majority of European Union citizens regard European space activities as important from the perspective of the EU's future global role: one in five citizens considered such activities *very* important (20%) and a further 43% felt that space activities are important in this respect. In total, almost two-thirds of Europeans share the view that space activities are important for the future international position of the European Union.

Those considering space activities as important were in the majority in each Member State of the EU. Even in those countries where the proportion of sceptical citizens was the highest (France: 41%, Austria: 39%, Denmark: 38%), most people believed that such activities were important for the EU's future global role.

The ratio of those considering such activities as "very important" remained at or below one-third of all interviewees, with the highest proportion in Bulgaria (33%), Greece (32%) and Ireland (32%). Still, in 22 Member States those who regarded European space activities important or very important exceeded 60%, signalling a positive mood behind initiatives in this area. The general appreciation (using an indicator that combines the "important" and "very important" replies) was highest in Cyprus (82%), Greece (80%) and Bulgaria (77%).

Importance of space activities for the future international position of the EU



Q1. Do you think space exploration and other space activities are important for the future international position of the European Union?
Base: all respondents, % by country

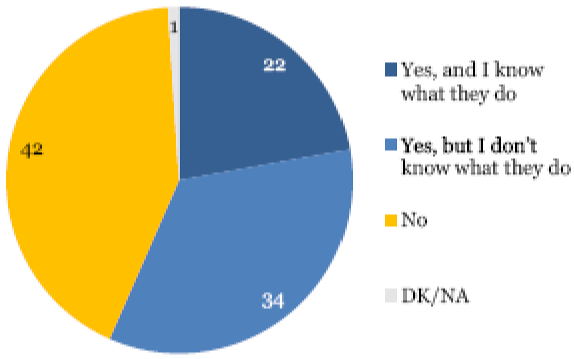
The vast majority of **Europeans agree that technology transfers from the space industry can contribute to innovation in terrestrial applications** (24% agreed strongly and 50% to some extent). Only 16% expressed scepticism at this idea. In addition, almost two-thirds agreed that **space activities may contribute to the success of the European economy at large**: 16% agreed strongly and 48% agreed that space industry activity can boost European competitiveness, economic growth and create jobs in Europe. Pessimism regarding the latter aspect remained at 28% (almost 3 in 10 respondents).

Satellite-based services

European Union countries independently as well as the European Space Agency (ESA) operate a number of satellites to provide information for terrestrial applications (surface/ meteorological/ environmental monitoring, broadcasting and communication, positioning, security applications, etc.).

The majority of Europeans indicated that they are aware that such European Earth Observation satellites exist (56%), and 22% were also confident that they knew what these satellites are used for (34%, albeit aware of their existence, were not sure what function they fulfil). 42% were not aware of (at least the specifically "European") Earth Observation satellites.

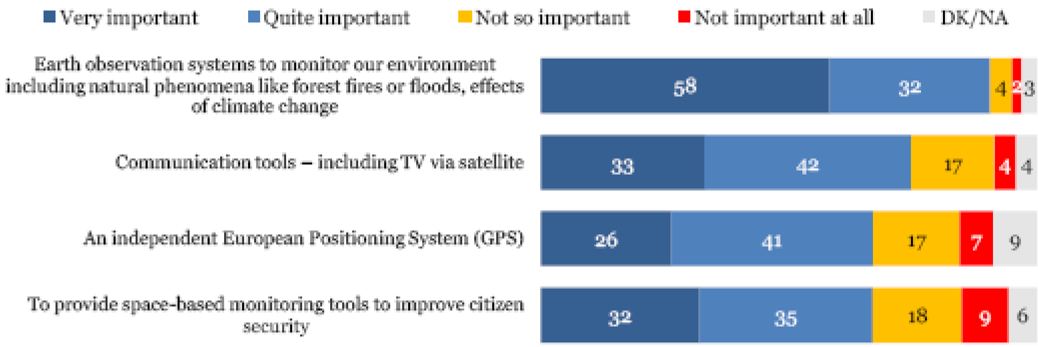
Awareness of the European Earth Observation satellites



Q3. Have you heard about the European Earth Observation satellites?
Base: all respondents, % EU27

When asked about the **importance of developing various space-based applications for Europe**, EU respondents were most keen on (further) developing environmental/natural monitoring systems: 58% found it *very* important that Europe has observation systems able to monitor natural and environmental threats (a mere 6% found this unimportant). When it comes to other applications, the mood remained positive with about two-thirds finding these important or very important, but except for Earth observation systems, at European level those who consider the development of this applications "very important" was lower than those that responded that they were important. Other applications mentioned concerned communications (regarded as at least quite important by 75%), positioning system (67%) and monitoring to improve citizens' security (67%).

Development of various space applications for Europe

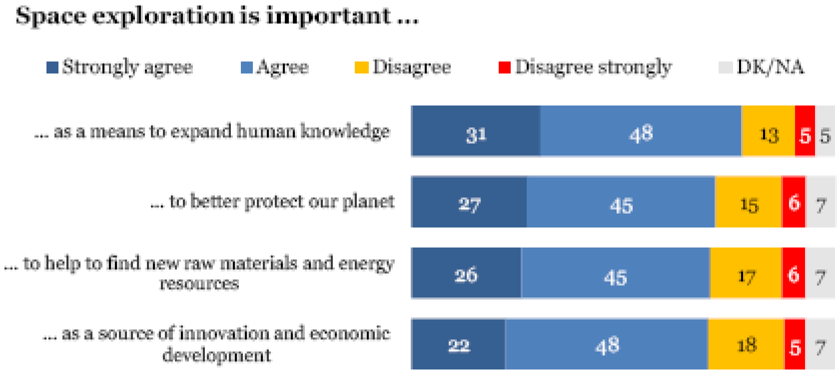


Q4. How important is in your view to develop the following space applications for Europe?
Base: all respondents, % EU27

Overall, 27% found it unimportant to develop satellite-based applications to improve citizens' security, and 24% had a similar opinion about an independent European positioning system. 21% did not think that European satellite-based communication services should be (further) developed.

Space exploration

European citizens tend to link space research and exploration to more abstract benefits. 79% saw it as important due to its contribution to the expansion of human knowledge (about three in ten of those interviewed agreed strongly). 72% believed that space exploration may add to mankind's ability to protect the Earth, 71% believed that space exploration may lead to accessing new energy resources and raw materials, and 70% thought that space research can be a source of innovation and economic development.

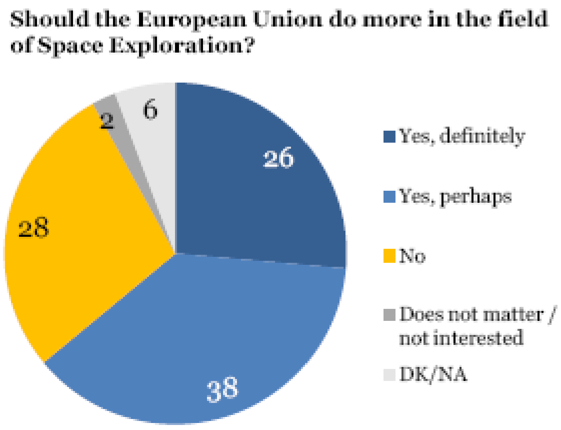


Q5. Please tell me how much do you agree or disagree with the following statements:
Base: all respondents, % EU27

Less than a quarter of respondents disagreed that space exploration is important to achieve the stated objectives, as shown above.

The question of whether **the European Union should do more in the field of space exploration** profoundly divides European citizens. 26% believe that the EU should *definitely* do more, while a similar number of respondents oppose further involvement (28%). A relative majority (38%) is not entirely convinced about the necessity, but feels that the EU should *perhaps* put more emphasis on this field.

Overall, this signals that while a majority favours EU action in the field of space exploration, only some of the supporters seem to be whole-heartedly committed to this. 30% provided an outright negative response to this question (28% opposed more involvement and 2% indicated that it does not matter for them whether or not the EU is more active in space exploration).



Q6. Should the European Union do more on the field of Space Exploration?
Base: all respondents, % EU27

Looking at the results in the various Member States, it appears that the highest levels of support for increased space exploration activities are found in countries that were most likely to acknowledge the importance of the various goals of space exploration: Bulgaria and Greece; in both countries more than half of those interviewed (55%) opted *definitely* for the EU being more active in this area. On the other hand, only about one in five respondents expressed full support in a number of various Member States, including Sweden (16%), France, Finland (both 19%), the Netherlands, Lithuania, Belgium (20% each) as well as in Italy, Slovakia and the Czech Republic (all 21%).

Nevertheless, the definite "no" answer was dominant only in the Netherlands (40%) and scored tied with "perhaps yes" in France (37%), Italy (35%) and Belgium (34%).

Overall there is **strong support for EU funding of space activities** at its current level (43%) or at increased level (20%). The 20% who felt that more budgetary resources should be allocated to space activities were outweighed – although only by a slim margin – by those who felt that the EU should reduce such spending (23%). (The survey was conducted under circumstances characterised by significant economic problems in essentially all Member States of the EU, resulting from the ongoing global economic and financial crisis.) Finally, 15% could not formulate an opinion or were not interested in answering the question.

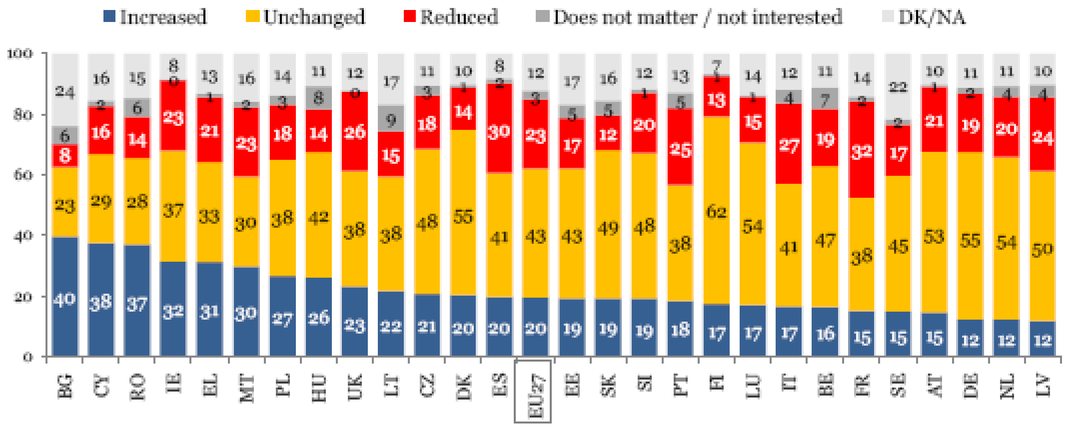
Only in Romania, Cyprus and Bulgaria was stability of the allocated funds *not* the most frequent answer (with most citizens supporting an increased budget) – in the rest of the countries the largest segment of the public tended to prefer maintaining the current EU space budget.

Reducing the European budget for space activities is an option shared by only 23% of the Europeans, with the highest scores recorded in France (32%), Spain (30%), Italy (27%) and United Kingdom (26%) and the lowest in Bulgaria (8%), Slovakia (12%) and Finland (13%).

While generally this study found only cosmetic variations of attitudes across Member States (that is, in most questions discussed thus far the predominant EU27 patterns were replicated in all Member States to a varying extent), this question brought up a divided picture across EU countries.

In five Member States those who felt that more funds should be allocated to space activities on EU level outnumbered those who rather desired reduction of such funds *by at least 10 percentage points*: Greece (increase: 31%, reduction: 21%[1]), Hungary (i: 26%, r: 14%), Cyprus (i: 38%, r: 16%), Romania (i: 37%, r: 14%), Bulgaria (i: 40%, r: 8%).

The share of the European budget to cover all space activities including space exploration should be...



Q7. There are various budget priorities for the European Union. According to you, the share of the European budget to cover all space activities including space exploration should be:
Base: all respondents, % by country

In contrast, an opposite difference with a similar order of magnitude (10 percentage points) was also found, in four Member States: France (i: 15%, r: 32%), Latvia (i: 12%, r: 24%), Spain (i: 20%, r: 30%) and Italy (i: 17%, r: 27%).

[1] percentages for the other countries are provided respectively

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Remote Sensing Data Policy (RSDP – 2011)

Recognising that Remote Sensing data provides much essential and critical information - which is an input for developmental activities at different levels, and is also of benefit to society;

Noting that a large number of users - both within and outside government, use Remote Sensing data from Indian and foreign remote sensing satellites for various developmental applications;

Taking into consideration the recent availability of very high-resolution images, from foreign and commercial remote sensing satellites, and noting the need for proper and better management of the data acquisition/ distribution from these satellites in India;

Recognising that national interest is paramount, and that security consideration of the country needs to be given utmost importance;

The Government of India adopts the **Remote Sensing Data Policy (RSDP) - 2011** containing modalities for managing and/ or permitting the acquisition/ dissemination of remote sensing data in support of developmental activities.

Department of Space (DOS) of the Government of India shall be the nodal agency for all actions under this policy, unless otherwise stated.

1. For operating a remote sensing satellite from India, license and/ or permission of the Government, through the nodal agency, shall be necessary.

    a. As a national commitment and as a "public good", Government assures a continuous and improved observing/ imaging capability from its own Indian Remote Sensing Satellites (IRS) programme.

    b. The Government, through the nodal agency, shall be the sole and exclusive owner of all data collected/ received from IRS. All users will be provided with only a license to use the said data, and add value to the satellite data.

    c. Government reserves the right to impose control over imaging tasks and distribution of data from IRS or any other Indian remote sensing satellite, when it is of the opinion that national security and/ or international obligations and/ or foreign policies of the Government so require.

2. For acquisition/ distribution of remote sensing data within India, license/ permission from the Government of India, through the nodal agency, shall be necessary.

   a. Government reserves the right to select and permit agencies to acquire/ distribute satellite remote sensing data in India. DOS shall be competent to decide on the procedure for granting license/ permission for dissemination of such data, and for the levy of necessary fees.

   b. To cater to the developmental needs of the country, the National Remote Sensing Centre (NRSC) of the Indian Space Research Organisation (ISRO)/ DOS is vested with the authority to acquire and disseminate all satellite remote sensing data in India, both from Indian and foreign satellites.

      i. NRSC shall enter into appropriate arrangements with DOS for acquiring/ distributing data from IRS within the visibility circle of NRSC's receiving station(s).

      ii. NRSC and/ or Antrix Corporation Ltd., shall be competent to enter into agreements with foreign satellite operator(s) for acquisition/distribution of foreign satellite data in India. However, NRSC will distribute the data as per terms agreed to with Antrix Corporation Ltd.

   c. NRSC shall maintain a systematic National Remote Sensing Data Archive, and a log of all acquisitions/ sales of data for all satellites.

3. For acquisition and distribution of IRS data for use in countries other than India, the Government of India, through the nodal agency, shall grant license to such bodies/ agencies of those countries as are interested in the acquisition/ distribution of IRS data, as per specific procedures.

   a. The Antrix Corporation Ltd. (of DOS) is vested with the authority for receiving the applications for grant of license for acquisition/ distribution of IRS data outside of India; to consider and decide on the granting of license within the policy considerations of the Government, and to enter into licensing agreements with the prospective users on behalf of the Government. Antrix Corporation Ltd. shall also be competent to levy such fees for granting licenses as may be considered appropriate by it. It shall also be responsible, where necessary, for rendering any further help/ guidance needed by the license.

b. The Government reserves right to impose restrictions over imaging tasks and distribution of IRS data in any country when it is of the opinion that national security and/ or international obligations and/ or foreign policies of the Government so require.

4. The Government prescribes the following guidelines to be adopted for dissemination of satellite remote sensing data in India:

    a. All data of resolutions up to 1 m shall be distributed on a non-discriminatory basis and on “as requested basis”.

    b. With a view to protect national security interests, all data of better than 1 m resolution shall be screened and cleared by the appropriate agency prior to distribution; and the following procedure shall be followed:

        1. Government users namely, Ministries/ Departments/ Public Sector/ Autonomous Bodies/ Government R&D institutions/ Government Educational/ Academic Institutions, can obtain the data without any further clearance.

        2. Private sector agencies, recommended at least by one Government agency, for supporting development activities, can obtain the data without any further clearance.

        3. Other private, foreign and other users, including web based service providers, can obtain the data after further clearance from an inter-agency High Resolution Image Clearance Committee (HRC), already in place.

        4. Specific requests for data of sensitive areas, by any user, can be serviced only after obtaining clearance from the HRC.

        5. Specific sale/ non-disclosure agreements to be concluded between NRSC and other users for data of better than 1 m resolution.

5. This Policy (RSDP-2011) comes into effect immediately, and may be reviewed from time-to-time-by Government.

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DOF: 30/07/2010

DECRETO por el que se expide la Ley que crea la Agencia Espacial Mexicana.

Al margen un sello con el Escudo Nacional, que dice: Estados Unidos Mexicanos.- Presidencia de la República.

FELIPE DE JESÚS CALDERÓN HINOJOSA, Presidente de los Estados Unidos Mexicanos, a sus habitantes sabed:

Que el Honorable Congreso de la Unión, se ha servido dirigirme el siguiente

DECRETO

"EL CONGRESO GENERAL DE LOS ESTADOS UNIDOS MEXICANOS, D E C R E T A :

SE EXPIDE LA LEY QUE CREA LA AGENCIA ESPACIAL MEXICANA.

ARTÍCULO ÚNICO. Se expide la Ley que crea la Agencia Espacial Mexicana.

CAPÍTULO I

Disposiciones Generales

Artículo 1. Se crea la Agencia Espacial Mexicana como organismo público descentralizado, con personalidad jurídica y patrimonio propio y con autonomía técnica y de gestión para el cumplimiento de sus atribuciones, objetivos y fines.

El organismo formará parte del sector coordinado por la Secretaría de Comunicaciones y Transportes. Su domicilio legal será la Ciudad de México, Distrito Federal, sin perjuicio de establecer oficinas y domicilios convencionales en cualquier parte del país.

Artículo 2. La Agencia Espacial Mexicana tendrá por objeto:

I. Formular y proponer al titular de la Secretaría de Comunicaciones y Transportes las líneas generales de la Política Espacial de México, así como el Programa Nacional de Actividades Espaciales;

II. Ejecutar la Política Espacial de México, a través de la elaboración y aplicación del Programa Nacional de Actividades Espaciales;

III. Promover el efectivo desarrollo de actividades espaciales para ampliar las capacidades del país en las ramas educativa, industrial, científica y tecnológica en materia espacial;

IV. Desarrollar la capacidad científico-tecnológica del país a través de la articulación de los sectores involucrados en todos los campos de la actividad espacial que hagan posible su actuación en un marco de autonomía nacional en la materia;

V. Promover el desarrollo de los sistemas espaciales y los medios, tecnología e infraestructura necesarios para la consolidación y autonomía de este sector en México;

VI. Facilitar la incorporación de los sectores relacionados a esta política y particularmente la participación del sector productivo, a fin de que éste adquiera competitividad en los mercados de bienes y servicios espaciales;

VII. Promover una activa cooperación internacional mediante acuerdos que beneficien a las actividades espaciales y que permitan la integración activa de México a la Comunidad Espacial Internacional;

VIII. Servir como instrumento de la rectoría del Estado en este sector, a fin de fortalecer la soberanía;

IX. Velar por el interés y seguridad nacionales, mediante una estrategia que integre conocimiento científico y tecnológico, eficiencia, experiencia y capacidad de coordinación entre las entidades públicas de la Administración Pública Federal;

X. Garantizar y preservar el interés público y la protección de la población, como fundamentos del desarrollo, seguridad, paz y prevención de problemas de seguridad nacional en México, y

XI. Recibir de las entidades públicas, privadas y sociales, propuestas y observaciones en el área espacial para su estudio y consideración.

Artículo 3. Son instrumentos de la Política Espacial de México:

I. La selección de alternativas tecnológicas para la solución de problemas nacionales;

II. El desarrollo de soluciones propias para problemas específicos;

III. La utilización de información y tecnología generada en las áreas espaciales y relacionadas, quesean de interés y para el beneficio de la sociedad mexicana;

IV. Negociaciones, acuerdos y tratados internacionales en materias relacionadas con las actividades espaciales;

V. Las investigaciones en materia espacial y la formación de recursos humanos de alto nivel, así como la infraestructura necesaria para dicho fin;

VI. El reconocimiento de la importancia que para la economía, la educación, la cultura y la vida social, tiene el desarrollo, apropiación y utilización de los conocimientos científicos y desarrollos tecnológicos asociados a la investigación espacial;

VII. El intercambio académico entre instituciones de investigación científica y tecnológica nacionales y extranjeras;

VIII. El intercambio científico, tecnológico y de colaboración con otras agencias espaciales;

IX. La participación de las empresas mexicanas con la capacidad tecnológica necesaria para proveer de equipos, materiales, insumos y servicios que requieran proyectos propios o de agencias con lasque se tengan protocolos de intercambio y colaboración, y

X. La adecuación del sector productivo nacional para participar y adquirir competitividad en los mercados de bienes y servicios espaciales.

Artículo 4. Para el cumplimiento de su objeto, la Agencia tendrá las siguientes funciones:

I. Impulsar estudios y desarrollo de investigaciones científicas y tecnológicas en la materia y en las áreas prioritarias de atención definidas en el Programa Nacional de Actividades Espaciales;

II. Establecer y desarrollar actividades de vinculación con instituciones nacionales de carácter académico, tecnológico y profesional dedicadas a estudios de especialidades relacionadas con la materia;

III. Promover el desarrollo de actividades espaciales para ampliar las capacidades del país, tanto en esta materia como en lo que a la industria aeronáutica, las telecomunicaciones y todas sus aplicaciones relacionadas con la ciencia y la tecnología espacial corresponde;

IV. Apoyar la adecuación de los sectores relacionados con la política espacial, particularmente el productivo, para que se incorporen y participen competitivamente en los mercados de bienes y servicios espaciales;

V. Promover la formación, el acercamiento y la colaboración entre instituciones, organismos públicos y privados nacionales, extranjeros o internacionales, que realicen actividades en materia espacial, así como el desarrollo de los sistemas espaciales y los medios, tecnología, infraestructura y formación de los recursos humanos necesarios para la consolidación y autonomía de este sector en México;

VI. Promover la firma de tratados internacionales de carácter bilateral y multilateral, y asesorar al Gobierno Federal en la implementación de los mismos, así como en la interpretación de textos internacionales relativos;

VII. Diseñar estrategias e instrumentos para el desarrollo del conocimiento, difusión y aplicación de las ciencias y tecnologías asociadas a la investigación espacial, en coordinación con dependencias de los tres órdenes de gobierno, así como con las instancias de la iniciativa privada y organizaciones de la sociedad civil interesadas;

VIII. Definir y promover programas, proyectos y acciones para fortalecer conocimiento y el desarrollo de la investigación espacial, su influencia en la vida cotidiana y sus potencialidades como factor de desarrollo económico;

IX. Impulsar investigaciones a través de las instituciones de investigación básica y aplicada y/o empresas especializadas, así como la difusión de sus resultados y aplicaciones;

X. Realizar investigaciones, trabajos, peritajes y emitir opiniones de carácter técnico, científico y legal sobre la materia;

XI. Impulsar la formación de especialistas en materia espacial y sus disciplinas afines, mediante la vinculación de actividades y programas de licenciatura, posgrado, diplomados y cursos de especialización, actualización y capacitación;

XII. Formular y realizar proyectos de difusión y educativos en la materia, así como elaborar y promover la producción de materiales de divulgación;

XIII. Crear y operar un sistema de información y consulta en la materia; llevar el registro nacional delas actividades relativas y promover el desarrollo y la educación espacial formal, así como la divulgación de estudios sobre investigación espacial, y

XIV. Las demás que se deriven de los ordenamientos jurídicos y administrativos aplicables en la materia.

Artículo 5. Son atribuciones de la Agencia Espacial Mexicana:

I. Coordinar el desarrollo de los sistemas de normalización, acreditación y certificación en la materia, en colaboración con las dependencias nacionales y organismos extranjeros e internacionales competentes;

II. Difundir lo dispuesto en la Constitución, esta Ley y los tratados internacionales ratificados por México en la materia, para aprovechar las oportunidades de desarrollo que puedan permitir estos últimos, y expedir a los tres órdenes de gobierno recomendaciones pertinentes para su desarrollo y aprovechamiento;

III. Promover y apoyar la creación y funcionamiento de instancias afines en los estados y municipios, conforme a las leyes aplicables en las entidades federativas y de acuerdo a sus realidades, necesidades y capacidades de participación en proyectos;

IV. Formular el Programa Nacional de Actividades Espaciales, gestionar y ejercer el presupuesto necesario para la realización de sus fines, así como procurar fuentes alternas de financiamiento;

V. Asesorar y resolver consultas que le formulen instituciones y dependencias de los diferentes órdenes y ramas de gobierno, sobre los problemas relativos a concesiones, permisos y autorizaciones de uso, desarrollo y aplicaciones tecnológicas en materia espacial;

VI. Realizar eventos científicos y tecnológicos en materia espacial, donde participen integrantes de la Agencia y especialistas invitados nacionales y extranjeros;

VII. Proponer la designación de los representantes del país ante las instancias internacionales en materia espacial de las que México sea parte y establecer la postura nacional en materia de su competencia;

VIII. Realizar y participar en acciones y eventos científicos y tecnológicos en materia espacial, con el fin de incrementar la competencia técnico científica nacional, y

IX. Ejecutar todos los demás actos análogos que impliquen la realización de sus atribuciones.

CAPÍTULO II

Organización y Funcionamiento

Artículo 6. La Agencia contará con los siguientes órganos de administración y gobierno:

I. Junta de Gobierno;

II. Dirección General;

III. Órgano de Vigilancia, y

IV. Las estructuras técnicas y administrativas que se establezcan en el Estatuto Orgánico.

Artículo 7. La Junta de Gobierno de la Agencia Espacial Mexicana estará integrada por 15 miembros, que serán:

I. El titular de la Secretaría de Comunicaciones y Transportes, quien la presidirá;

II. Un representante de la Secretaría de Gobernación que deberá tener nivel de subsecretario;

III. Un representante de la Secretaría de Relaciones Exteriores que deberá tener nivel de subsecretario;

IV. Un representante de la Secretaría de Educación Pública que deberá tener nivel de subsecretario;

V. Un representante de la Secretaría de Hacienda y Crédito Público que deberá tener nivel de subsecretario;

VI. Un representante de la Secretaría de la Defensa Nacional que deberá tener nivel de subsecretario;

VII. Un representante de la Secretaría de Marina que deberá tener nivel de subsecretario;

VIII. El titular del Consejo Nacional de Ciencia y Tecnología;

IX. El Rector de la Universidad Nacional Autónoma de México;

X. El Director General del Instituto Politécnico Nacional;

XI. El Presidente de la Academia Mexicana de Ciencias;

XII. El Presidente de la Academia de Ingeniería;

XIII. El Presidente de la Academia Nacional de Medicina;

XIV. Un representante de la Asociación Nacional de Universidades e Instituciones de Educación Superior, y

XV. El titular del Instituto Nacional de Estadística y Geografía.

Por cada miembro propietario de la Junta de Gobierno habrá un suplente designado por el titular, quien en su caso deberá tener el nivel de director general o equivalente. El suplente contará con las mismas facultades que los propietarios y podrá asistir, con voz y voto, a las sesiones de la Junta, cuando el propietario respectivo no concurra.

Artículo 8. La Junta de Gobierno sesionará por lo menos cuatro veces al año y las sesiones que celebre podrán ser ordinarias y extraordinarias.

Sesionará válidamente con la asistencia de por lo menos ocho de sus miembros; y sus resoluciones serán válidas cuando sean tomadas por la mayoría de los presentes. Sólo en caso de empate, el presidente de la Junta de Gobierno decidirá con voto de calidad.

La Junta de Gobierno tendrá un Secretario Técnico y un Prosecretario, quienes serán los responsables de preparar lo necesario para sus sesiones, integrar las carpetas básicas y dar seguimiento a los acuerdos.

Artículo 9. La Junta de Gobierno tendrá las siguientes facultades indelegables:

I. Formular y proponer al titular de la Secretaría de Comunicaciones y Transportes las líneas generales de la política espacial de México y, así como el Programa Nacional de Actividades Espaciales;

II. Definir prioridades, conocer y aprobar programas y proyectos de la Agencia;

III. Aprobar recomendaciones, orientaciones y acuerdos de política y acciones en materia espacial;

IV. Proponer y aprobar acciones que aseguren el cumplimiento de tratados, convenciones y acuerdos internacionales signados y ratificados por México en la materia;

V. Aprobar políticas en materia de evaluación, seguimiento, promoción y orientación de los programas de la Agencia;

VI. Conocer y en su caso aprobar los informes del Director General;

VII. Autorizar los programas y el proyecto de presupuesto de la Agencia, así como las modificaciones en su ejercicio;

VIII. Conocer y en su caso aprobar los estados financieros de la Agencia y autorizar su publicación;

IX. Aprobar acuerdos, bases de coordinación y convenios de colaboración con autoridades y organismos relacionados con la materia, instituciones académicas, de investigación y asociaciones;

X. Fijar bases y mecanismos de coordinación, participación y colaboración con autoridades e instituciones, particulares y grupos sociales e instituciones autónomas;

XI. Fijar criterios y bases para crear o ampliar instancias locales afines asociadas;

XII. Analizar y en su caso aprobar el Reglamento, Estatuto Orgánico, Manual de Organización, Manual de Procedimientos y Manual de Servicios de la Agencia, y

XIII. Las demás que le señalen la presente Ley y otros ordenamientos.

Artículo 10. El Director General de la Agencia será nombrado y removido por el titular del Ejecutivo Federal. El nombramiento será por un periodo de cuatro años, con posibilidad de un periodo adicional.

Para ser Director General deberán cumplirse los siguientes requisitos:

I. Ser ciudadano mexicano por nacimiento, mayor de 30 años y estar en pleno goce y ejercicio de sus derechos civiles y políticos;

II. Haber desempeñado cargos de alto nivel decisorio y contar con conocimientos y experiencia en materia técnica y espacial por lo menos cinco años, y

III. No encontrarse comprendido en alguno de los impedimentos que establecen la Ley Federal de las Entidades Paraestatales o la Ley Federal de Responsabilidades de los Servidores Públicos.

Artículo 11. Son causas de remoción del Director General, aquellas que marca la Ley Federal de Responsabilidades de los Servidores Públicos y el marco legal aplicable.

Artículo 12. El Director General es el responsable de la conducción, administración y buena marcha de la Agencia, y tendrá las siguientes facultades:

I. Elaborar el Programa Nacional de Actividades Espaciales y someterlo a la aprobación de la Junta de Gobierno;

II. Celebrar y otorgar toda clase de actos y documentos inherentes a su objeto;

III. Ejercer las más amplias facultades de dominio, administración y pleitos y cobranzas, aun de aquellas que requieran de autorización especial, según otras disposiciones legales o reglamentarias con apego a la Ley;

IV. Emitir, avalar y negociar títulos de crédito;

V. Formular querellas y otorgar perdón;

VI. Ejercitar y desistirse de acciones judiciales, inclusive del juicio de amparo;

VII. Comprometer asuntos en arbitraje y celebrar transacciones;

VIII. Otorgar poderes generales y especiales con las facultades que le competan, entre ellas las que requieran autorización o cláusula especial;

IX. Informar a la Junta de Gobierno respecto a sus actividades;

X. Elaborar el proyecto de Reglamento Interno, Estatuto Orgánico, el Manual de Organización General, los de Procedimientos y de Servicios al Público de la Agencia.

XI. Sustituir y revocar poderes generales o especiales;

XII. Dar seguimiento y cumplimiento a los acuerdos de la Junta de Gobierno, y

XIII. Las demás que le señalen el Estatuto Orgánico, la presente Ley y otros ordenamientos.

Artículo 13. La vigilancia del organismo estará a cargo del Gobierno Federal, por conducto de un Comisario Público propietario y un suplente, designados por la Secretaría de la Función Pública; lo anterior, sin perjuicio de sus propios órganos internos de control que sean parte integrante de la estructura del organismo.

El Comisario Público asistirá, con voz pero sin voto, a las sesiones de la Junta de Gobierno.

Artículo 14. El Comisario Público evaluará el desempeño global y por áreas del organismo, su nivel de eficiencia, y el apego a las disposiciones legales, así como el manejo de sus ingresos y egresos, pudiendo solicitar y estando el organismo obligado a proporcionar toda la información que requiera para la realización de sus funciones.

Tendrá a su cargo las atribuciones que le confieren los artículos correspondientes de la Ley Federal de las Entidades Paraestatales, así como las del Reglamento Interno de la Agencia y las demás disposiciones legales aplicables.

Artículo 15. Las relaciones laborales entre la Agencia Espacial Mexicana y sus trabajadores se regirán por lo dispuesto en el Apartado B del artículo 123 de la Constitución Política de los Estados Unidos Mexicanos, la Ley Federal del Trabajo y las demás disposiciones legales y reglamentarias de la misma.

CAPÍTULO III

Del Presupuesto y Patrimonio

Artículo 16. La Agencia administrará su patrimonio conforme a las disposiciones legales aplicables y a los programas y presupuestos que formule anualmente y que apruebe su Junta de Gobierno.

Artículo 17. El patrimonio de la Agencia se integrará con:

I. Los bienes muebles e inmuebles que se destinen a su servicio;

II. La cantidad que se le asigne en el Presupuesto de Egresos de la Federación para su funcionamiento;

III. Los ingresos que perciba por los servicios que preste;

IV. Las donaciones y legados que se otorguen a su favor;

V. Los demás bienes, derechos y recursos que adquiera por cualquier otro título legal;

VI. Los ingresos de la Agencia generados por servicios, aportaciones, donaciones o cualquier otro concepto provenientes de sus propias actividades o de instituciones u organismos públicos o privados nacionales o extranjeros, no tendrán que ser concentrados en la Tesorería de la Federación para su reasignación a la Agencia, y

VII. Los recursos que ingresen a la Agencia por los conceptos señalados en el apartado anterior, deberán ser aplicados precisamente para los fines, programas y proyectos que sean autorizados por la Junta Directiva.

TRANSITORIOS

Artículo Primero. El presente Decreto entrará en vigor al día siguiente de su publicación en el Diario Oficial de la Federación.

Artículo Segundo. La Junta de Gobierno se instalará en un periodo no mayor a los cuarenta y cinco días naturales siguientes a la entrada en vigor del presente Decreto.

Artículo Tercero. Una vez instalada la Junta de Gobierno, ésta organizará y convocará a foros y mesas permanentes de trabajo para que en un plazo no mayor a ciento ochenta días, expertos en materia espacial, tanto nacionales como extranjeros, así como Instituciones de Educación Superior y Centros Públicos de Investigación, discutan y formulen las líneas generales de la Política Espacial de México que será desarrollada por la Agencia Espacial Mexicana.

Artículo Cuarto. Una vez concluidos los foros y mesas permanentes de trabajo, el Presidente de la Junta de Gobierno expedirá la convocatoria para la designación del Director General de la Agencia Espacial Mexicana, quien será nombrado en un periodo no mayor a los treinta días naturales siguientes a partir de la expedición de dicha convocatoria y de acuerdo a lo dispuesto en este Decreto.

Artículo Quinto. El Director General de la Agencia contará con un plazo de noventa días naturales a partir de su nombramiento para elaborar y presentar el Programa Nacional de Actividades Espaciales, el proyecto de Reglamento Interior, así como el proyecto de Estatuto Orgánico que le permitan a la Agencia cumplir sus unciones, los cuales serán aprobados por la Junta de Gobierno en un plazo no mayor a noventa días naturales a partir de su presentación.

México, D.F., a 20 de abril de 2010.- Sen. **Carlos Navarrete Ruiz**, Presidente.- Dip. **Francisco Javier Ramírez Acuña**, Presidente.- Sen. **Martha Leticia Sosa Govea**, Secretaria.- Dip. **Jaime Arturo Vázquez Aguilar**, Secretario.- Rúbricas."

En cumplimiento de lo dispuesto por la fracción I del Artículo 89 de la Constitución Política de los Estados Unidos Mexicanos, y para su debida publicación y observancia, expido el presente Decreto en la Residencia del Poder Ejecutivo Federal, en la Ciudad de México, Distrito Federal, a trece de julio de dos mil diez.- **Felipe de Jesús Calderón Hinojosa**.- Rúbrica.- El Secretario de Gobernación, Lic. **Fernando Francisco Gómez Mont Urueta**.- Rúbrica.

UK Space Agency Strategy 2011 – 2015

Consultation Document

1 April 2011

Response Date: 8 July 2011

An Executive Agency of:

BIS

Department for Business Innovation & Skills

URN **11/834**

Contents

UK Space Agency Strategy 2011-2015: Consultation

This consultation document seeks the views of stakeholders on what the UK Space Agency strategy should be for 2011-2015 towards the aim of leading and sustaining the growth of the UK space sector.

It is likely to be of particular interest to members of: (i) the UK space industry; (ii) UK space-related academia and users of space applications; and (iii) the UK public with an interest in UK space policy.

Issued: **1 April 2011**

Respond by: **8 July 2011**

Enquiries to:

UK Space Strategy Consultation
c/o Emma Lord
Director of Policy and Operations
UK Space Agency
C204 Polaris House
North Star Avenue
Swindon
Wilts SN2 1SZ

Tel: 44 (0)20 7215 5000
Email: emma.lord@ukspaceagency.bis.gsi.gov.uk

1. Foreword by David Willetts, Minister of State for Universities and Science

Fifty years ago, when the first UK satellite was being built, space was at the frontier of science and Cold War rivalry. Today, our everyday lives depend on space technology: it is woven into the economy in a way unimaginable at the dawn of the space age. But the global space scene is changing rapidly. In response, UK civil space policy must anticipate and react to developments being driven both by the emergence of ground-breaking technologies and by the needs of society. The creation of the UK Space Agency allows the UK to embrace these changes and take full advantage of the opportunities that lie ahead.

The UK's space industry provides important economic and social benefits for UK citizens. The UK's space sector already has strength in core space markets such as telecommunications, weather forecasting, navigation, and observation imagery. The UK also has a strong space research community, able to respond to the new scientific challenges, such as mapping the mysterious dark energy across the Universe and searching for places beyond Earth that could support life. These scientific challenges will help drive innovation and develop new skills.

UK companies manufacture and operate satellites, collect space data and provide services that generate high value. Continuing economic growth will depend on a strong UK presence in markets of the future - for example: satellite broadband; Earth observation; and applications that integrate space and terrestrial data for new-high value uses.

With all the success to date, space is still an industry for the future. The UK Space Agency's strategy for civil space policy responds to the complex and rapidly developing landscape in order to answer the needs of industry, the research community and the citizen.

I therefore invite you to respond to this consultation document. It aims to set out the priorities for the UK Space Agency in a national civil space strategy which will replace the existing 2008-2012 strategy. Whether you are in the space community, or have an interest in space, please let us know what you think. We will consider your views carefully before finalising the strategy.

Thank you for your help.

David Willetts

2. How to respond

When responding, please state whether you are responding as an individual or representing the views of an organisation. If responding on behalf of an organisation, please ensure it is clear whom the organisation represents and, where applicable, how the views of members were assembled.

Please send responses to:

UK Space Strategy Consultation
c/o Emma Lord
Director of Policy and Operations
UK Space Agency
C204 Polaris House
North Star Avenue
Swindon
Wilts SN2 1SZ

Tel: 44 (0)20 7215 5000
Email: emma.lord@ukspaceagency.bis.gsi.gov.uk

We do not intend to acknowledge receipt of individual responses unless explicitly requested by respondents.

Any enquiries about this document may be sent to the same address. If enquiries are from a representative body, please summarise the persons or organisations represented.
Please see section on confidentiality and data protection below.

3. Additional copies

You may make copies of this document without seeking permission. Further printed copies of the consultation document can be obtained from the address above.

An electronic version can be found at on the UK Space Agency website at www.bis.gov.uk/ukspaceagency/who-we-are/strategy or on the BIS website at http://bis.ecgroup.net/Publications/UKSpaceAgency.aspx

We will arrange for alternative formats to be provided if necessary.

4. Confidentiality and data protection

Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information regimes (these are primarily the Freedom of Information Act 2000 (FOIA), the Data Protection Act 1998 (DPA) and the Environmental Information Regulations 2004). If you want other information that you provide to be treated as confidential, please be aware that, under the FOI, there is a statutory Code of Practice with which public authorities must comply and which deals, amongst other things, with obligations of confidence.

In view of this, it would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on the Department.

The Department will process your personal data in accordance with the DPA and in the majority of circumstances this will mean that your personal data will not be disclosed to third parties.

5. Help with queries

Any comments or complaints about the conduct of this consultation should be addressed to:

Louise Bergin
UK Space Agency
C204 Polaris House
North Star Avenue
Swindon
Wilts SN2 1SZ

Tel: 44 (0)20 7215 5000
Email: louise.bergin@ukspaceagency.bis.gsi.gov.uk

A copy of the Code of Practice on Consultation criteria is attached at Annex A.

6. The Consultation

Background

In the current economic climate it is important to show how the UK's support for research and innovation is of major importance to the UK economic growth and social infrastructure. Space is demonstrating a clear added value in this way across the economy as a whole. It is making a significant contribution in our scientific understanding of the Universe, our ability to manage and understand the climate and environment of our planet, to defence, and to economic services and products. Underpinning this is a leading edge technological and engineering capability in both industry and academia.

It is in this context that the Department for Business, Innovation and Skills (BIS) is launching a formal consultation on what the UK civil space strategy should be for 2011-2015 in order to deliver value for money and maximise the economic benefits of space activities. This consultation is without prejudice to any future spending decisions.

Your views are welcome on any or all of the strategy themes detailed in this document.

The UK Civil Space Strategy

The UK's current civil space strategy aims to support the Government's ambition of achieving excellence in science, supporting industry in key areas of wealth creation and encouraging innovation. This can be found at:
http://www.bis.gov.uk/assets/bispartners/ukspaceagency/docs/ukcss2008-2010.pdf

Given recent developments in the UK's civil space programme such as the formation of the Agency and the publication of industry's Space Innovation and Growth Strategy (IGS), there is an urgent need to update the document.

About The UK Space Agency

The UK Space Agency is at the heart of UK efforts to explore space, exploit space-based applications and technology and support our academic and industrial communities.
The UK Space Agency was launched officially on 23 March 2010 and became an executive agency of BIS from 1 April 2011. The Agency is responsible for all strategic decisions on the UK civil space programme and provides a clear, single voice for UK space ambitions.

The UK Space Agency:

- co-ordinates UK civil space activity;
- supports academic research;
- nurtures the UK space industry;
- raises the profile of UK space activities at home and abroad;
- works to increase understanding of space and its practical benefits and;
- inspires our next generation of UK scientists and engineers.

The Draft Strategy

The draft strategy is markedly different in tone and style than previous versions. It is relatively brief and draws on the Space IGS for its inspiration by taking growth as the over-arching theme. The strategy sets out six areas of focus and describes how each area is important to the growth agenda. The strategy also sets out what the UK Space Agency will do to achieve the ambition of each of these themes.

The areas the strategy sets out are:

1. Growth through new opportunities

Opportunities are opening to offer space-based services to an increasing range of customers, from the general public to multi-national organisations. Possible new areas include the provision of information systems to support carbon trading; systems for space surveillance to alert us to natural and man-made hazards which threaten critical space infrastructure; innovative launch systems; services to support space exploration; and space tourism. Countries which recognise these new markets and invest early will reap the rewards.

2. Growth from export

To realise the UK's objective to grow its share of the global market to 10% by 2030 the new services and products need to be turned into sales. The UK Space Agency has a role to play in assisting the space sector to capture more business in all areas but particularly the global commercial and security markets which are forecast to grow most strongly.

3. Innovation supporting growth

Space is at the cutting edge of technology, data processing and analysis. UK academia works in partnership with industry to deliver new missions, instrumentation, and data analysis techniques. This brings mutual benefits and underpins the UK space sector growth. These benefits flow out into the commercial sector, for example delivering new types of data processing systems; advanced structures; and electric propulsion.

The UK is playing a pivotal role in developing new applications which will assist with many critical global issues such as managing natural resources, understanding and managing our responses to the changing climate, planning and monitoring man-made infrastructure, security and defence.

4. Science to enable growth

Sustained investment in basic science aimed at seeking new knowledge also delivers tangible benefits. The UK's Earth observation programme allows us to understand our changing environment, including our own impact upon it. Space science answers questions about the birth and evolution of our Universe and the basic physics that underpins the behaviour of matter. Space exploration informs us about the possibility of life beyond the Earth and the potential to expand into the Solar System.

Scientific missions can inspire the next generation to explore, understand and use the tools of science, mathematics and engineering that underpin the modern economy.

Furthermore, a strong research community provides a technical and scientific knowledge base that feeds future developments both in the upstream industries and the downstream business.

5. Education for growth

The future wealth of the nation is dependent on developing a highly skilled technical workforce. Studies have demonstrated the value of space activities in attracting children into science, technology, engineering and mathematics (STEM) and encouraging them to excel. An expanding space sector needs a supply of graduates and technicians with appropriate skills. The Agency has a role to both encourage the take up of STEM subjects for the benefit of the whole UK economy and to ensure that universities and colleges provide appropriate skills to meet the space sectors requirements.

6. Growth through smarter government

Government will increasingly rely on satellite-derived services and data. In many areas, information gathered from space enables government to make better informed public policy decisions. For example, space can provide data on the environment, climate, weather, security, agriculture, coastal management and disaster mitigation. The UK Space Agency will support the development of smarter, more efficient government through the use of space data by providing the strategic leadership and acting as the centre of expertise for Government departments.

The full draft text of the strategy is attached at Annex B.

7. Consultation Questions

The primary issue the Government is seeking a response on is whether the draft strategy addresses the challenges and changes facing the space sector in a way which will support and encourage growth in the space sector.

To this end a set of questions is posed, which seek to ensure that any decision is made on the basis of maximum knowledge and input from all stakeholders. Responses are free to address all or a subset of the questions. You may express views on related issues not specifically addressed in the questions.

Question 1 – Does the draft strategy adequately address the space policy issues facing the UK?

Question 2 – In the current context, is the overarching theme of growth of the space sector the correct one?

Question 3 – Are there any space policy issues which are missing or not clearly addressed?

Question 4 – Are there critical organisations or interfaces which are not mentioned?

Question 5 – How should industry and other stakeholders best be involved in taking forward the strategy?

You may answer as many or as few questions as you wish.

We look forward to receiving your responses to the questions raised in this consultation.

ANNEX A

THE SEVEN CONSULTATION CRITERIA

Criterion 1 – When to consult
Formal consultation should take place at a stage when there is scope to influence the policy outcome.

Criterion 2 – Duration of consultation exercises
Consultations should normally last for at least 12 weeks with consideration given to longer timescales where feasible and sensible.

Criterion 3 – Clarity of scope and impact
Consultation documents should be clear about the consultation process, what is being proposed, the scope to influence and the expected costs and benefits of the proposals.

Criterion 4 – Accessibility of consultation exercises
Consultation exercises should be designed to be accessible to, and clearly targeted at, those people the exercise is intended to reach.

Criterion 5 – The burden of consultation
Keeping the burden of consultation to a minimum is essential if consultations are to be effective and if consultees' buy-in to the process is to be obtained.

Criterion 6 – Responsiveness of consultation exercises
Consultation responses should be analysed carefully and clear feedback should be provided to participants following the consultation.

Criterion 7 – Capacity to consult
Officials running consultations should seek guidance in how to run an effective consultation exercise and share what they have learned from the experience.

The complete code is available on the Department for Business, Innovation and Skills web site at: http://www.bis.gov.uk/whatwedo/bre/consultation-guidance/page44420.html

ANNEX B

UK SPACE AGENCY STRATEGY 2011-2015

'To lead and sustain the growth of the UK Space Sector'

UK Civil Space Policy: Challenges and Changes

Fifty years ago, when the first UK satellite was being built, space was at the frontier of science and Cold War rivalry. Today, our everyday lives depend on space technology: it is woven into the economy in a way unimaginable at the dawn of the space age. But the global space scene is rapidly changing. In response, UK civil space policy must anticipate and react to developments being driven both by the emergence of ground-breaking technologies and by the needs of society. The creation of the UK Space Agency allows the UK to embrace these changes and take full advantage of the opportunities that lie ahead.

Many more users are gaining access to space as small satellites deliver cost-effective services. Broadcast and communications satellites are becoming more powerful and flexible. New funding models are allowing businesses to be developed with shared private and government funding. Space can provide the tools needed to manage global challenges such as climate change; and the UK has the opportunity to be a leader in turning these tools into practical solutions.

By satisfying demand in global markets that need space-based infrastructure, the UK's space industry provides important economic and social benefits for UK citizens. The UK's space sector already has strength in core space markets such as telecommunications, weather forecasting, navigation, and observation imagery. The UK also has a strong space research community, able to respond to the new scientific challenges, such as mapping the mysterious dark energy across the Universe and searching for places beyond Earth that could support life. These scientific challenges will help drive innovation and develop new skills.

UK companies manufacture and operate satellites, collect space data and provide services that generate high value. Continuing economic growth will depend on a strong UK presence in markets of the future - for example: satellite broadband; Earth observation; and applications that integrate space and terrestrial data for new-high value uses. In February 2010, the UK's space industry set out its determination to grow the UK's space sector in its Space Innovation and Growth Strategy. In particular, it stated its determination to seize 10% of the global market by 2030.

Our industry faces new market opportunities and types of customers such as the European Union; but also more competition from an increasing number of active space-faring nations. Many are providing active government support to grow their industries. The UK must develop strategies and policies to work effectively in the changing international landscape.

More attention must be paid to the security and sustainability of space assets. Issues such as the impact of extreme space weather and space debris must be understood and addressed. The UK can also benefit from a clear articulation of civil, security and military strategies that enable us to work with international partners to secure our space infrastructure.

The UK Space Agency's strategy for civil space policy responds to this complex landscape in order to answer the needs of industry, the research community and the citizen.

The UK Space Agency: How We Will Make a Difference

The UK Space Agency provides the right government structure to respond to this new environment. Formed in 2010, the UK Space Agency is an executive agency of the Department for Business, Innovation and Skills. It oversees civil space activities and provides a more coherent approach to strategic funding and management than was achievable by the previous British National Space Centre.

The new Agency is placing growth at the centre of this strategy and this goal permeates all aspects of our programme. Consequently, the impact of the Agency’s work is not limited to the space sector: knowledge and applications spill-out into other sectors, so acting as an engine of innovation for the wider economy. Crucially, the Agency acts as a focus for stakeholder engagement and negotiates on the UK’s behalf at international bodies such as the European Space Agency (ESA).

Our over-arching objective is to maintain and improve the space sector’s impressive growth rate and to increase revenues by more than six times by 2030 to £40B. The Agency assists in this by providing a coherent approach stretching from basic science through technology development and on to high value-adding services. Key ingredients in an environment which encourages innovation include a strong research base; the availability of skilled people; targeted government investment addressing market failure; proactive assistance in opening export markets; and the right regulatory framework.

The UK space sector has existing strengths but to foster growth it must acquire new capabilities and move into new markets. The Agency will therefore work with all players to explore new possibilities and set new priorities.

The following chapters set out the main themes of the Agency’s strategy for growth. These are:

1. Growth through new opportunities;
2. Growth from export;
3. Innovation supporting growth;
4. Science to enable growth;
5. Education for growth;
6. Growth through smarter government.

This document presents the overall approach the Agency will take: detailed actions will be defined in our corporate plan and an annual delivery statement.

1. Growth from New Opportunities

Opportunities are opening to offer space-based services to an increasing range of customers from the general public to multi-national organisations. Possible new areas include the provision of information systems to support carbon trading; systems for space surveillance to alert us to natural and man-made hazards which threaten critical space infrastructure; innovative launch systems; services to support space exploration; and space tourism. Countries which recognise these new markets and invest early will reap the rewards.

Working with its partners at home and internationally, the UK Space Agency will:

- assist industry to build the new markets identified in the Space Innovation and Growth Strategy;
- carry out horizon-scanning activities with industry and researchers to identify emerging opportunities;
- invest in programmes that demonstrate new services;
- work with industry, the Technology Strategy Board, the European Commission and ESA to translate investment into down-to-Earth applications.

By bringing together industry, academia and government facilities, the Harwell Space Cluster (which includes the ESA Harwell centre, the International Space Innovation Centre and a space Business Incubator) will be a vital tool for delivering growth through new opportunities.

2. Growth from Export

To realise the UK's objective to grow its share of the global market to 10% by 2030 these new services and products need to be turned into sales. The UK Space Agency has a role to play in assisting the space sector to capture more business in all areas but particularly the global commercial and security markets which are forecast to grow most strongly.

To achieve this, the UK Space Agency will promote export opportunities by:

- Consulting with industry and academia to lead the definition of a UK space export strategy;
- Working with industry in partnership with the Foreign and Commonwealth Office, UK Trade and Investment, the Science and Innovation Network and the Research Council's overseas offices to deliver this strategy;
- reducing barriers to export growth such as excessive regulation, regulatory costs and differences in the international cost of capital;
- working with the space sector and the City to develop greater awareness of market opportunities and exploit expertise in financing in order to grow existing UK businesses and attract more businesses to set up in the UK;
- and by building relationships with international space agencies world-wide to enable collaborative endeavours which can open up markets for business.

3. Innovation Supporting Growth

Space is at the cutting edge of technology, data processing and analysis. UK academia works in partnership with industry to deliver new missions, instrumentation, and data analysis techniques. This brings mutual benefits and underpins the UK space sector growth.

These benefits flow out into the commercial sector, for example delivering new types of data processing systems; advanced structures; and electric propulsion.

This know-how can be exploited by other industries from manufacturing to medicine and energy to information technology. The Agency, working with the research councils and the Technology Strategy Board will enable an integrated approach to technology development from ‘blue skies’ research through to technology demonstration, pulling ideas developed in the science base through to the stage where private sector will invest. The International Space Innovations Centre (ISIC) and the ESA Business Incubation Centre will play an important role in creating the open innovation environment where new technology, applications and services can flourish.

The UK is playing a pivotal role in developing new applications which will assist with many critical global issues such as managing natural resources, understanding and managing our responses to the changing climate, planning and monitoring man-made infrastructure, security and defence. By fostering innovation in service sectors the Agency will maximise technical superiority and uptake of space applications.

Inspired by the Space IGS, a set of technology ‘roadmaps’ have been developed by the space community, supported by the Space ‘Knowledge Transfer Network’ Special Interest Group. The UK Space Agency will:

- use these technology road maps to prioritise investment and identify high impact, disruptive technologies;
- launch a National Space Technology Programme co-funded with industry to deliver the National Space Technology Strategy;
- develop strategies to take priority technologies from concept to demonstration through national, ESA, EU or bi-lateral programmes as appropriate;
- work with other technology funders to make the most effective use of resources by identifying common technological requirements and dual-use capabilities;
- selectively join ESA optional programmes, engaging with them at an early stage and contributing at a meaningful level to influence the programme to meet UK priorities;
- facilitate exploitation of technology by encouraging academia-industry collaboration at all stages of the technology development cycle;
- work with partners to ensure transferrable technologies are taken up by other sectors;
- maximise private financing by assisting with risk reduction during the earliest phases of technology development.

4. Science to Enable Growth

The Agency believes in the intrinsic value of science as a national endeavour. History shows that sustained investment in basic science aimed at seeking new knowledge also delivers tangible benefits. Our Earth observation programme allows us to understand our changing environment, including our own impact upon it. Space science answers questions about the birth and evolution of our Universe and the basic physics that underpins the behaviour of matter. Space exploration informs us about the possibility of life beyond the Earth and the potential to expand into the Solar System. The weightless environment of space offers the possibility of developing new materials, insights into human physiology and a laboratory for basic physics and life sciences.

Scientific missions provide the most emblematic and visible part of our space programme. They can inspire the next generation to explore, understand and use the tools of science, mathematics and engineering that underpin the modern economy.

Furthermore, a strong research community provides a technical and scientific knowledge base that feeds future developments both in the upstream industries (e.g. satellite manufacturers and software companies) and the downstream business (applications and services that use space data). Finally, investment in science not only plays a vital role in taking forward new technologies and applications but also ensures the UK has a strong academic base able to supply industry with skilled graduates and experienced researchers.

To maintain the health of the science-base the UK Space Agency will:

- provide opportunities to participate in world class scientific missions, working primarily through ESA but also in bilateral collaborations;
- work with all the Research Councils to coordinate investments to maximise the scientific exploitation of UK investment in space;
- maintain excellence in Earth observation technologies, techniques and systems to provide the knowledge base to feed into commercial and public applications;
- support actions to foster effective knowledge exchange between academia, government departments, agencies and industry.

5. Education for Growth

The future wealth of the nation is dependent on developing a highly skilled technical workforce. Studies have demonstrated the value of space activities in attracting children into science, technology, engineering and mathematics (STEM) and encouraging them to excel. An expanding space sector needs a supply of graduates and technicians with appropriate skills. The Agency has a role to both encourage the take up of STEM subjects for the benefit of the whole UK economy and to ensure that universities and colleges provide appropriate skills to meet the space sectors requirements. These twin themes of 'education for space' and 'space for education' are embodied in the Agency's Education, Skills and Outreach Strategy, which is published separately.

The UK Space Agency will:

- work with the Department for Education, further education and higher education authorities, industry, education organisations and career advisors to deliver the skilled staff that industry needs for growth and promote careers in the space industry;
- work with the Research Councils to maintain the UK's world leading space research community;
- work with space education and advocacy groups to tell the exciting story of the UK space programme and use it as a tool to encourage children to take up and excel at STEM subjects.

6. Growth Through Smarter Government

Government will increasingly rely on satellite-derived services and data. In many areas information gathered from space enables government to make better informed public policy decisions. For example, space can provide data on the environment, climate, weather, security, agriculture, coastal management and disaster mitigation.

The UK Space Agency will therefore support the development of ‘smarter’, more efficient government through the use of space data by providing the strategic leadership and acting as the centre of expertise for Government departments; working with them to identify applications and translate their needs into requirements for the space industry. By becoming an anchor customer, Government could enable service-providers to attract private investment, develop export markets and stimulate wider market uptake.

The UK Space Agency will work across government:

- to improve their capabilities and efficiency through increased use of space services;
- and with industry to create data services that meet public sector requirements;
- and with international bodies to identify how space services can assist the world’s poorest and most vulnerable people.

The burgeoning entrepreneurial climate within the space sector needs an appropriate regulatory framework which balances international obligations and national security while encouraging enterprise and industry. Indeed, regulation can be used as a tool to establish a competitive edge in the international arena. It can create an environment which attracts inward investment and encourages industry to develop new systems and services in the UK. It is also important that the Agency ensures that the international regulatory environment for orbit and frequency allocations facilitates growth of UK markets.

A responsibility of government is also to put in place strategies to protect important infrastructure. Space is becoming increasingly congested, competitive, and contested. Given the large number of space objects in orbit around the Earth, collisions and radio frequency interference is a real and growing problem. The Agency will support Government departments involved in space governance and work with international partners to establish a Space Security Strategy as a first step towards ensuring the safety, stability and security of the space domain for years to come. We will:

- work with the Civil Aviation Authority and the European Aviation Safety Agency to ensure the right regulatory framework is in place to facilitate UK launch capabilities and space tourism;
- reform the Outer Space Act by introducing an upper limit on liability for UK operators;
- work with OFCOM and international bodies to ensure appropriate radio frequencies and orbit slots are available for future space services and new ways of accessing space
- provide UK industry with clearer guidance on the regulation of security aspects in export deals;
- support the Cabinet Office, Ministry of Defence and the Home Office activity in developing a Space Security Strategy that ensures that the relevant space infrastructure is identified and risk mitigation strategies are developed.

The UK Space Agency: How We Will Deliver

The UK Space Agency will seek advice on its policies and investment in an open and transparent way. We will work in innovative ways to deliver our responsibilities. An important role of the Agency is to explain to the public the relevance of, and benefits arising from, government investment in the space programme. In pursuit of this goal the Agency will hold an annual UK Space Conference.

The Agency is responsible for delivering the space infrastructure required by Government departments. Additional effort will be placed on building relationships across government, capturing their requirements and translating these into affordable programmes. Existing relationships with the Science and Technology Facilities Council (STFC) and the Natural Environment Research Council (NERC) - who are responsible for funding exploitation of our scientific missions - will be strengthened. New relationships with the wider family of Research Councils will be forged.

The Agency will continue to work closely with industry and the Technology Strategy Board to deliver economic growth and social benefits for the UK. It will offer clear lines of ownership and accountability for capturing issues important to industry, including working across sectors to implement the Space IGS recommendations.

Almost everything the UK does in space is in partnership with other countries, agencies or organisations. By working with international partners, the UK can participate in a wider range of space activities than it could undertake alone. Much of the investment made by the Agency is channelled through ESA to enable UK industry and academia to work in collaboration with Europe to develop world leading technologies, services and science missions. ESA will continue to be our main delivery mechanism but we will continue to support bilateral space missions where this is in the UK's interest.

The Agency will strengthen the role of the ESA Centre at Harwell in order to anchor the UK in ESA; and ESA in the UK. We will reinforce the Centre's links with the wider UK space infrastructure, for example in areas such as applications which bring economic benefit to the UK. The Agency will use the hub-and-spoke model of the International Space Innovation Centre as a key route to delivering growth.

Following the Lisbon Treaty the European Union is taking an increasing role in space policy. On behalf of Member States, the European Commission already manages the Galileo and GMES programmes. In the future, it may become involved in Space Situational Awareness (SSA) and space exploration activities. The Agency will focus on ensuring that developments in European space policy are compatible with UK national interests. In particular, we will work with Member States and the European Commission to formulate new programmes so that they complement ESA.

The Agency will work with the Met Office to obtain maximum benefit from EUMETSAT's satellite programme, ensuring sustained access to data from observation systems servicing operational meteorology, climate monitoring and oceanography. The Agency will work together with the Met Office and the Natural Environment Research Council to exploit all the opportunities arising from space-based monitoring of our planet. The Agency will work with Cabinet Office, Ministry of Defence and the Home Office to ensure that civil, security and military space strategies and activities are developed in a coherent and proactive way.

The UK already collaborates with many of the world's space agencies. We will continue to forge new international partnerships that provide access to launch opportunities, deliver science or develop new technology and services, while strengthening existing relationships.

The Agency will be an active member of the Group on Earth Observation and the Committee on Earth Observation Satellites. The UK will remain active in the United Nations Committee for Peaceful Uses of Outer Space and with entities such as the UN Office for Outer Space Affairs promoting the peaceful exploitation of outer space, and will support actions to ensure the long term sustainability of space activities.

As a founding member, the Agency will participate in the International Space Exploration Coordination Group of space agencies. It will work with important professional and scientific bodies such as the International Academy of Astronautics, the International Astronautics Federation and the Committee on Space Research. The Agency will also strengthen links with UK trade associations, professional bodies and the general public through its outreach programme.

The Agency will work with Government, education organisations and experts to exploit the inspirational effect of space in delivering education. The European Space Education Resource Office (ESERO-UK) will help us deliver this vital goal.

In Conclusion: A New Strategy for a New Era

The UK space scene has changed. The creation of the UK Space Agency, the publication of the Space Innovation and Growth Strategy, the establishment of the International Space Innovation Centre and the presence of a European Space Agency facility at the Harwell Space Cluster are all part of the dynamic, new environment in which the UK space sector can flourish. The UK Space Agency will invest in, lead and coordinate the UK's civil space programme. We will ensure that our central goal of growth becomes a reality and the potential of space to the twenty-first century economy will be both recognised and realised.

The Agency's investment in space will be targeted at areas that have the greatest potential for delivering economic benefits, scientific excellence and national security. We recognise that in some instances these benefits may be realised many years downstream. The added value of the Agency will be to provide coherence between investment in long-term basic research and in near-term applications, harnessing the skills and experience of universities, national laboratories and industry to grow a stronger UK strategic space capability.

Through the Agency's leadership of the space sector, we will build links between industry and the research community and also between Government users of space and organisations that contribute to creating capabilities in space, such as the Technology Strategy Board, the Research Councils and the Harwell Space Cluster.

The Agency's work of promoting the space industry will assist in selling UK capability abroad in order to increase the UK's share of the world space market. Furthermore, we will act as champion in Government to provide a regulatory environment that promotes the space sector.

Last, but by no means least, the UK Space Agency will provide inspiration and discovery through its exploration of the Universe and its study of planet Earth. For the next generation, the growth of UK space sector will create opportunities for rewarding careers and turn their imaginations towards the possibilities of tomorrow.

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NATIONAL SECURITY SPACE STRATEGY

UNCLASSIFIED SUMMARY

JANUARY 2011

NATIONAL SECURITY SPACE STRATEGY

UNCLASSIFIED SUMMARY

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During the past 50 years, U.S. leadership in space activities has benefited the global economy, enhanced our national security, strengthened international relationships, advanced scientific discovery, and improved our way of life.

Space capabilities provide the United States and our allies unprecedented advantages in national decision-making, military operations, and homeland security. Space systems provide national security decision-makers with unfettered global access and create a decision advantage by enabling a rapid and tailored response to global challenges. Moreover, space systems are vital to monitoring strategic and military developments as well as supporting treaty monitoring and arms control verification. Space systems are also critical in our ability to respond to natural and man-made disasters and monitor long-term environmental trends. Space systems allow people and governments around the world to see with clarity, communicate with certainty, navigate with accuracy, and operate with assurance.

Maintaining the benefits afforded to the United States by space is central to our national security, but an evolving strategic environment increasingly challenges U.S. space advantages. Space, a domain that no nation owns but on which all rely, is becoming increasingly congested, contested, and competitive. These challenges, however, also present the United States with opportunities for leadership and partnership. Just as the United States helped promote space security in the 20th century, we will build on this foundation to embrace the opportunities and address the challenges of this century.

The National Security Space Strategy charts a path for the next decade to respond to the current and projected space strategic environment. Leveraging emerging opportunities will strengthen the U.S. national security space posture while maintaining and enhancing the advantages the United States gains from space.

Our strategy requires active U.S. leadership enabled by an approach that updates, balances, and integrates all of the tools of U.S. power. The Department of Defense (DoD) and the Intelligence Community (IC), in coordination with other departments and agencies, will implement this strategy by using it to inform planning, programming, acquisition, operations, and analysis.

Robert M. Gates
Secretary of Defense

James R. Clapper
Director of National Intelligence

THE STRATEGIC ENVIRONMENT

> *"The now-ubiquitous and interconnected nature of space capabilities and the world's growing dependence on them mean that irresponsible acts in space can have damaging consequences for all of us."*
>
> - 2010 National Space Policy

Space is vital to U.S. national security and our ability to understand emerging threats, project power globally, conduct operations, support diplomatic efforts, and enable global economic viability. As more nations and non-state actors recognize these benefits and seek their own space or counterspace capabilities, we are faced with new opportunities and new challenges in the space domain.

The current and future strategic environment is driven by three trends – space is becoming increasingly *congested*, *contested,* and *competitive.*

Space is increasingly *congested*. Growing global space activity and testing of China's destructive anti-satellite (ASAT) system have increased congestion in important areas in space. DoD tracks approximately 22,000 man-made objects in orbit, of which 1,100 are active satellites (see Figure 1). There may be as many as hundreds of thousands of additional pieces of debris that are too small to track with current sensors. Yet these smaller pieces of debris can damage satellites in orbit.

Satellite Catalog Growth

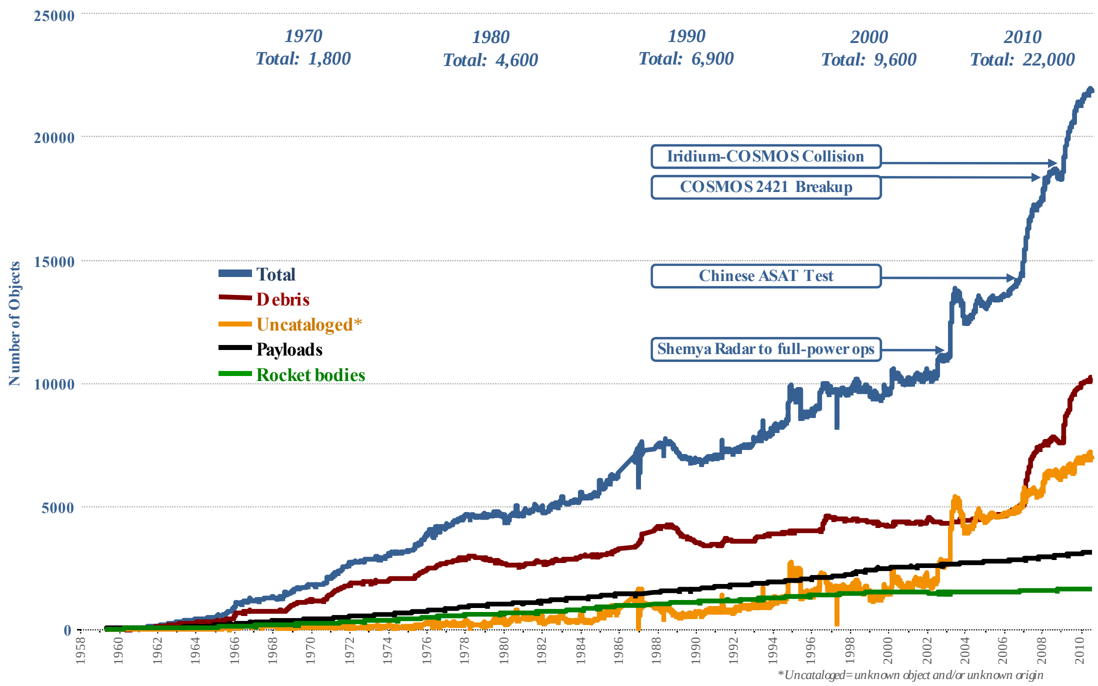


Figure 1. Source: Joint Space Operations Center

Today's space environment contrasts with earlier days of the space age in which only a handful of nations needed to be concerned with congestion. Now there are approximately 60 nations and government consortia that own and operate satellites, in addition to numerous commercial and academic satellite operators (see Figure 2). This congestion – along with the effects of operational use, structural failures, accidents involving space systems, and irresponsible testing or employment of debris-producing destructive ASATs – is complicating space operations for all those that seek to benefit from space.

Increased congestion was highlighted by the 2009 collision between a Russian government Cosmos satellite and a U.S. commercial Iridium satellite. The collision created approximately 1,500 new pieces of trackable space debris, adding to the more than 3,000 pieces of debris created by the 2007 Chinese ASAT test. These two events greatly increased the cataloged population of orbital debris.

Another area of increasing congestion is the radiofrequency spectrum. Demand for radiofrequency spectrum to support worldwide satellite services is expected to grow commensurate with the rapid expansion of satellite services and applications. As many as 9,000 satellite communications transponders are expected to be in orbit by 2015. As the demand for bandwidth increases and more transponders are placed in service, the greater the probability of radiofrequency interference and the strain on international processes to minimize that interference.

Number of Nations and Government Consortia Operating in Space

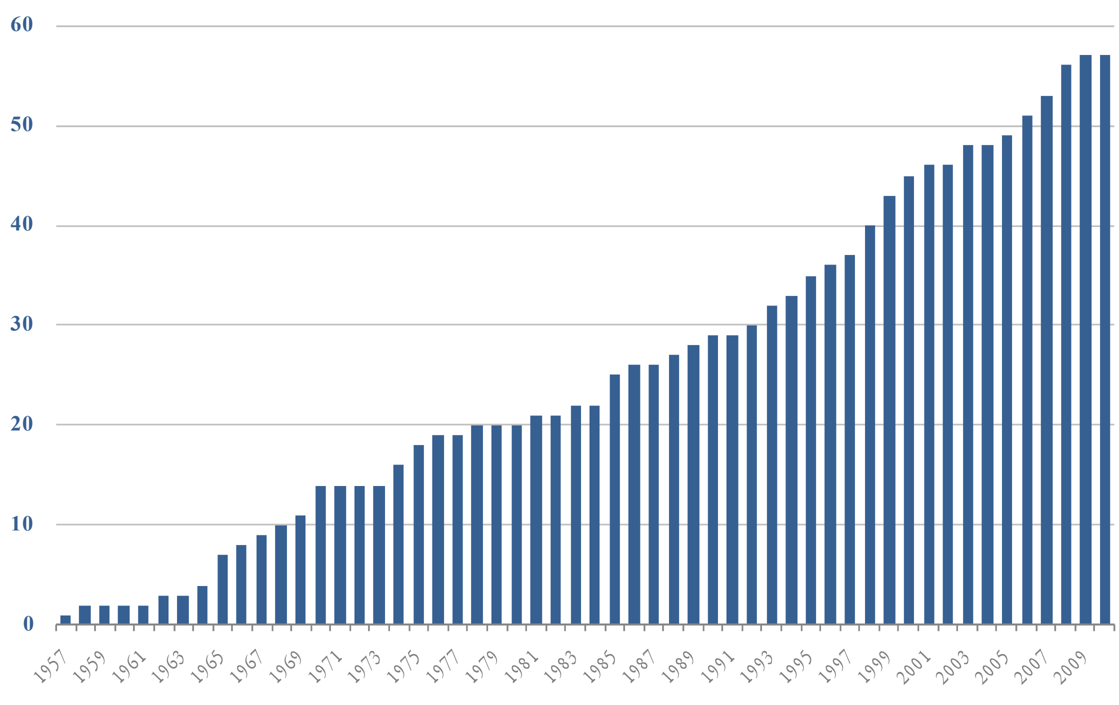


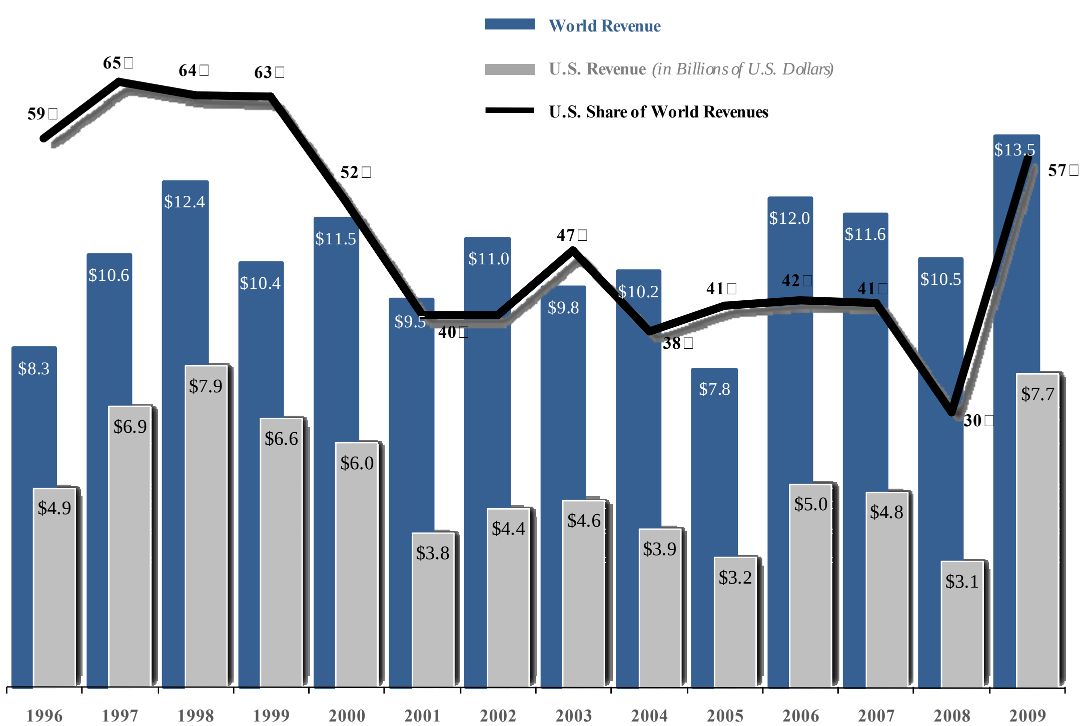
Figure 2. Source: National Air and Space Intelligence Center

Space is increasingly *contested* in all orbits. Today space systems and their supporting infrastructure face a range of man-made threats that may deny, degrade, deceive, disrupt, or destroy assets. Potential adversaries are seeking to exploit perceived space vulnerabilities. As more nations and non-state actors develop counterspace capabilities over the next decade, threats to U.S. space systems and challenges to the stability and security of the space environment will increase. Irresponsible acts against space systems could have implications beyond the space domain, disrupting worldwide services upon which the civil and commerical sectors depend.

Space is increasingly *competitive*. Although the United States still maintains an overall edge in space capabilities, the U.S. competitive advantage has decreased as market-entry barriers have lowered (see Figure 3). The U.S. technological lead is eroding in several areas as expertise among other nations increases. International advances in space technology and the associated increase in foreign availability of components have put increased importance on the U.S. export control review process to ensure the competitiveness of the U.S. space industrial base while also addressing national security needs.

U.S. suppliers, especially those in the second and third tiers, are at risk due to inconsistent acquisition and production rates, long development cycles, consolidation of suppliers under first-tier prime contractors, and a more competitive foreign market. A decrease in specialized suppliers further challenges U.S. abilities to maintain assured access to critical technologies, avoid critical dependencies, inspire innovation, and maintain leadership advantages. All of these issues are compounded by challenges in recruiting, developing, and retaining a technical workforce.

U.S. versus World Satellite Manufacturing Revenues, 1996-2009



Notes: Revenue figures are in-year estimates, not adjusted for inflation over time. Satellite Manufacturing revenues are recorded in the year the satellite is delivered/launched, not when contract is awarded or interim payments are transacted. World revenue includes U.S. revenue.

Figure 3. Source: Satellite Industry Association.

STRATEGIC OBJECTIVES

In executing the National Space Policy, our National Security Space Strategy seeks to maintain and enhance the national security benefits we derive from our activities and capabilities in space while addressing and shaping the strategic environment and strengthening the foundations of our enterprise. The U.S. defense and intelligence communities will continue to rely on space systems for military operations, intelligence collection, and related activities; access to these capabilities must be assured. We must address the growing challenges of the congested, contested, and competitive space environment while continuing our leadership in the space domain.

Our strategy is derived from the principles and goals found in the National Space Policy and builds on the strategic approach laid out in the National Security Strategy. Specifically, our national security space objectives are to:

- Strengthen safety, stability, and security in space;
- Maintain and enhance the strategic national security advantages afforded to the United States by space; and
- Energize the space industrial base that supports U.S. national security.

We seek a safe space environment in which all can operate with minimal risk of accidents, breakups, and purposeful interference. We seek a stable space environment in which nations exercise shared responsibility to act as stewards of the space domain and follow norms of behavior. We seek a secure space environment in which responsible nations have access to space and the benefits of space operations without need to exercise their inherent right of self-defense.

We seek to ensure national security access to space and use of space capabilities in peace, crisis, or conflict. We seek to meet the needs of national leaders and intelligence and military personnel, irrespective of degradation of the space environment or attacks on specific systems or satellites. Enhancing these benefits requires improving the foundational activities of our national security space enterprise – including our systems, our acquisition processes, our industrial base, our technology innovation, and our space professionals.

A resilient, flexible, and healthy space industrial base must underpin all of our space activities. We seek to foster a space industrial base comprised of skilled professionals who deliver those innovative technologies and systems that enable our competitive advantage. Our space system developers, operators, and analysts must deliver, field, and sustain national security space capabilities for the 21st century.

STRATEGIC APPROACHES

"To promote security and stability in space, we will pursue activities consistent with the inherent right of self-defense, deepen cooperation with allies and friends, and work with all nations toward the responsible and peaceful use of space."

- 2010 National Security Strategy

The National Security Space Strategy draws upon all elements of national power and requires active U.S. leadership in space. The United States will pursue a set of interrelated strategic approaches to meet our national security space objectives:

- Promote responsible, peaceful, and safe use of space;
- Provide improved U.S. space capabilities;
- Partner with responsible nations, international organizations, and commercial firms;
- Prevent and deter aggression against space infrastructure that supports U.S. national security; and
- Prepare to defeat attacks and to operate in a degraded environment.

Promoting Responsible, Peaceful, and Safe Use of Space

"All nations have the right to use and explore space, but with this right also comes responsibility. The United States, therefore, calls on all nations to work together to adopt approaches for responsible activity in space to preserve this right for the benefit of future generations."

- 2010 National Space Policy

As directed in the National Space Policy, the United States will promote the responsible, peaceful, and safe use of space as the foundational step to addressing the congested and contested space domain and enabling other aspects of our approach. We will encourage allies, partners, and others to do the same. As more nations, international organizations, and commercial firms field or aspire to field space capabilities, it is increasingly important that they act responsibly, peacefully, and safely in space. At the same time, they must be reassured of U.S. intentions to act likewise. We will encourage responsible behavior in space and lead by the power of our example. Moreover, U.S. diplomatic engagements will enhance our ability to cooperate with our allies and partners and seek common ground among all space-faring nations.

The United States will support development of data standards, best practices, transparency and confidence-building measures, and norms of behavior for responsible space operations. We will consider proposals and concepts for arms control measures if they are equitable, effectively verifiable, and enhance the national security of the United States and its allies. We believe setting pragmatic guidelines for safe activity in space can help avoid collisions and other debris-producing events, reduce radiofrequency interference, and promote security and stability in the space domain – all of which are in the interests of all nations.

Shared awareness of spaceflight activity must improve in order to foster global spaceflight safety and help prevent mishaps, misperceptions, and mistrust. The United States is the leader in space situational awareness (SSA) and can use its knowledge to foster cooperative SSA relationships, support safe space operations, and protect U.S. and allied space capabilities and operations.

DoD will continue to improve the quantity and quality of the SSA information it obtains and expand provision of safety of flight services to U.S. Government agencies, other nations, and commercial firms. DoD will encourage other space operators to share their spaceflight safety data. DoD, in coordination with other government agencies, will seek to establish agreements with other nations and commercial firms to maintain and improve space object databases, pursue common international data standards and data integrity measures, and provide services and disseminate orbital tracking information, including predictions of space object conjunction, to enhance spaceflight safety for all parties.

Providing Improved U.S. Space Capabilities

> *"Being able to deliver capability cost-effectively when it is needed improves mission effectiveness, provides leadership with flexibility in making investments, and precludes gaps in necessary capabilities."*
>
> \- 2009 National Intelligence Strategy

U.S. space capabilities will continue to be fundamental for national security. DoD and the IC will identify, improve, and prioritize investments in those capabilities that garner the greatest advantages. We will develop, acquire, field, operate, and sustain space capabilities to deliver timely and accurate space services to a variety of customers, from soldiers to national decision-makers. We will enhance interoperability and compatibility of existing national security systems, across operational domains and mission areas, to maximize efficiency of our national security architecture; we will ensure these characteristics are built into future systems. We will ensure that data collection and products are released at the lowest possible classification to maximize their usefulness to the user community.

Ensuring U.S. capabilities are developed and fielded in a timely, reliable, and responsive manner is critical for national decision-makers to act on time-sensitive and accurate information, for military forces to plan and execute effective operations, and for the IC to enable all of the above with timely indications and warning. Improving our acquisition processes, energizing the U.S. space industrial base, enhancing technological innovation, and deliberately developing space professionals are critical enablers to maintaining U.S. space leadership.

In cooperation with our industrial base partners, DoD and the IC will revalidate current measures and implement new measures, where practicable, to stabilize program acquisition more effectively and improve our space acquisition processes. We will reduce programmatic risk through improved management of requirements. We will use proven best practices of systems engineering, mission assurance, contracting, technology maturation, cost estimating, and financial management to improve system acquisition, reduce the risk of mission failure, and increase successful launch and operation of our space systems.

Mission permitting, we will synchronize the planning, programming, and execution of major acquisition programs with other DoD and IC processes to improve efficiencies and overall performance of our acquisition system and industrial base. DoD and the IC will evaluate the requirements and analysis of alternatives processes to ensure a range of affordable solutions is considered and to identify requirements for possible adjustment. The requirements process must produce combinations of material and non-material solutions. Realistic cost and schedule estimates must inform the President's annual budget request. Human resources processes must provide the right personnel for successful execution.

We seek to foster a U.S. space industrial base that is robust, competitive, flexible, healthy, and delivers reliable space capabilities on time and on budget. DoD and the IC, in concert with the civil space sector, will better manage investments across portfolios to ensure the industrial base can sustain those critical technologies and skills that produce the systems we require. Additionally, we will continue to explore a mix of capabilities with shorter development cycles to minimize delays, cut cost growth, and enable more rapid technology maturation, innovation, and exploitation.

A key aspect of energizing the U.S. space industrial base is to reform U.S. export controls to address technology security and global competitiveness. Export controls have a far-reaching impact on national security interests, as they help deter illicit efforts by others to obtain and use the materials, technology, and know-how that are vital to our national security. Export controls, however, can also affect the health and welfare of the industrial base, in particular second-tier and third-tier suppliers. Reforming export controls will facilitate U.S. firms' ability to compete to become providers-of-choice in the international marketplace for capabilities that are, or will soon become, widely available globally, while strengthening our ability to protect the most significant U.S. technology advantages. In particular, as new opportunities arise for international collaboration, a revised export control system will better enable the domestic firms competing for these contracts. Revised export control policies will address U.S. firms' ability to export space-related items generally available in the global marketplace, consistent with U.S. policy and international commitments.

We will continue to pursue, adapt, and evolve the unique technologies, innovative exploitation techniques, and diverse applications that give the United States its strategic advantage in space. The United States seeks to maintain and enhance access to those global and domestic technologies needed for national security space systems. We will do so by expanding technology partnerships with the academic community, industry, U.S. and partner governments, mission customers, and other centers of technical excellence and innovation, consistent with U.S. policy, technology transfer objectives, and international commitments. To advance the science and technology that enables U.S. space capabilities, we will continue to assess global technology trends to find emerging technologies and potential breakthroughs. We will explore new applications of current technologies and the development of unique, innovative technologies and capabilities. We will improve the transition of scientific research and technology development to the operational user and into major system acquisition. To the extent practicable, we will also facilitate the incorporation of these capabilities and technologies into appropriate domestic space programs.

People are our greatest asset. To support the range of national security space activities, we will develop current and future national security space professionals – our "space cadre" – who can acquire capabilities, operate systems, analyze information, and succeed in a congested, contested, and competitive environment. We will build a more diverse and balanced workforce among military, civilian, and contractor components. These professionals must be educated, experienced, and trained in the best practices of their field – whether it is planning, programming, acquisition, manufacturing, operations, or analysis.

We will continue to encourage students at all levels to pursue technical coursework as a foundation for space-related career fields. Working with other departments and agencies, we will synchronize our science, technology, engineering, and mathematics (STEM) education initiatives with sound education investments to ensure an ample supply of space professionals with appropriate skills and capabilities. We will encourage our space professionals to participate in STEM outreach and mentoring programs.

We will continue to develop structured personnel development programs to expand, track, and sustain our space expertise, employing focused education and training as well as purposeful utilization of our people to offer a broad range of experiential opportunities. We will further professional development by growing, rewarding, and retaining scientific and technical expertise and professional leadership. We will support an entrepreneurial ethos by encouraging initiative, innovation, collaboration, resourcefulness, and resilience. As national security space priorities shift, we will continue to educate and train the workforce to align with new priorities.

Partnering with Responsible Nations, International Organizations, and Commercial Firms

> *"[E]xplore opportunities to leverage growing international and commercial expertise to enhance U.S. capabilities and reduce the vulnerability of space systems and their supporting ground infrastructure."*
>
> - 2010 Quadrennial Defense Review

The evolving strategic environment allows for additional opportunities to partner with responsible nations, international organizations, and commercial firms. DoD and the IC will continue to partner with others to augment the U.S. national security space posture across many mission areas. This includes looking for opportunities to leverage or work in conjunction with partnerships pursued by U.S. Government civil space agencies. By sharing or exchanging capabilities, data, services, personnel, operations, and technology, we can ensure access to information and services from a more diverse set of systems – an advantage in a contested space environment. We will promote appropriate cost-sharing and risk-sharing partnerships to develop and share capabilities. Decisions on partnering will be consistent with U.S. policy and international commitments and consider cost, protection of sources and methods, and effects on the U.S. industrial base.

Partnering with other nations also is essential to ensuring global access to the radiofrequency spectrum and related orbital assignments and promoting the responsible, peaceful, and safe use of outer space. Nations gain international acceptance of their use of the radiofrequency spectrum and satellite orbits through the International Telecommunication Union (ITU). Registering satellite networks with the ITU can help prevent and, if necessary, address radiofrequency interference.

The United States will lead in building coalitions of like-minded space-faring nations and, where appropriate, work with international institutions to do so. With our allies, we will explore the development of combined space doctrine with principles, goals, and objectives that, in particular, endorse and enable the collaborative sharing of space capabilities in crisis and conflict. We will seek to expand mutually beneficial agreements with key partners to utilize existing and planned capabilities that can augment U.S. national security space capabilities. We will pursue increased interoperability, compatibility, and integration of partner nations into appropriate DoD and IC networks to support information sharing and collective endeavors, taking affordability and mutual benefit into account. At the same time, U.S. military and intelligence personnel will ensure the appropriate review and release of classified information to enhance partner access to space information.

We will actively promote the sale of U.S.-developed capabilities to partner nations and the integration of those capabilities into existing U.S. architectures and networks. Posturing our domestic industry to develop these systems will also enable the competitiveness of the U.S. industrial base.

We will explore sharing space-derived information as "global utilities" with partnered nations. As we do today with the positioning, navigation, and timing services of the Global Positioning System, we will provide services derived from selected space systems and enhance those services through partnerships. We will continue to share SSA information to promote responsible and safe space operations. We will also pursue enhanced sharing of other space services such as missile warning and maritime domain awareness. We may seek to establish a collaborative missile warning network to detect attacks against our interests and those of our allies and partners.

Strategic partnerships with commercial firms will continue to enable access to a more diverse, robust, and distributed set of space systems and provide easily releasable data. Strategic partnerships with commercial firms will be pursued in areas that both stabilize costs and improve the resilience of space architectures upon which we rely. Innovative approaches will be explored for their utility in meeting government performance requirements in a cost-effective and timely manner. We will rely on proven commercial capabilities to the maximum extent practicable, and we will modify commercial capabilities to meet government requirements when doing so is more cost-effective and timely for the government. We will develop space systems only when there is no suitable, cost-effective commercial alternative or when national security needs dictate.

Preventing and Deterring Aggression against Space Infrastructure that Supports U.S. National Security

> *"U.S. forces must be able to deter, defend against, and defeat aggression by potentially hostile nation-states. This capability is fundamental to the nation's ability to protect its interests and to provide security in key regions."*
>
> - 2010 Quadrennial Defense Review

Given the degree to which the United States relies on space systems and supporting infrastructure for national security, we must use a multilayered approach to prevent and deter aggression. We seek to enhance our national capability to dissuade and deter the development, testing, and employment of counterspace systems and prevent and deter aggression against space systems and supporting infrastructure that support U.S. national security.

Many elements of this strategy contribute to this approach. We will: support diplomatic efforts to promote norms of responsible behavior in space; pursue international partnerships that encourge potential adversary restraint; improve our ability to attribute attacks; strengthen the resilience of our architectures to deny the benefits of an attack; and retain the right to respond, should deterrence fail.

DoD and the IC will support the diplomatic and public diplomacy efforts of the Department of State to promote the responsible use of space and discourage activities that threaten the safety, stability, and security of the space domain. We will also work with the Department of State and other appropriate U.S. Government agencies to strengthen alliances with other space-faring nations and pursue partnerships with commercial firms and international organizations.

We will improve our intelligence posture – predictive awareness, characterization, warning, and attribution – to better monitor and attribute activities in the space domain. Thus, SSA and foundational intelligence will continue to be top priorities, as they underpin our ability to maintain awareness of natural disturbances and the capabilities, activities, and intentions of others. We will also enable and develop intelligence professionals who can provide greater scope, depth, and quality of intelligence collection and analysis.

We will seek to deny adversaries meaningful benefits of attack by improving cost-effective protection and strengthening the resilience of our architectures. Partnerships with other nations, commercial firms, and international organizations, as well as alternative U.S. Government approaches such as cross-domain solutions, hosted payloads, responsive options, and other innovative solutions, can deliver capability, should our space systems be attacked. This also will enable our ability to operate in a degraded space environment.

Finally, the United States will retain the right and capabilities to respond in self-defense, should deterrence fail. We will use force in a manner that is consistent with longstanding principles of international law, treaties to which the United States is a party, and the inherent right of self defense.

Preparing to Defeat Attacks and Operate in a Degraded Environment

> *"Increase assurance and resilience of mission-essential functions enabled by commercial, civil, scientific, and national security spacecraft and supporting infrastructure against disruption, degradation, and destruction, whether from environmental, mechanical, electronic, or hostile causes."*
>
> \- 2010 National Space Policy

We believe it is in the interests of all space-faring nations to avoid hostilities in space. In spite of this, some actors may still believe counterspace actions could provide military advantage. Our military and intelligence capabilities must be prepared to "fight through" a degraded environment and defeat attacks targeted at our space systems and supporting infrastructure. We must deny and defeat an adversary's ability to achieve its objectives.

As we invest in next generation space capabilities and fill gaps in current capabilities, we will include resilience as a key criterion in evaluating alternative architectures. Resilience can be achieved in a variety of ways, to include cost-effective space system protection, cross-domain solutions, hosting payloads on a mix of platforms in various orbits, drawing on distributed international and commercial partner capabilities, and developing and maturing responsive space capabilities. We will develop the most feasible, mission-effective, and fiscally sound mix of these alternatives.

To make the most effective use of space protection resources, we will identify and prioritize protection for vital space missions supporting national security requirements. We will implement cost-effective protection commensurate with threat, system use, and impact of loss – applied to each segment of our space systems and supporting infrastructure.

To enhance resilience, we will continue to develop mission-effective alternatives, including land, sea, air, space, and cyber-based alternatives for critical capabilities currently delivered primarily through space-based platforms. In addition, we will seek to establish relationships and agreements whereby we can access partner capabilities if U.S. systems are degraded or unavailable. We will be prepared to use these capabilities to ensure the timely continuity of services in a degraded space environment.

Preparing for attacks must extend to the people and processes relying on space information, operating our space systems, and analyzing space-derived information. We will improve the ability of U.S. military and intelligence agencies to operate in a denied or degraded space environment through focused education, training, and exercises and through new doctrine and tactics, techniques, and procedures (TTPs).

IMPLEMENTATION

Consistent with the guidance provided by the President in the National Space Policy, DoD and the IC will implement the National Security Space Strategy by using it to inform future planning, programming, acquisition, operations, and analysis guidance. DoD and the IC will work with other U.S. Government agencies and departments, as well as foreign governments and commercial partners, to update, balance, and integrate all of the tools of U.S. power. We will evolve policies, strategies, and doctrine pertaining to national security space.

Implementation plans will be developed based on feasibility and affordability assessments and cost, benefit, and risk analyses. Further, the impact of plans on manning, operations, and programs will be understood prior to implementation. As stated in the National Security Strategy, our ability to achieve long-term goals for space depends upon our fiscal responsibility and making tough choices, such as between capability and survivability.

CONCLUSION – A NEW TYPE OF LEADERSHIP

> *"Our national security strategy is, therefore, focused on renewing American leadership so that we can more effectively advance our interests in the 21st century. We will do so by building on the sources of our strength at home, while shaping an international order that can meet the challenges of our time."*
>
> \- 2010 National Security Strategy

The United States will retain leadership in space by strengthening our posture at home and collaborating with others worldwide. Just as U.S. national security is built upon maintaining strategic advantages, it is also increasingly predicated on active U.S. leadership of alliance and coalition efforts in peacetime, crisis, and conflict.

Active U.S. leadership in space requires a whole-of-government approach that integrates all elements of national power, from technological prowess and industrial capacity to alliance building and diplomatic engagement. Leadership cannot be predicated on declaratory policy alone. It must build upon a willingness to maintain strategic advantages while working with the international community to develop collective norms, share information, and collaborate on capabilities.

U.S. leadership in space can help the United States and our partners address the challenges posed by a space domain that is increasingly congested, contested, and competitive. Our strategy seeks to address this new environment through its set of interrelated approaches:

- We seek to address *congestion* by establishing norms, enhancing space situational awareness, and fostering greater transparency and information sharing. Our words and deeds should reassure our allies and the world at large of our intent to act peacefully and responsibly in space and encourage others to do the same.
- We seek to address the *contested* environment with a multilayered deterrence approach. We will support establishing international norms and transparency and confidence-building measures in space, primarily to promote spaceflight safety but also to dissuade and impose international costs on aggressive behavior. We will improve and protect vital U.S. space capabilities while using interoperability, compatibility, and integration to create coalitions and alliances of responsible space-faring nations. We will improve our capability to attribute attacks and seek to deny meaningful operational benefits from such attacks. We will retain the right and capabilities to respond in self-defense, should deterrence fail.
- We seek to address *competition* by enhancing our own capabilities, improving our acquisition processes, fostering a healthy U.S. industrial base, and strengthening collaboration and cooperation.

Our objectives are to improve safety, stability, and security in space; to maintain and enhance the strategic national security advantages afforded to the United States by space; and to energize the space industrial base that supports U.S. national security. Achieving these objectives will mean not only that our military and intelligence communities can continue to use space for national security purposes, but that a community of nations is working toward creating a sustainable and peaceful space environment to benefit the world for years to come.

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Department of Defense

DIRECTIVE

NUMBER 5105.23
June 28, 2011

DA&M

SUBJECT: National Reconnaissance Office (NRO)

References: See Enclosure 1

1. PURPOSE. Pursuant to the authorities vested in the Secretary of Defense by title 10, United States Code (U.S.C.); title 50, U.S.C.; and Executive Order (E.O.) 12333 (References (a) through (c)), and pursuant to the Secretary of Defense-Director of National Intelligence (DNI) Memorandum of Agreement (MoA) of September 21, 2010 and DoD Directive (DoDD) 5143.01 (References (d) and (e)), this Directive reissues DoDD 5105.23 (Reference (f)) to update the mission, organization and management, responsibilities and functions, relationships, authorities, and administration of the NRO. This Directive shall be interpreted consistent with law, policy, and directive, including, as applicable, those related to the DNI and existing parent element agreements. This Directive addresses the roles and responsibilities of the NRO within the DoD and acknowledges interdependencies with parent elements, other government agencies (OGAs), and the DNI, as appropriate.

2. APPLICABILITY. This Directive applies to OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities in the DoD (hereinafter referred to collectively as the "DoD Components").

3. DEFINITIONS. See Glossary.

4. MISSION. The NRO is responsible for research and development (R&D), acquisition, launch, deployment, and operation of overhead reconnaissance systems, and related data-processing facilities to collect intelligence and information to support national and DoD missions and other United States Government (USG) needs, pursuant to Reference (d).

5. ORGANIZATION AND MANAGEMENT

a. The NRO is a Defense Agency. The Secretary of Defense exercises authority, direction, and control over the NRO, pursuant to References (a) and (b) and other applicable authorities. The Under Secretary of Defense for Intelligence (USD(I)) exercises the authority, direction, and control of the Secretary of Defense over the Director, NRO (DNRO), pursuant to section 192(a) of Reference (a) and section 5.1.2. of Reference (e).

b. The NRO shall consist of a Director, a Principal Deputy Director, a Deputy Director, and such subordinate organizational elements as are established by the Director within the resources assigned by the Secretary of Defense, the DNI, or OGAs, as appropriate.

c. The NRO is also an element of the Intelligence Community (IC), subject to the oversight of the DNI, pursuant to References (b), (c), and (d). The DNI provides objectives, priorities, and guidance for, determines requirements and the budget of, and exercises transfer and reprogramming authorities over the National Intelligence Program (NIP) portion of the NRO budget. The DNI also exercises National Intelligence tasking and oversight; authorities for IC-wide policies relating to personnel, acquisition management, security, information technology, education, and training; oversight of intelligence coordination with foreign governments and international organizations; and other applicable authorities over the NRO, pursuant to References (b) and (c). The DNRO shall keep the USD(I) fully informed of all National Intelligence activities undertaken by the NRO that are tasked by the DNI consistent with Reference (d) and the Secretary of Defense and DNI MoA (Reference (g)). The DNRO shall assist the Secretary of Defense and the DNI in their respective responsibilities to manage, develop, and ensure implementation of policies, principles, standards, and guidelines for the security of information systems supporting the operations under their respective control, as well as supporting the operations of OGAs with national security information.

d. The DNRO shall also advise the DNI and Director of Defense Intelligence (DDI), as appropriate, and as established by Reference (g), on all matters under the purview of the DNI concerning overhead reconnaissance. The DDI will advise the DNI on critical deficiencies and strengths regarding overhead reconnaissance-related Defense Intelligence capabilities after coordination with the DNRO, and provide assessments on the effect of such deficiencies and strengths in meeting National Intelligence objectives.

6. RESPONSIBILITIES AND FUNCTIONS. The DNRO, under the authority, direction, and control of the USD(I), serves as the principal advisor on overhead reconnaissance to the Secretary of Defense, the Chairman of the Joint Chiefs of Staff, the Combatant Commanders, the Secretary of the Air Force, and the DoD Executive Agent (EA) for Space. The DNRO is responsible for the management and operations of the NRO, its program activities, and the acquisition of NRO systems. The DNRO directs and manages all assigned resources to provide peacetime, contingency, crisis, and combat overhead reconnaissance support to the Armed Forces of the United States, and delivers intelligence, surveillance, and reconnaissance capabilities, information products, services, and tools in response to national-level tasking in coordination with the Functional Managers. The DNRO shall receive and implement Secretary

of Defense and DNI guidance and direction by establishing strategic guidance, policy, and procedures for the execution of the NRO mission and the accomplishment of DNRO National Security Space (NSS) responsibilities. In the fulfillment of these responsibilities, the DNRO shall:

a. Operations

(1) General

(a) Set, control, direct, and standardize policies, procedures, standards, infrastructure systems, and operations within the NRO.

(b) Pursuant to Reference (d), negotiate and maintain formal agreements with parent elements to ensure the NRO is staffed with qualified detailees from DoD Components, other IC elements, and OGAs as necessary and to address delegation of authority requirements in order to assemble high-quality leadership and workforce with domain or other appropriate enabling functional experience for tours of duty that promote continuity of effort. The resulting NRO workforce shall act as a unified staff supporting the NRO mission. Formal agreements between DNRO and the Heads of other DoD Components, other IC elements, or OGAs shall be used to address staffing and delegations of authority requirements. Any existing agreements between agencies relating to staffing, authorities, and delegations of authorities remain in effect unless and until formally revoked or modified according to the terms of those agreements.

(c) Ensure that the NRO is responsive to its organizational customer requirements and that their levels of satisfaction are ascertained and factored into program execution and measures are taken to improve responsiveness, as appropriate.

(2) Support to the Armed Forces of the United States and the IC

(a) Carry out operational responsibilities for launch integration of NRO spacecraft, spacecraft command and control, and overhead reconnaissance data processing, and manage facilities required for these functions.

(b) Provide communications, collection capabilities, and related data processing based on validated capabilities requirements in support of DoD, IC, and other USG needs. Collected data shall be processed and handled in accordance with the laws and policies of the supported USG entity.

(c) Plan and provide for survival, recovery, and reconstitution of NRO mission-essential functions, pursuant to DoDD 3020.26 (Reference (h)).

(3) Security

(a) Establish security control policies and procedures that incorporate requirements of DoD 5200.1-R (Reference (i)) and applicable Intelligence Community Directives (ICDs), and that are consistent with DoD and Office of the DNI (ODNI) guidance, as appropriate.

(b) Operate security programs to protect people, facilities, technology, information systems, and information.

(4) Counterintelligence (CI)

(a) Integrate CI activities into operations, programs, systems, exercises, planning, doctrine, strategies, policies, and architectures.

(b) Conduct and report CI activities in accordance with DoDD O-5240.02 (Reference (j)).

(5) Establish and coordinate performance metrics to measure, assess, and improve NRO overhead reconnaissance programs, operations, activities, and performance.

b. Principal Advisor for Overhead Reconnaissance

(1) Establish and chair a senior-level advisory group to advise the DNRO. This group shall be known as the Overhead Reconnaissance Advisory Group (ORAG). ORAG membership shall be drawn from key DoD and IC stakeholders, pursuant to Reference (d).

(2) Provide the principal interface between overhead reconnaissance and other domains.

(3) Recommend proposed overhead reconnaissance space architectures and appropriate sustainment plans for established space architectures where the DNRO is responsible.

c. Support to NSS Activities

(1) As the Head of a DoD Component and IC element with a unique mission, history, and organizational composition, the DNRO shares NSS sector leadership and management responsibilities, and coordinates with other NSS sector stakeholders, such as the Secretary of the Air Force, the USD(I), the Under Secretary of Defense for Policy (USD(P)), the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), the Assistant Secretary of Defense for Networks and Information Integration/DoD Chief Information Officer, the DoD EA for Space, the Chairman of the Joint Chiefs of Staff, and the Commander, United States Strategic Command (CDRUSSTRATCOM), on policy and strategy, technology security, export control, and international engagement related to overhead reconnaissance or other space activities. Those NSS sector stakeholders that have leadership and management responsibilities should coordinate the aforementioned overhead reconnaissance or other space activities with the DNRO.

(2) Serve as a member of the Defense Space Council (DSC), advising the DoD EA for Space on overhead reconnaissance matters, in order to generate greater synchronization for NSS programs and planning.

(3) Lead and manage NRO commercial partnerships, and industrial and supplier base issues that involve overhead reconnaissance, and consult with the DSC on industrial and supplier base matters.

(4) Collaborate with the DoD EA for Space in the development of other space mission architectures, when appropriate.

(5) Ensure NRO activities are integrated, when appropriate, within the DoD, and with programs of the National Aeronautics and Space Administration and OGAs, as well as those organizations and the governments of allied and friendly countries, as appropriate.

(6) Maintain partnerships across organizational boundaries with other members of the IC and other entities, as required, in support of NRO missions and programs to optimize appropriate DoD technical and operational capabilities and resources.

(7) Ensure that the Secretary of Defense and the DNI are fully informed of all important activities of the NRO, including all other space governance processes that are addressed in DoD, IC, or other USG policy, law, and directives.

d. Program Activities

(1) Budgeting and Efficiency

(a) Prepare a comprehensive NRO program and budget input, pursuant to applicable Secretary of Defense-DNI guidance and mission requirements, for inclusion in the President's NIP and the DoD Military Intelligence Program (MIP), pursuant to DoDD 5205.12 (Reference (k)).

1. Develop, manage, implement, and conduct the NRP within the NIP and the NRO Program within the MIP.

2. Manage the NRP and, in accordance with Reference (k), the NRO MIP.

3. Develop an integrated NRP/NRO MIP, for the approval of the Secretary of Defense and the DNI.

(b) Pursuant to Reference (d) and Secretary of Defense-DNI MoA (Reference (l)), for wholly or majority NIP-funded NRO programs, budget to Independent Cost Estimates in accordance with applicable law, and with policy and regulations unless waived by the DNI. For these NIP-funded NRO programs, the IC shall validate capabilities requirements with the Joint Staff supporting coordination. For wholly or majority MIP-funded NRO programs, the Joint Requirements Oversight Council (JROC) shall validate requirements with the IC supporting coordination.

(c) Work with the Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer (OUSD(C)/CFO) and ODNI to ensure proper budgeting, execution, and accounting of programs. The DNRO needs budget flexibility to respond to program challenges, including the ability to move funds within and between programs for budget planning to the fullest extent allowed by law. In cases of successful acquisition performance or where sufficient risk has been retired, reprogramming of savings may be permitted in coordination with OUSD(C)/CFO and ODNI, as authorized by law and regulation.

(d) Develop and manage those MIP resources and capabilities under DNRO purview, pursuant to Reference (k).

(e) Ensure that NRO operations are planned and managed in ways that provide for optimally efficient and effective expenditure and use of all assigned and programmed USG resources; and that business operations are streamlined, infrastructure and support staffs are mission essential, and leadership and management are as effective and efficient as possible.

(2) R&D

(a) Plan and conduct overhead reconnaissance R&D in support of the NRO mission.

(b) Manage and direct a science and technology program that underpins NRO R&D priorities.

(3) Acquisition

(a) Serve as the Senior Acquisition Executive for the NRO.

(b) When and if designated or assigned by the USD(AT&L) and the Assistant DNI for Acquisition, Technology, and Facilities (ADNI/AT&F) execute milestone decision authority (MDA) and full program management authority over majority or wholly NIP funded NRO programs, pursuant to Reference (d).

(c) When designated or assigned by the USD(AT&L), execute MDA and full program management authority over majority or wholly MIP-funded NRO programs with ODNI participation.

(d) Ensure the active participation of NRO staff at all levels of DoD and IC processes so that technical and programmatic risk factors are properly considered, when proposed or ongoing NRO-directed programs are to be considered by either the JROC or IC.

(e) Be responsive to program review and program management plan processes conducted by the USD(AT&L) or the ADNI/AT&F.

(f) Address overhead reconnaissance system requirements established by the Functional Managers and validated by the JROC and IC requirements process.

e. NRO Oversight

(1) Conduct all NRO activities in conformity with applicable law, policy, and regulations, and report issues or activities that raise questions of legality or propriety to the USD(I), the Inspector General of the Department of Defense, the Assistant to the Secretary of Defense for Intelligence Oversight (ATSD(IO)), and, as appropriate, the General Counsel of the DoD (GC DoD), pursuant to DoDD 5240.01 (Reference (m)) and DoD 5240.1-R (Reference (n)), and appropriate controls and standards of conduct.

(2) Comply with applicable laws, requirements, and DoD policies related to the privacy and civil liberties responsibilities of the DoD.

(3) As a Defense Intelligence Component, NRO shall ensure that all employees and subordinate organizations, to include supporting contractors and external laboratories, fully comply with the intelligence oversight awareness, training, and reporting requirements set forth in Reference (i), and with additional IC mission partner directives and regulations concerning intelligence collection, retention, and dissemination. The NRO intelligence oversight responsibility applies to R&D, acquisition, launch, deployment, and operation of overhead reconnaissance systems, and related data-processing facilities that collect intelligence and information.

f. International Engagement

(1) Conduct foreign liaison relationships relating to the NRO mission, with the authority of the Secretary of Defense and/or the DNI, as appropriate, pursuant to Reference (c). As appropriate, coordinate overhead reconnaissance agreements and arrangements with OGAs.

(2) Provide technical advice and support on overhead reconnaissance arrangements with foreign governments and international organizations, and conduct, as authorized, exchanges, pursuant to References (a) through (d).

(3) Leverage overhead reconnaissance capabilities of foreign partners with whom NRO has an established relationship or as directed by the Secretary of Defense or DNI, or as coordinated with the Director of the National Security Agency (NSA) or the Director of the National Geospatial-Intelligence Agency (NGA).

g. Other Duties. Perform those additional activities for the DoD and the IC, and such other duties as may be directed by the President of the United States, the Secretary of Defense, the USD(I), or the DNI.

7. RELATIONSHIPS. The unique mission, history, and organization of the NRO requires that the DNRO maintain close, integral relationships, through appropriate channels, in a broad array of partnerships with the heads of OGAs, the Chairman of the Joint Chiefs of Staff, the Heads of the other DoD Components, and the Commanders of the Combatant Commands with specific responsibilities for overhead and space activities in peacetime and wartime. The DNRO must also maintain close integral relationships with IC and DoD mission partners and Functional

Managers. The following relationships support the DNRO in the performance of assigned responsibilities and functions:

a. DNRO. In the execution of duties assigned herein, the DNRO shall:

(1) Report to the USD(I).

(2) Report to the Secretary of Defense and the Deputy Secretary of Defense when circumstances require their immediate attention and/or decision. The DNRO shall inform the USD(I) in a timely manner when such instances are imminent or have occurred.

(3) Report to the DNI, consistent with References (a), (b), and (c).

(4) Communicate directly with the DoD EA for Space and the members of the DSC, as appropriate.

(5) Coordinate with the USD(P) and other DoD Officials on matters that relate to DNRO areas of responsibility, as appropriate.

(6) Maintain communications with other IC elements, pursuant to Reference (c) and other applicable authorities.

(7) Inform the USD(I) in coordination with the DNI and in accordance with procedures to be established separately by the USD(I) and approved by the Secretary of Defense, when the NRO has submitted information on the NRO and/or its activities to OGAs.

(8) Participate in the Secretary of Defense Biennial Review of Defense Agencies and DoD Field Activities as directed by the Director of Administration and Management (DA&M).

(9) Notify the USD(I) and the GC, DoD within 90 days of the issuance date when the DNRO believes a DoD Issuance would damage, limit, or seriously inhibit the NRO from carrying out its national or DoD missions.

(10) Obtain concurrence from the Heads of DoD Components on programs for which the Head of the DoD Component has the primary responsibility and where the NRO has a collateral responsibility.

(11) Coordinate with the IC Functional Managers and the DoD Geospatial Intelligence (GEOINT) Manager on applicable NRO Overhead Reconnaissance activities.

(12) Identify a Special Communications focal point who will represent NRO interests to the DoD Special Communications Enterprise Office (SCEO) and the Defense Special Communications Enterprise Working Group. Provide support to the DoD SCEO in accordance with DoD Instruction (DoDI) S3200.17 (Reference (o)).

b. USD(I). The USD(I) shall:

(1) Exercise authority, direction, and control over the DNRO in accordance with References (a) and (e).

(2) Inform the DNRO when NRO overhead reconnaissance-related information is shared with the DNI and OGAs, as appropriate.

(3) Consider and, where appropriate, delegate authority for certain overhead reconnaissance-related matters to the DNRO, unless prohibited by regulation, E.O., or law.

(4) Oversee coordination of NRO information management within and among the Defense Intelligence Components in accordance with DoD 8910.1-M (Reference (p)).

c. USD(AT&L). The USD(AT&L), in accordance with DoDD 5134.01 (Reference (q)), shall:

(1) Oversee, advise, and assist the DNRO on the acquisition process.

(2) Jointly with the ADNI/AT&F, and as delegated by the Secretary of Defense and DNI, respectively:

(a) Exercise the decision to delegate indefinite acquisition MDA to the DNRO as programs are initiated or at subsequent milestone decision points, if determined appropriate and agreed to with the ODNI. Delegation of that authority shall continue and shall be reconsidered only by exception consistent with current DoD and IC acquisition policy.

(b) Oversee all wholly or majority NIP-funded NRO major system acquisition programs, and at least once per quarter review and assess program execution. Effective NRO program execution shall address needs for both transparency and agility to respond to a dynamic program environment. Oversight of wholly or majority MIP-funded NRO major system acquisition programs shall be conducted by the USD(AT&L) with ODNI participation. These acquisition authorities are further described in Reference (l) and ICD 801 “Acquisition” (Reference (r)).

(3) Develop relationships with aerospace contractors and other organizations relevant to the NRO mission for the purposes of improving technological strength.

d. ATSD(IO). The ATSD(IO) shall have access to records and information of the NRO pursuant to DoDD 5148.11 (Reference (s)) necessary for the fulfillment of ATSD(IO) responsibilities and functions.

e. Chairman of the Joint Chiefs of Staff. The Chairman of the Joint Chiefs of Staff shall facilitate communications with the Combatant Commanders, especially CDRUSSTRATCOM, to ensure a close working relationship exists between the NRO and the Combatant Commands.

f. Heads of the DoD Components. The Heads of DoD Components shall:

(1) Obtain DNRO concurrence on programs for which the NRO has a primary responsibility, and coordinate with DNRO on programs for which NRO has collateral responsibility. This includes, but is not limited to, the review and approval of statements of work, proposed contract changes, and the definition of technical specifications and standards.

(2) Provide such support to the DNRO, within their capabilities, as may be necessary to assist the DNRO in carrying out assigned responsibilities and functions.

g. Secretaries of the Military Departments. The Secretaries of the Military Departments, in addition to the duties in paragraph 7.f. above, shall:

(1) As heads of parent elements, provide personnel, infrastructure, and resource support to the NRO as agreed to separately with the USD(I) and the DNRO. Personnel shall have space domain or other appropriate experience to promote the NRO mission and continuity of effort, pursuant to Reference (d).

(2) Collaborate with the DNRO regarding the NRO responsibility to develop and submit for approval consolidated overhead reconnaissance plans and programs, together with DNRO recommendations regarding requirements for military and civilian manpower, operating costs, investment in facilities and capital equipment, R&D, testing, and evaluation.

h. The Secretary of the Air Force. The Secretary of the Air Force, in addition to paragraph 7.g. of this section, shall:

(1) Coordinate with the DNRO on the use of military facilities for reconnaissance satellite launches, in accordance with DoDD 5101.02 (Reference (t)).

(2) Fulfill responsibilities regarding NRO matters when required and applicable.

(3) Coordinate with the DNRO on the use of shared resources.

(4) Serve as the DoD EA for Space, in accordance with Reference (t).

i. CDRUSSTRATCOM. The CDRUSSTRATCOM shall provide functional and operational expertise in the employment of space systems. Such expertise shall include, but will not be limited to: articulation of the military strategy for space operations; identification of military operational capabilities and objectives for space systems; development of space command and control operational structures and procedures for employing military space capabilities; and the development and execution of procedures for sharing space situational awareness information within the DoD and USG, as well as with authorized non-USG entities. The CDRUSSTRATCOM, through the Joint Space Operations Center, shall also support the DNRO's responsibilities for collision avoidance and management of the exclusion list. They share management of some facilities, collaborate on a continuing basis to evolve the mission and improve operational effectiveness, and specifically provide systems to support tasking, processing, exploitation and dissemination for NRO systems.

j. Director of the Defense Intelligence Agency (DIA), Director of the NGA, and Director, National Security Agency/Chief, Central Security Service (DIRNSA/CHCSS). The Director of the DIA, the Director of the NGA, and the DIRNSA/CHCSS, under the authority, direction, and control of the USD(I), and in addition to duties in paragraph 7.f. above, shall provide expertise, capabilities, and all available data and information necessary for the DNRO to perform the responsibilities and functions prescribed herein, within existing resources.

8. AUTHORITIES. The DNRO is hereby delegated authority to:

a. Communicate directly with the Heads of the DoD Components, as necessary, to carry out assigned responsibilities and functions, including requests for advice and assistance. Communications to the Military Departments shall be transmitted through the Secretaries of the Military Departments, their designees, or as otherwise provided in law or as directed by the Secretary of Defense in other DoD issuances. Communications to the Commanders of the Combatant Commands normally shall be transmitted through the Chairman of the Joint Chiefs of Staff.

b. Communicate with other Government officials, representatives of the Legislative Branch, members of the public, and representatives of foreign governments or other entities, as appropriate, in carrying out assigned responsibilities and functions. Communications with representatives of the Legislative Branch shall be coordinated with the Assistant Secretary of Defense for Legislative Affairs or the Under Secretary of Defense (Comptroller)/Chief Financial Officer, as applicable, and be consistent with the DoD Legislative Program. Those issues that fall under the purview of the DNI or parent element shall be coordinated with the DNI and conducted in accordance with DNI or parent element guidance.

c. Request a meeting with the Secretary of Defense and/or DNI, or their deputies, to discuss overhead reconnaissance issues, including elevating for decision strategic or programmatic issues related to DNRO responsibilities, as appropriate or necessary.

d. Obtain reports and information, pursuant to DoDI 8910.01 (Reference (u)), as necessary, to carry out assigned responsibilities and functions.

e. Establish and maintain relationships with foreign governments and other entities, including commercial relationships, and industrial and supplier base issues that are consistent with the NRO mission for overhead reconnaissance in accordance with References (a) through (d).

f. Publish guidance to the DoD Components in carrying out assigned responsibilities and functions prescribed herein in accordance with the authorities contained in Enclosure 2.

g. Ensure that other authorities provided by statute or specifically delegated by the Secretary of Defense are carried out in support of the NRO mission.

h. Execute the authorities and responsibilities concerning personnel support established in the MoA between the Central Intelligence Agency and the National Reconnaissance Office on Personnel Support Relationships (Reference (v)).

i. Exercise the administrative authorities contained in Enclosure 2.

9. ADMINISTRATION

a. The DNRO is appointed by the Secretary of Defense with the concurrence of the DNI, in accordance with References (a) through (d). The Principal Deputy Director, NRO, and the Deputy Director, NRO, are nominated and approved in accordance with Reference (d).

b. The DNRO shall be authorized such personnel, facilities, funds, and other resources as the Secretary of Defense deems appropriate, including facilities, services, and other support from the Military Departments. The DNI, pursuant to DNI authorities, may also authorize such personnel, facilities, funds, and other resources as appropriate.

10. RELEASABILITY. UNLIMITED. This Directive is approved for public release and is available on the Internet from the DoD Issuances Website at http://www.dtic.mil/whs/directives.

11. EFFECTIVE DATE. This Directive is effective upon its publication to the DoD Issuances Website.

Robert M. Gates
Secretary of Defense

Enclosures
1. References
2. Delegations of Authority
Glossary

<u>ENCLOSURE 1</u>

<u>REFERENCES</u>

(a) Title 10, United States Code
(b) Title 50, United States Code
(c) Executive Order 12333, “United States Intelligence Activities,” December 4, 1981, as amended
(d) Memorandum of Agreement between the Secretary of Defense and the Director of National Intelligence concerning the National Reconnaissance Office, September 21, 2010
(e) DoD Directive 5143.01, “Under Secretary of Defense for Intelligence (USD(I)),” November 23, 2005
(f) DoD Directive 5105.23, “National Reconnaissance Office,” March 27, 1964 (hereby cancelled)
(g) Memorandum of Agreement between the Secretary of Defense and the Director of National Intelligence on the Director of Defense Intelligence, May 21, 2007
(h) DoD Directive 3020.26, “Department of Defense Continuity Programs,” January 9, 2009
(i) DoD 5200.1-R, “Information Security Program,” January 1997
(j) DoD Directive O-5240.02, “Counterintelligence,” December 20, 2007
(k) DoD Directive 5205.12, “Military Intelligence Program (MIP),” November 14, 2008
(l) Memorandum of Agreement between the Secretary of Defense and the Director of National Intelligence, “Management of Acquisition Programs Executed at the Department of Defense Intelligence Community Elements,” March 25, 2008
(m) DoD Directive 5240.01, “DoD Intelligence Activities,” August 27, 2007
(n) DoD Regulation 5240.1-R, “Procedures Governing the Activities of DoD Intelligence Components That Affect United States Persons,” December 1982
(o) DoD Instruction S-3200.17, “Implementing Instructions for the DoD Special Communications Enterprise Office (SCEO) (U),” July 15, 2009
(p) DoD Manual 8910.1-M, “DoD Procedures for Management of Information Requirements,” June 30, 1998
(q) DoD Directive 5134.01, “Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)),” December 9, 2005
(r) Intelligence Community Directive (ICD) 801, “Acquisition,” August 15, 2006
(s) DoD Directive 5148.11, “Assistant to the Secretary of Defense for Intelligence Oversight (ATSD(IO)),” September 20, 2010
(t) DoDD 5101.02, “DoD Executive Agent for Space,” June 3, 2003
(u) DoD Instruction 8910.01, “Information Collection and Reporting,” March 6, 2007
(v) Memorandum of Agreement between the Central Intelligence Agency and the National Reconnaissance Office on Personnel Support Relationships, September 6, 2007

ENCLOSURE 2

DELEGATIONS OF AUTHORITY

Pursuant to the authority vested in the Secretary of Defense, and subject to the authority, direction, and control of the Secretary of Defense or the USD(I), and in accordance with DoD policies and issuances, the DNRO, or in the absence of the Director, the person acting for the Director, is hereby delegated authority, as required, in the administration and operation of NRO for the functions herein. Parent element authorities related to the functions described below shall be addressed in MoAs, memoranda of understanding, or other agreements between the DNRO and the applicable head of a parent element.

a. Human Resources

(1) Establish an NRO Incentive Awards Board and pay cash awards to, and incur necessary expenses for, the honorary recognition of USG civilian employees whose suggestions, inventions, superior accomplishments, or other personal efforts, including special acts or services, benefit the NRO, pursuant to section 4503 of title 5, U.S.C., Office of Personnel Management (OPM) regulations, and DoDI 1400.25.

(2) Establish a joint military recognition program, pursuant to DoD 1348.33-M.

(3) As necessary, use advisory committees and employ temporary or intermittent experts or consultants, as approved by the Secretary of Defense or the DA&M, in support of NRO functions, in accordance with section 173 of Reference (a); section 3109(b) of title 5, U.S.C.; Federal Advisory Committee Act, title 5, U.S.C. Appendix 2; and DoDI 5105.04.

(4) Authorize and approve:

(a) Temporary duty travel for military personnel assigned or detailed to the NRO, pursuant to Joint Federal Travel Regulations, Volume 1.

(b) Temporary duty travel for civilian personnel assigned or detailed to the NRO, pursuant to Joint Travel Regulations, Volume 2.

(c) Invitational travel to non-DoD personnel whose consultative, advisory, or other highly specialized technical services are required in a capacity that is directly related to or in connection with NRO activities, pursuant to section 5703 of title 5, U.S.C., and Joint Travel Regulations, Volume 2.

(d) Overtime work for civilian personnel assigned or detailed to the NRO, pursuant to chapter 55, subchapter V of title 5, U.S.C., and applicable OPM regulations, if not provided by the associated parent element under separate agreement.

(e) Funds available for travel by military personnel assigned or detailed to the NRO for expenses incident to attendance at meetings of technical, scientific, professional, or other similar organizations in such instances when the approval of the Secretary of Defense, or designee, is required by section 412 of title 37, U.S.C., and sections 4110 and 4111 of title 5, U.S.C.

b. Personnel Security

(1) Collaborate and partner with the parent elements of personnel detailed or assigned to NRO, using separate agreements, as needed, regarding parent element personnel security policies and authorities as they affect the NRO. Such agreements will stipulate the personnel security requirements for assignment or detail to the NRO, and conditions under which NRO can deny or revoke such assignments or details.

(2) Adhere to the personnel security policies and procedures in this section and elsewhere in this Directive regarding all contractor personnel supporting contracts under the cognizance of the DNRO and supporting NRO operations, activities, and programs, consistent with the National Industrial Security Program.

(3) Collaborate with the applicable parent element, as necessary, regarding Sensitive Compartmented Information (SCI) access eligibility for all persons detailed or assigned to the NRO. Parent elements are responsible for these eligibility and access determinations, pursuant to Reference (c) and ICD 704. The DNRO remains responsible for determining eligibility for access to SCI and clearing NRO employees, contractors and such other NRO persons as may be appropriate for access to classified information pursuant to Reference (i), the DoD Personnel Security Program, the National Industrial Security Program, and applicable DNI policy.

c. Physical Security

(1) Promulgate the necessary security policies for the physical protection of property and places under the jurisdiction of the DNRO, including those in industry wherein NRO SCI resides, pursuant to Reference (c), DoDI 5200.08, and applicable DNI guidance. Promulgate regulations governing the granting or denial of industrial clearances for access to sensitive information and regulate physical security in industry or NRO-sponsored contracts for sensitive materials.

(2) Protect the security of NRO installations, activities, property, information, and personnel by appropriate means, including the publication of necessary security regulations.

(3) Establish, direct, and administer all aspects of the NRO security program for the protection of SCI, including all necessary coordination and implementation of DNI security policy, pursuant to References (c) and (i), DCID 6/1, and E.O. 13526.

d. Information Security

(1) Establish, direct, and administer an information security program that incorporates requirements of applicable DNI policy for protection of SCI, and Reference (i) for protection of collateral classified information.

(2) Coordinate with the Office of the Under Secretary of Defense for Intelligence on matters relating to the DoD security oversight program, and security program implementation.

e. Counterintelligence (CI)

(1) Maintain an organic CI capability to identify vulnerabilities, recommend countermeasures, and resolve other CI matters to counter the foreign intelligence and international terrorist threat to NRO operations.

(2) Conduct authorized DoD polygraph and credibility assessment examinations in accordance with DoDD 5210.48.

(3) Conduct authorized DoD technical surveillance countermeasures activities in accordance with DoDI 5240.05.

f. Records

(1) Maintain an official seal and attest to the authenticity of official NRO records under that seal.

(2) Develop, establish, and maintain an active and continuing Records Management Program, pursuant to section 3102 of title 44, U.S.C., and DoDD 5015.2.

g. Publications

(1) Authorize the publication of advertisements, notices, or proposals in newspapers, magazines, or other public media, as required, for the effective administration and operation of the NRO, pursuant to section 3702 of title 44, U.S.C.

(2) Establish and maintain, for the functions assigned, an appropriate publications system for common supply and service regulations, instructions, and reference documents, and changes thereto, pursuant to DoDI 5025.01.

h. Acquisition/Procurement, Financial Management, and Property

(1) Comply with DoD and IC directives and agreements concerning acquisition, including References (d), (q), and (r).

(2) Enter into support and service agreements with the Military Departments, other DoD Components, and other USG departments and agencies and parent elements, as required, for the effective performance of NRO responsibilities and functions.

(3) Enter into and administer contracts, directly or through a Military Department, DoD contract administration services component, or other USG department or agency, as appropriate, for supplies, equipment, and services required to accomplish the NRO mission. To the extent that any law or E.O. specifically limits such authority to persons at the Secretarial level of a

Military Department, such authority shall be exercised by the appropriate Under Secretary of Defense.

(4) Use the Government-wide commercial purchase card for making appropriate purchases of material and services, other than personal services, for the NRO when it is determined to be more advantageous and consistent with the best interests of the Government.

(5) Lease non-excess property under NRO control, under terms that will promote the National Defense or that will be in the public interest, pursuant to section 2667a of Reference (a).

(6) Enter into personal-services contracts to the extent permitted by law.

(7) Approve premium-class travel, when required, for the successful performance of an intelligence mission.

(8) Exercise the authority delegated to the Secretary of Defense by the Administrator of the General Services Administration on the disposal of surplus personal property for responsibilities assigned herein.

(9) Establish and maintain appropriate property accounts for the NRO, appoint Boards of Survey, approve reports of survey, relieve personal liability, and drop accountability for NRO property contained in the authorized property accounts that has been lost, damaged, stolen, destroyed, or otherwise rendered unserviceable, pursuant to applicable laws and regulations.

i. Training. Establish and administer training programs as prescribed in DoDI 1430.04.

j. Re-Delegation. The DNRO may re-delegate these authorities, as appropriate and in writing, except as otherwise restricted in this enclosure or by law or regulation.

GLOSSARY

PART I. ABBREVIATIONS AND ACRONYMS

ADNI/AT&F	Assistant DNI for Acquisition, Technology, and Facilities
ATSD(IO)	Assistant to the Secretary of Defense for Intelligence Oversight
CDRUSSTRATCOM	Commander, United States Strategic Command
CI	counterintelligence
DA&M	Director of Administration and Management
DCID	Director of Central Intelligence Directive
DDI	Director of Defense Intelligence
DIA	Defense Intelligence Agency
DIRNSA/CHCSS	Director, National Security Agency/Chief, Central Security Service
DoDD	DoD Directive
DoDI	DoD Instruction
DNI	Director of National Intelligence
DNRO	Director, National Reconnaissance Office
DSC	Defense Space Council
EA	Executive Agent
E.O.	Executive Order
GC DoD	General Counsel of the DoD
GEOINT	Geospatial Intelligence
IC	Intelligence Community
ICD	Intelligence Community Directive
JROC	Joint Requirements Oversight Council
MDA	milestone decision authority
MIP	Military Intelligence Program
MoA	memorandum of agreement

NGA	National Geospatial-Intelligence Agency
NIP	National Intelligence Program
NRO	National Reconnaissance Office
NRP	National Reconnaissance Program
NSA	National Security Agency
NSS	National Security Space
ODNI	Office of the DNI
OGAs	other government agencies
OPM	Office of Personnel Management
OUSD(C)/CFO	Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, Department of Defense
R&D	research and development
SCI	Sensitive Compartmented Information
SCEO	Special Communications Enterprise Office
U.S.C.	United States Code
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics
USD(C)/CFO	Under Secretary of Defense (Comptroller)/Chief Financial Officer, Department of Defense
USD(I)	Under Secretary of Defense for Intelligence
USD(P)	Under Secretary of Defense for Policy
USG	United States Government

PART II. DEFINITIONS

Unless otherwise noted, these terms and their definitions are for the purpose of this Directive:

Defense Intelligence Components. Refers to all DoD organizations that perform National Intelligence, Defense Intelligence, and intelligence-related functions, including the DIA, the NGA, the NRO, the National Security Agency/Central Security Service, and the intelligence elements of the Active and Reserve Components of the Military Departments, including the United States Coast Guard when operating as a service in the Department of the Navy.

Functional Manager. Pursuant to Reference (c), Functional Managers shall report to the DNI concerning the extent of their duties as Functional Managers, and may be charged with developing and implementing strategic guidance, policies, and procedures for activities related to a specific intelligence discipline or set of intelligence activities; setting training and tradecraft standards; and ensuring coordination within and across intelligence disciplines and IC elements and with related non-intelligence activities. Functional Managers may also advise on resource management; policies and procedures; collection capabilities and gaps; intelligence processing and dissemination; technical architectures; and other issues or activities, as applicable.

IC. A collective term meaning the USG departments and agencies involved with intelligence and intelligence-related matters and that are designated as part of this group in Reference (c).

National Intelligence. Refers to all intelligence regardless of the source from which derived and including information gathered within or outside the United States that pertains, as determined consistent with any guidance issued by the President, to more than one USG agency, and that involves threats to the United States, its people, property, or interests; the development, proliferation or use of weapons of mass destruction, or any other matter bearing on United States national or homeland security (Reference (o)).

NRO MIP. The NRO portion of the MIP.

NRO NIP. The NRO portion of the NIP.

NRP. The activities and all associated resources of the NRO, including its most recently approved budget, used to support its mission and further its strategic goals -- all under the authority, direction, and control of the DNRO.

NSS. The space-related systems, services, capabilities, and associated information systems and networks of the DoD and the National Intelligence community that support U.S. national security and enable defense and intelligence operations during times of peace, crisis, or conflict. The Secretary of Defense may designate other space-related systems as National Security Space systems in coordination with the system owner.

overhead reconnaissance. Activities carried out by space-based capabilities whose principal purpose is conducting and/or enabling intelligence collection. These activities are comprised of associated R&D, acquisition, test and evaluation, and system operations performed on or by satellites, communications, and facilities for data processing as well as command and control of spacecraft and payloads.

parent element. A DoD Component or OGA that provides personnel to work at the NRO, as mutually agreed between the DNRO and the Head of the applicable DoD Component or OGA.

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 417

[Docket No. FAA–2011–0181; Amdt. No. 417–2]

RIN 2120–AJ84

Launch Safety: Lightning Criteria for Expendable Launch Vehicles

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Direct final rule; request for comments.

SUMMARY: The FAA is amending its lightning commit criteria to account for new information about the risks of natural and triggered lightning. This action amends flight criteria for mitigating against naturally occurring lightning and lightning triggered by the flight of an expendable launch vehicle through or near an electrified environment in or near a cloud. These changes will increase launch availability and implement changes already adopted by the United States Air Force.

DATES: Effective July 25, 2011. Submit comments on or before July 8, 2011.

ADDRESSES: You may send comments identified by Docket Number FAA–2011–0181 using any of the following methods:

- *Federal eRulemaking Portal:* Go to *http://www.regulations.gov* and follow the instructions for sending your comments electronically.
- *Mail:* Send comments to Docket Operations, U.S. Department of Transportation, 1200 New Jersey Avenue, SE., West Building Ground Floor, Room W12–140, Washington, DC 20590.
- *Fax:* Fax comments to Docket Operations at 202–493–2251.
- *Hand Delivery:* Take comments to Docket Operations in Room W12–140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

For more information on the rulemaking process, see the **SUPPLEMENTARY INFORMATION** section of this document.

Privacy: We will post all comments we receive, without change, to *http://www.regulations.gov,* including any personal information you provide. Using the search function of our docket web site, anyone can find and read the comments received into any of our dockets, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (65 FR 19477–78) or you may visit *http://DocketsInfo.dot.gov.*

Docket: To read background documents or comments received, go to *http://www.regulations.gov* at any time or to Docket Operations in Room W12–140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and

5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: For technical questions concerning this rule contact Karen Shelton-Mur, Office of Commercial Space Transportation, AST–300, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591; telephone (202) 267–7985; facsimile (202) 267–5463, e-mail *Karen.Shelton-Mur@faa.gov.*

For legal questions concerning this rule contact Laura Montgomery, Senior Attorney for Commercial Space Transportation, Office of the Chief Counsel, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591; telephone (202) 267–3150; facsimile (202) 267–7971, e-mail *laura.montgomery@faa.gov.*

SUPPLEMENTARY INFORMATION:

Authority for This Rulemaking

The FAA's authority to issue rules on commercial space transportation safety is found in Title 49 of the United States Codes, section 322(a), which authorizes the Secretary of Transportation to carry out rulemakings. 51 U.S.C. subtitle V, chapter 509, 51 U.S.C. 50901–50923 (Chapter 509) governs the FAA's regulation of the safety of commercial space transportation. This rulemaking is promulgated under the authority of section 322(a).

Direct Final Rule Procedure

The FAA anticipates this regulation will not result in adverse or negative comment and therefore is issuing it as a direct final rulemaking. Because the changes to the lightning commit criteria will increase launch availability and are already implemented at Air Force launch ranges, the public interest is well served by this rulemaking.

Unless a written adverse or negative comment or a written notice of intent to submit an adverse or negative comment is received within the comment period, the regulations will become effective on the date specified above. After the close of the comment period, the FAA will publish a document in the **Federal Register** indicating that no adverse or negative comments were received and confirming the date on which the final rule will become effective. If the FAA does receive, within the comment period, an adverse or negative comment, or written notice of intent to submit such a comment, the FAA will withdraw the direct final rule by publication in the **Federal Register**, and a notice of proposed rulemaking may be published with a new comment period.

Comments Invited

The FAA invites interested persons to participate in this rulemaking by submitting written comments, data, or views. The agency also invites comments relating to the economic, environmental, energy, or federalism impacts that might result from adopting the changes. The most helpful comments reference a specific portion of the proposal, explain the reason for any recommended change, and include supporting data. To ensure the docket does not contain duplicate comments, please send only one copy of written comments, or if you are filing comments electronically, please submit your comments only one time.

The FAA will file in the docket all comments we receive, as well as a report summarizing each substantive public contact with FAA personnel concerning this rulemaking. Before acting on this proposal, the FAA will consider all comments received on or before the closing date for comments. The agency will consider comments filed after the comment period has closed if possible without incurring expense or delay. The FAA may make changes in light of the comments received.

Proprietary or Confidential Business Information

Do not file in the docket information that you consider to be proprietary or confidential business information. Send or deliver this information directly to the person identified in the **FOR FURTHER INFORMATION CONTACT** section of this document. Mark the information that is considered proprietary or confidential. If the information is on a disk or CD–ROM, mark the outside of the disk or CD–ROM and also identify electronically within the disk or CD–ROM the specific information that is proprietary or confidential.

Under 14 CFR 11.35(b), when the FAA is aware of proprietary information filed with a comment, the agency does not place it in the docket. The FAA holds it in a separate file to which the public does not have access, and the agency places a note in the docket that it has received it. If the FAA receives a request to examine or copy this information, the FAA treats it as any other request under the Freedom of Information Act, 5 U.S.C. 552. The FAA processes such a request under the DOT procedures found in 49 CFR part 7.

Availability of Rulemaking Documents

You can get an electronic copy using the Internet by:

(1) Searching the Federal eRulemaking portal at *http://www.regulations.gov;*

(2) Visiting the FAA's Regulations and Policies web page at *http://www.faa.gov/regulations_policies/;* or

(3) Accessing the Government Printing Office's web page at *http://www.gpoaccess.gov/fr/index.html.*

You can also get a copy by sending a request to the Federal Aviation Administration, Office of Rulemaking, ARM–1, 800 Independence Avenue, SW., Washington, DC 20591, or by calling (202) 267–9680. Make sure to identify the docket and amendment numbers of this rulemaking.

I. Background

On August 25, 2006, the FAA issued requirements designed for an expendable launch vehicle (ELV) to avoid natural and triggered lightning during flight. *Licensing and Safety Requirements for Launch,* 71 FR 50508 (Aug. 25, 2006). An ELV is an unmanned rocket that typically carries satellites to orbit. ELVs carry large amounts of fuel and, due to the explosive nature of the fuel, may not be permitted to reach populated areas in the event they go off course. In the United States, safety for ELVs is achieved by use of a flight termination system. A flight termination system prevents an errant launch vehicle from reaching a populated area by destroying the vehicle. A flight termination system consists of all components on board a launch vehicle that provide the ability to end its flight in a controlled manner. Without the restrictions mandated by appendix G of part 417, a lightning strike could disable a flight safety system yet allow continued flight of the launch vehicle without a launch operator being able to stop its flight.

By codifying appendix G, the FAA implemented criteria developed by a Lightning Advisory Panel (LAP) to the National Aeronautics and Space Administration (NASA) and the U.S. Air Force. *See* Merceret et al., ed., *A History of the Lightning Launch Commit Criteria and the Lightning Advisory Panel for America's Space Program,* NASA/SP–2010–216283, 124, par. 25 (Aug. 2010) (*A History of the Lightning Criteria*) and *Rationales for the Lightning Flight-Commit Criteria, NASA/TP–2010–216291,* (Oct. 7, 2010)(*Rationales for Lightning Criteria*). Appendix G's flight commit criteria impose time and distance restrictions on launch, requiring a launch operator to wait to initiate flight for specified amounts of time after a lightning strike or when launch would take a flight path too close to an electrified cloud.

In this direct final rule, the FAA is permitting greater launch availability. In brief, the FAA is reducing requirements that a launch operator wait to launch by expanding the applicability of certain exceptions and recognizing that the risk of triggering lightning is less than previously understood at distances closer than previously believed. The FAA is also codifying criteria for obtaining accurate radar reflectivity measurements to ensure calculation of the volume-averaged, height-integrated radar reflectivity (VAHIRR) and other measurements, such as the vertical extent of a cloud top, are representative of actual conditions at the time of launch, because these calculations are instrumental in determining the presence of and risk posed by electrified clouds.

II. New Requirements

A. General Applicability

The FAA is revising the general description of appendix G to clarify that the flight commit criteria are to mitigate lightning strikes and avoid initiation of lightning when a launch vehicle flies near or through a highly electrified environment in or near a cloud. The FAA is also clarifying that, when a launch operator uses optional equipment, such as a field mill, to increase launch availability, an operator may not ignore data that does not satisfy the requirement. This addition, particularly when read in conjunction with 14 CFR 417.113(c)(1)(ii), should ensure that a launch takes place only when it is clear that all the criteria are satisfied. Section 417.113(c)(1)(ii) states that a launch operator's launch safety rules [1] must ensure there is clear and convincing evidence that the criteria of appendix G, which apply to the conditions present at the time of lift-off, are not violated. Section G417.1 states that *all* lightning flight commit criteria of Appendix G must be satisfied. In other words, each paragraph of each section must be individually satisfied at the time of launch. In short, the burden is on the launch operator to ensure that conditions are safe for launch.

A launch operator must understand that each of the sections of appendix G deliberately *prohibits* launch under certain conditions. Since all of the criteria must be satisfied, appendix G must be read in its entirety to determine whether or not launch is prohibited. Thus, the satisfaction of any particular paragraph or section cannot be considered to *permit* launch. Even the simultaneous satisfaction of all sections means only that there are no known natural- or triggered-lightning threats that prohibit launch. According to § 417.113(c)(1)(ii), it is still necessary for the launch weather team to report any other hazardous conditions to the person with authority for deciding whether or not to launch.

B. New Definitions and Clarifications of Existing Definitions

Section G.417.3 of appendix G defines terms if they would not be familiar to a trained meteorological observer, such as "field mill," or if they constitute non-standard usage of an otherwise familiar term, such as "associated." The FAA is adding new definitions, clarifying existing ones, and making minor editorial changes to others. For terms not defined in this section, a useful reference is the AMS Glossary of Meteorology, American Meteorological Society, 2000: Glossary of Meteorology, 2nd ed., American Meteorological Society, Boston, MA, 850; also available on line at *http://amsglossary.allenpress.com/glossary.*

New definitions to appendix G include definitions of *Cone of silence, Electric field, Horizontal distance, Radar reflectivity,* and *Slant distance.*

A cone of silence is a volume within which a radar cannot detect any object and is an inverted circular cone centered on the radar antenna. A cone of silence consists of all elevation angles greater than the maximum elevation angle reached by the radar. The cone of silence is a volume that the radar beam cannot access because of a radar's maximum tilt elevation. Radar echoes close to and directly above the radar cannot be detected. The methodology of section G417.25(b) provides that the specified volume for the VAHIRR calculation must not contain any portion of the cone of silence. Note as well that, for any given search pattern, certain sectors may be blocked out for reasons of payload safety, and the specified volume also may not contain any portion of a sector blocked out for these reasons. The methodology of section G417.25(a) also provides that no other radar reflectivity measurements, such as those used to delineate a cloud, may be affected by any volume that is inaccessible to the radar.

An electric field is a vertical electric field (Ez) at the surface of the Earth. This definition differentiates the surface electric field from those measured aloft.

A horizontal distance is a distance that is measured horizontally between a field mill or electric-field-measurement point and the nearest part of the vertical projection of an object or flight path onto the surface of the Earth. The FAA is defining horizontal distance in order to distinguish between the measurement of this two-dimensional distance and the three-dimensional "slant distance."

Radar reflectivity means the radar reflectivity factor due to hydrometeors, in dBZ. This is non-standard usage of a term that is defined in the Glossary of Meteorology. Radar reflectivity measurements in units of dBZ (as defined in the Glossary and not further discussed herein) are further specified in section G417.25(a) and are used throughout this appendix, including for the calculation of VAHIRR.

A slant distance means the shortest distance between two points, whether horizontal, vertical, or inclined in three dimensional space. A slant distance is used in measuring the distance between a radar reflectivity or VAHIRR measurement point and either a flight path or an object such as a cloud.

The FAA is also clarifying the definitions of *Associated, Cloud, Disturbed weather, Flight path, Transparent,* and *Volume-averaged height-integrated radar reflectivity* (VAHIRR). The following paragraphs describe the changes made to these definitions and the reasons for those changes.

Associated means two or more clouds are caused by the same disturbed weather or are physically connected. The FAA is deleting the discussion contained in the current definition. Discussion is better placed in explanatory material like this preamble, and is unnecessary in regulatory text. Accordingly, it is still the case that "associated" does not have to mean occurring at the same time. It is also still the case that a cumulus cloud formed locally and a cirrus layer physically separated from that cumulus cloud and generated by a distant source are not associated, even if they occur over or near the launch point at the same time.

A cloud is a visible mass of suspended water droplets, ice crystals, or a combination of water droplets and ice crystals. A "cloud" includes the entire volume containing such particles. This clarification omits an unnecessary reference to the particles being produced by condensation of water vapor in the atmosphere. Note that this definition works together with that of "slant distance" to specify that standoff distances from a cloud be measured from the nearest edge of that cloud.

Disturbed weather is a weather system where a dynamical process destabilizes the air on a scale larger than individual clouds or cells. Disturbed weather specifically includes, but is not limited to, fronts, troughs, and squall lines. (In

[1] A launch operator must follow its safety rules. 14 CFR 417.113(a)(3).

this case, the examples are retained as a critical part of the definition.) The body of the definition remains unchanged, but the FAA is now adding a squall line as an important example of disturbed weather because, along with fronts and troughs, it is frequently related to electrification of the associated clouds.

Flight path means a launch vehicle's planned flight trajectory, including the trajectory's vertical and horizontal uncertainties resulting from all three-sigma guidance and performance deviations. The FAA is no longer referencing wind effects because three-sigma dispersions already take wind effects into account.

The definition of *transparent* is clarified to mean any of the following conditions apply:

➢ Objects above, including higher clouds, blue sky, and stars are not blurred, are distinct, and are not obscured when viewed at visible wavelengths;

➢ Objects below, including terrain, buildings, and lights on the ground, are clear, distinct, and not obscured when viewed at visible wavelengths;

➢ Objects above or below are seen distinctly not only through breaks in a cloud;

➢ The cloud has a radar reflectivity of less than 0 dBZ.

Historically, transparency has been determined by a person watching the sky. The weather experts at the Federal launch ranges prefer observations undertaken by a person. Rather than limiting visual observations to those made by a person standing outdoors, this definition reflects the fact that transparency may be determined by satellite or camera as well. A person may also look at images of the conditions outside to ascertain transparency. For these reasons, the phrase “at visible wavelengths” has been retained; clouds that look transparent to a human observer may not look transparent to an imaging sensor operating at another wavelength, and vice versa.

Volume-averaged height-integrated radar reflectivity means the product, expressed in units of dBZ-km, of the volume-averaged radar reflectivity (in dBZ) and the average cloud thickness (in kilometers) in the specified volume determined by a VAHIRR-measurement point. The old definition states that the calculation applies to “a specified volume relative to a point along the flight track.” The change clarifies that VAHIRR may be computed at points other than along a flight path. New section G417.25(b) describes in detail how VAHIRR is calculated.

Additionally, the FAA is making minor editorial changes to the following definitions: *Anvil cloud, Precipitation, Moderate precipitation, Thick cloud layer, Triboelectrification,* and *Volume-averaged height-integrated radar reflectivity.*

The FAA is also deleting several definitions.

Cloud edge is being deleted because it is now part of the definition of a cloud. *Electric field measurement at the surface of the Earth* is being deleted. The criteria this term contained are more accurately characterized as requirements, and, therefore, now appear in new section G417.25(c) *Electric field measurement,* which governs how to measure electric fields. *Electric field measurement aloft* is removed because Appendix G contains no criteria for electric field measurement aloft in the regulations. Although the FAA initially considered criteria for electric fields aloft, in the end, it did not promulgate requirements when it issued part 417. The definition was inadvertently left in the final rule. The definition of *Ohms/square* is removed because the term is a standard unit of measurement. The definition of *Specified volume* is no longer necessary because the term contained requirements now located in section G417.25. *Treated* is being deleted because it contained requirements now located in section G417.23(b). *Within* is being deleted because more precise language regarding the distance between a flight path and a cloud should prevent any misunderstanding regarding the distance for which a launch operator must account.

III. Changes to Temperature, Time, and Distance Restrictions for Anvil and Debris Clouds

In this direct final rule, the FAA is permitting greater launch availability. In brief, the FAA is reducing requirements that a launch operator wait to launch by expanding the applicability of certain exceptions and decreasing waiting time requirements because of recognition that the risk of triggering lightning is less than previously understood at distances closer than previously believed. In order to ensure satisfaction of minimum standards of measurement and uniformity across launch sites, the FAA is codifying in new section G417.25 the measurement criteria used during a second airborne field mill campaign (ABFM–II) conducted during 2000 and 2001. A lightning advisory panel that provides expertise to the Air Force and NASA recommended this approach to the ranges. The FAA also accepts the more simple approach that the ranges currently use to calculate volume-averaged, height-integrated radar reflectivity because it is more conservative than the codified approach. Acceptable techniques to calculate VAHIRR are further discussed in Section III.C.3 below.

A. Structural Changes

At the outset, the FAA must note that the order of the new requirements for anvil and debris clouds is reversed from the old requirements. These new rules have also been written so that only one set of restrictions applies at a time. For example, for attached anvil clouds, in old section G417.9.

- Paragraph (a) contains requirements for flight paths through or within 10 nautical miles of the cloud,
- Paragraph (b) contains requirements for flight paths through or within 5 nautical miles of the cloud, and
- Paragraph (c) contains requirements for flight paths through a cloud.

This organization is potentially confusing, since all three paragraphs apply to flight through, and both paragraphs (a) and (b) apply to flight within 5 nautical miles of, the cloud. The application has been simplified in the new G417.9, where—

- Paragraph (b) contains all requirements for flight paths through a cloud,
- Paragraph (c) contains all requirements for flight paths greater than 0 and less than or equal to 3 nautical miles from the cloud,
- Paragraph (d) contains all requirements for flight paths greater than 3 and less than or equal to 5 nautical miles from the cloud, and finally,
- Paragraph (e) contains all requirements for flight paths greater than 5 and less than or equal to 10 nautical miles from a cloud.

Whereas more than one paragraph could apply under the old rule, the end result of this restructuring is that, for any given slant distance from a cloud, at most, one paragraph will apply in the new rule. For example, suppose a launch vehicle's flight path would place the closest approach of the vehicle 2 nautical miles from an attached anvil cloud. Under the old rule, the operator would need to satisfy the requirements of both sections G417.9(a), because 2 nautical miles is less than 10 nautical miles, and G417.9(b), because 2 nautical miles is less than 5 nautical miles. Under the new rule, the operator only needs to satisfy the requirements of G417.9(c) because 2 nautical miles is between zero and 3 nautical miles. This change should make the rules easier to follow. However, because of this restructuring, there is not a one-to-one correspondence between the paragraphs of the old and new rules.

Even in the rules that have been structurally rearranged, it must be remembered that slant distance from a cloud refers only to the closest approach of the vehicle. Otherwise multiple paragraphs may still be taken to apply. An operator must always take care that all paragraphs are satisfied.

B. Clarification of Applicability of Restrictions to Anvil Clouds Formed From Parents at Altitudes below −10 Degrees Celsius

Under new paragraphs (a) of sections G417.9 and G417.11, for both attached and detached anvil clouds, the requirements to wait before initiating flight apply only when an anvil cloud forms from a parent cloud that has a top at an altitude where the temperature is −10 degrees Celsius or colder. Even though anvil clouds can form in temperatures slightly above freezing, only anvil clouds with parents whose tops are at altitudes with temperatures at or below −10 degrees Celsius pose a real possibility of containing high electric fields.[2] When a convective cloud grows through different altitudes, it may reach altitudes with freezing or colder temperatures. At these altitudes the cloud may acquire ice particles, ice crystals, super-cooled water droplets or a combination thereof. It is primarily this mixture of phases that can produce a strong electrical generator within the cloud. When the cloud top has become colder than −10 degrees Celsius, the cloud is likely to be electrified, and when its top has become colder than −20 degrees Celsius, strong electrification is likely.[3]

The temperature criterion in paragraphs (a) applies to the parent cloud. Anvil clouds are limited to outflow from convective clouds at altitudes with temperatures at or colder than −-10 degrees Celsius. According to studies, anvil clouds that develop from cumulus clouds with cloud top temperatures warmer than −10 degrees Celsius rarely develop electric fields with the strength of a thunderstorm.[4]

In practice, this limitation of the flight commit criteria to anvil clouds formed from parents at sufficiently cold altitudes is not new. Although not clearly expressed in the old appendix G, the Federal ranges have historically limited their restrictions on flight to non-transparent anvil clouds formed from parents at altitudes where the temperatures are −10 degrees Celsius or colder.

C. Exceptions to the Requirement To Wait To Initiate Flight

This rulemaking increases the availability of exceptions to certain prohibitions on initiating flight under circumstances posing a risk of natural or triggered lightning. Specifically, although an FAA licensee must wait specified amounts of time after the last lightning discharge to initiate flight through a non-transparent attached or detached anvil cloud or a non-transparent debris cloud, the licensee need not wait, under the new versions of the anvil and debris-cloud rules, if all of the non-transparent anvil or debris clouds within 3 nautical miles of a flight path are located at altitudes where the temperature is colder than 0 degrees Celsius and if the volume-averaged, height-integrated radar reflectivity (VAHIRR) is less than +10 dBZ-km. For the longer standoff distances, anvil clouds must be cold within 10 nautical miles, but there is no requirement to calculate VAHIRR.

The launch operator must always remember, however, that all sections of Appendix G must be satisfied simultaneously. In particular, section G417.5, requires standoff distances of 10 nautical miles from a parent thunderstorm and from the lightning itself, so there will usually be portions of a non-transparent anvil or debris cloud through which flight is prohibited by the lightning provision even though it may not be prohibited by the anvil or debris cloud requirements themselves.

1. Reduced Restrictions on Launches With a Flight Path Greater Than 3 Nautical Miles From an Anvil or Debris Cloud

The first change reduces some restrictions on launches with a flight path greater than 3 nautical miles from a non-transparent anvil or debris cloud. For flight paths more than 3 nautical miles from a non-transparent anvil cloud, rather than requiring that a launch operator always wait after a lightning discharge, the FAA now requires only that the altitude of the portion of the cloud within a specified distance of the flight path be at temperatures less than 0 degrees Celsius to permit flight. For non-transparent debris clouds with flight paths greater than 3 nautical miles from the cloud, the FAA will no longer require any waiting after a lightning discharge or detachment.

For non-transparent anvil clouds, the requirements for a waiting period for flight paths more than 3 nautical miles from a cloud are not being dropped entirely. However, the requirements for anvil clouds will be more flexible beyond 3 nautical miles than they are under the current rules. For anvil clouds more than 3 nautical miles from a flight path, the FAA will require, unless the operator waits 3 hours after the last lightning discharge, that the altitudes at which the flight path passes within a specified distance of the cloud have temperatures of less than 0 degrees Celsius. This restriction was based on the first Airborne Field Mill campaign (ABFM–II) which showed that clouds at altitudes with temperatures of less than 0 degrees Celsius do not contain electric field magnitudes of greater than 3 kV/m. Merceret et al., *supra,* 242. The specific rule changes for attached and detached anvil clouds are explained in turn below. The reasons for the changes follow these descriptions.

i. Attached Anvil Clouds (G417.9)

A launch operator using flight paths of greater than 3 and less than or equal to 5 nautical miles from an attached non-transparent anvil cloud will no longer always need to wait 30 minutes after a lightning discharge, and will no longer need to show that the VAHIRR is less than 33 dBZ-kft within 3 hours of a lightning discharge. The old requirement is contained in both section G417.9(a), which requires waiting for 30 minutes after a lightning discharge regardless of distance, and in section G417.9(b), which only allows passage between 30 minutes and 3 hours after a lightning discharge, if the VAHIRR measurement is under +33 dBZ-kft and the altitudes at which the flight path passes within 5 nautical miles of the cloud have temperatures of less than 0 degrees Celsius.

Under the new requirements, the restriction applicable to flight paths between 3 and 5 nautical miles will be contained in section G417.9(d) and will require waiting for 3 hours after a lighting discharge *unless,* as with the old rule, the portion of the attached anvil cloud at a slant distance of less than or equal to 5 nautical miles from the flight path is located entirely at altitudes where the temperature is colder than 0 degrees Celsius. A launch operator will no longer be required to wait for 30 minutes after a lightning discharge and will not need to calculate VAHIRR to be able to launch within 3

[2] Willett, ed., *Rationales for Lightning Criteria,* at 9, 45, 61, and 108.

[3] *Id.* at 45.

[4] Dye, J.E., W.P. Winn, J.J. Jones, and D.W. Breed, 1989: The electrification of New Mexico Thunderstorms. 1. Relationship between precipitation development and the onset of electrification, *J. Geophys. Res.*, **94**, 8643–8656. Breed, D.W., and J.E. Dye, 1989: The electrification of New Mexico Thunderstorms Part 2. Electric field growth during initial electrification. *J. Geophys. Res,* **94**, 14, 841–14, 854.

hours of a lightning discharge. However, a launch operator will still need to show satisfaction of the temperature at altitude restriction in order to launch within 3 hours of a lightning discharge.

Launch operators with flight paths of greater than 5 and less than or equal to 10 nautical miles from an attached non-transparent anvil cloud will no longer always need to wait 30 minutes after a lightning discharge as required by old section G417.9(a). Section G417.9(e) will now require waiting 30 minutes *unless* the portion of the attached anvil cloud at a slant distance of less than or equal to 10 nautical miles from the flight path is located entirely at altitudes where the temperature is colder than 0 degrees Celsius.

ii. Detached Anvil Clouds (G417.11)

Launch operators with flight paths between 3 and 10 nautical miles from a detached non-transparent anvil cloud will no longer always need to wait 30 minutes after a lightning discharge and will no longer need to meet any requirements once 30 minutes have passed since the last lightning discharge. The new G417.11(d) will require that the launch operator wait 30 minutes after a lightning discharge from the cloud *unless* the portion of the detached anvil cloud at a slant distance of less than or equal to 10 nautical miles from the flight path is located entirely at altitudes where the temperature is colder than 0 degrees Celsius. Section G417.11(a) currently requires that a launch operator wait 30 minutes after a lightning discharge, without the benefit of any exceptions. Additionally, current G417.11(b) does not allow a launch operator to pass between 3 and 5 nautical miles from a cloud between 30 minutes and 3 hours after a lightning discharge unless one of two sets of conditions are met. The new requirements are more flexible because they allow an exception to the requirement that the launch operator wait 30 minutes after a lightning discharge and because they do not require any conditions to be met after 30 minutes, even between 3 and 5 nautical miles.

iii. Rationale

The reduced restrictions on a flight path in excess of 3 nautical miles of a cold [5] anvil or debris cloud arise out of experimental and statistical work performed by the LAP, which recommends lightning requirements for launches at Federal launch ranges. The LAP has performed statistical analyses of data collected during ABFM–II. The goal of ABFM–II was to characterize the electric fields of anvil and debris clouds by flying an aircraft into these types of clouds while taking measurements at various distances from the clouds using electric field mills. The ABFM II campaign used aircraft carrying airborne field mills to measure the electric fields of clouds of interest. The campaign used ground-based radar to measure the reflectivity of the same clouds so that it would be possible to correlate the radar reflectivity of the clouds with the electric field measurements of the airborne field mills. Francis J. Merceret, et al., *On the Magnitude of the Electric Field near Thunderstorm-Associated Clouds,* 47 Journal of Applied Meteorology and Climatology 240, 243 (2008). These data were used to develop the VAHIRR parameter associated with cloud electrification. Both the temperature and VAHIRR criteria are correlated with mixed-phase precipitation, namely, the presence of water in both solid and liquid phases.

When a cloud spans the freezing level, the cloud can acquire a charge due to processes involving the mixing of liquid water droplets and ice crystals. A build up of electric charge in a cloud can lead to natural or triggered lightning. When the VAHIRR is less than 10 dBZ-km, it means that any mixed phase processes are unable to produce significant charging.

Like the Air Force and NASA before it, the FAA's existing triggered lightning criteria are based on the determination that a launch vehicle will not trigger lightning in an electric field with a magnitude of less than 3 kilovolts per meter (kV/m). The following discussion of each of the changes to the FAA's lightning commit criteria will, therefore, focus on showing how the FAA's new requirements ensure that the electric field magnitude along the flight path will be less than 3 kV/m, so that the new requirements will be essentially as safe as the current requirements.

Therefore, the FAA is able to follow the Federal launch range's lead in making the rules less restrictive because of new analyses of the ABFM–II data. T.P. O'Brien & R. Walterscheid, *Supplemental Statistical Analysis of ABFM–II Data for Lightning Launch Commit Criteria,* Aerospace Report No. TOR–2007(1494)–6, 3 (2007).

As a purely qualitative matter, out of 158 flights through non-transparent debris or anvil clouds during ABFM–II, the field mills detected no electric field with a magnitude of greater than 3 kV/m outside of a cloud. This was so even though the sample contained 30 flights through clouds with an electric field magnitude of more than 3 kV/m somewhere inside the cloud. *Id.*

Based on the data obtained, a qualitative analysis shows that flying more than 3 nautical miles from a non-transparent anvil cloud is as safe as the FAA's current requirements. The LAP also used this data to demonstrate statistically in two ways that it is extremely unlikely that the electric field magnitude will be more than 3 kV/m at distances greater than 3 nautical miles from the clouds.

A launch operator may calculate VAHIRR to help determine whether it is safe to fly, even if there has been a relatively recent lightning discharge. If the VAHIRR is less than 10 dBZ-km (about 33 dBZ-kft), the probability of an electric field of greater than 3 kV/m occurring is less than 1 in 10,000. Dye et al., *supra,* 14.

Calculating VAHIRR consists of multiplying the average cloud thickness and the average radar reflectivity found in a column with an 11 kilometer by 11 kilometer cross-section centered on a point of interest, where the two sides are oriented north-south and east-west. Because 3 nautical miles is 5.52 kilometers, a VAHIRR box centered on a flight path more than 3 nautical miles from the anvil cloud's edge will not contain the anvil cloud and will, therefore, have a radar reflectivity of zero, meaning that the VAHIRR will be zero. Because zero is clearly less than +33 dBZ-kft, flight at more than 3 nautical miles from the cloud will be at least as safe as the current requirements of G417.9(b)(2) and G417.11(b)(2)(ii), which only require a VAHIRR of less than +33 dBZ-kft. James E. Dye, et al., *Analysis of Proposed 2007–2008 Revisions to the Lightning Launch Commit Criteria for United States Space Launches,* 13th Conference on Aviation, Range and Aerospace Meteorology 8.2, 2–3 (available at *http://ams.confex.com/ams/88Annual/techprogram/programexpanded_474.htm*) (2008); Francis J. Merceret, *Risk Analysis of Proposed Reduction of Anvil and Debris Cloud LLCC Standoff Distances from Five to Three Miles,* 1–2 (2007) (internal LAP memorandum).

The LAP also performed a Gaussian statistical analysis on the electric field data collected between 6 kilometers (3.2 nautical miles) and 12 kilometers (6.5 nautical miles) from anvil and debris clouds in an attempt to determine the likelihood of various electric field magnitudes occurring at those distances from the clouds. The LAP found that an electric field of significance was highly unlikely.

[5] For the sake of brevity, the references to "cold" anvil clouds in this discussion refer to those whose parent clouds have tops at an altitude where the temperature is equal to or colder than −10 degrees Celsius.

The LAP used a Gaussian distribution to perform a conservative three-sigma worst-case risk analysis by using an assumed mean of three times the measured mean and an assumed error estimate of three times the calculated error. The LAP concluded that, even with these conservative assumptions, the probability that an electric field with a magnitude of 3 kV/m would occur within 3.2 to 6.5 nautical miles of a non-transparent anvil or debris cloud was negligible; the probability of a field of even 2 kV/m was on the order of 10^{-7}. Dye et al., *supra,* at 3–4. These probabilities were obtained by only analyzing non-transparent clouds that typically contain elevated electric fields, namely, those that somewhere contained electric fields greater than 3 kV/m. Merceret, *supra,* at 2–6. The FAA concludes from this analysis that launches more than 3 nautical miles from anvil and debris clouds are unlikely to trigger lightning because it is extremely remote for the electric field to reach a magnitude of 3 kV/m at distances more than 3 nautical miles from these clouds.

However, this analysis uses an unconventional technique for extreme value analysis. Gaussian analysis is not typically used to determine the likelihood of a quantity that is relatively far from any of the observed quantities. Therefore, the LAP also performed a second statistical analysis. Dye et al., *supra,* at 4–5.

The LAP used a second statistical method to determine the probability of the electric field magnitude exceeding 3 kV/m at various distances from the anvil and debris clouds in increments of 0.6 kilometers (0.32 nautical miles) and again found it extremely unlikely. O'Brien & Walterscheid, *supra,* at 7. Gaussian distributions are not necessarily well suited to extrapolating fits to the wings of a frequency distribution where the event frequency (in this case the frequency of fields exceeding 3 kV/m) is very small. A widely used function for extreme value estimation is the Weibull function. For each distance increment from the clouds, a 2-parameter Weibull distribution was a good statistical fit for the data. Extrapolating the tail of the Weibull shows how likely it would be at each increment to encounter an electric field with a magnitude greater than 3 kV/m. Even at 0.6 kilometers (0.32 nautical miles) from the cloud's edge, the probability of exceeding 3 kV/m was on the order of 10^{-9}. If only clouds containing an electric field of over 3 kV/m were considered, the calculated probability was somewhat lower, but this is most likely a statistical artifact relating to sample size. At 5.4 kilometers (2.9 nautical miles), the probability was under 10^{-16} even if only clouds containing an electric field of over 3 kV/m were considered. O'Brien & Walterscheid, *supra,* at 7.

Therefore, the FAA concludes that the risk of encountering electric field magnitudes greater than 3 kV/m is very small if the flight path is more than 3 nautical miles from the edge of an anvil or debris cloud. In fact, the Weibull fit analysis indicates that a launch would not likely encounter a field of 3 kV/m even if the flight path was at 0.32 nautical miles from the cloud's edge, so the requirements to wait or satisfy the VAHIRR criteria on launches with flight paths more than 3 nautical miles from a cloud's edge are not necessary.

iv. Reduced Restrictions on Launches With a Flight Path Within 3 Nautical Miles of a Debris Cloud

Analysis of the ABFM–II data has also demonstrated that satisfying the VAHIRR criteria can allow greater launch opportunities near a non-transparent debris cloud that has discharged lightning. This change expands launch availability because at any distance from a cloud the regulations permit flight if the conditions satisfy the VAHIRR and temperature restrictions. For a flight path through a non-transparent debris cloud under old section G417.13(a), a launch operator must wait 3 hours after detachment or a lightning discharge without exception. New section G417.13(a) requires a launch operator to wait 3 hours only if the operator cannot demonstrate that the VAHIRR is below 10 dBZ-km (+33 dBZ-kft) and that every portion of the non-transparent debris cloud at a slant distance within 5 nautical miles of the flight path is at altitudes where the cloud has temperatures of less than 0 degrees Celsius.

For flight paths between 0 and 3 nautical miles from the debris cloud, the current section G417.13(b) requires waiting 3 hours unless the launch meets three conditions:

1. There is at least one working field mill within 5 nautical miles of the cloud,

2. The magnitude of the electric field measurements has been less than 1 kV/m for 15 minutes within 5 nautical miles of the cloud, and

3. The maximum radar reflectivity has been less than 10 dBZ for 15 minutes within 5 nautical miles of the cloud.

The new requirements still allow the fulfillment of these three conditions as a method to avoid waiting the 3-hour period, but will also allow earlier flight if the operator meets the VAHIRR exception, and if every portion of the debris cloud at a slant distance within 5 nautical miles of the flight path is at altitudes where the cloud has temperatures of less than 0 degrees Celsius.

A VAHIRR measurement of less than 10 dBZ-km (or approximately 33 dBZ-kft), along with satisfactory field mill measurements and temperatures, means that a debris cloud does not contain an elevated electric field, even if portions of it are located at an altitude conducive to the creation of an electric charge. In fact, the VAHIRR method may be even more reliable when applied to non-transparent debris clouds than to anvil clouds. To demonstrate this, the LAP used a Weibull distribution to show that the upper bound of the 95-percent-confidence-interval for the probability of the electric field exceeding 3 kV/m if the VAHIRR measurement is between 5 and 15 dBZ-km is on the order of 10^{-5} for debris clouds, as opposed to 10^{-2} for anvil clouds. The expected value of the probability of exceeding 3 kV/m is much less. A more detailed examination demonstrated that the expected value of the probability of exceeding 3 kV/m for anvil clouds is 10^{-4} if the VAHIRR is less than 10 dBZ-km, so the probability of exceeding 3 kV/m for debris clouds is probably even lower than 10^{-5} if the VAHIRR is less than 10 dBZ-km. Dye et al., *supra,* 4–5. Therefore, the FAA has concluded that it is appropriate to extend the availability of the VAHIRR exception to waiting to launch to debris clouds.

2. Changes for Launches With a Flight Path Within Three Nautical Miles of an Attached Anvil Cloud

For flight paths within 3 nautical miles of a cold, non-transparent anvil cloud, the FAA will now permit flight within 30 minutes of a lightning discharge when temperature and VAHIRR readings satisfy the regulatory criteria. Therefore, for flight paths between 0 and 3 nautical miles from a cloud, the new section G417.9(c) allows launch at any time if the VAHIRR is below 10 dBZ-km and every portion of the anvil cloud at a slant distance within 5 nautical miles of the flight path is at altitudes where the non-transparent cloud has temperatures of less than 0 degrees Celsius. The old rule requires waiting for 30 minutes after lightning discharge if not passing through the non-transparent cloud (current G417.9(a) and (b)) or 3 hours after lightning discharge if passing through the non-transparent cloud (current G417.9(c)) unless VAHIRR and temperature at altitude conditions are met. The new requirements will allow VAHIRR and the temperature at altitude conditions to always be an alternative to having to wait after a lightning discharge. For detached non-transparent anvil clouds, the requirements remain the same for flight paths less than or equal to 3 nautical miles except that now a launch operator can pass within 3 nautical miles of the non-transparent cloud within 30 minutes of a lightning discharge if the VAHIRR is below 10 dBZ-km and every portion of the non-transparent cloud at a slant distance within 5 nautical miles of the flight path is at altitudes where the cloud has temperatures of less than 0 degrees Celsius. This change is contained in G417.11(c)(1). This change is possible because the studies of the ABFM–II campaign show, as discussed above, that electric fields greater than 3 kv/m do not extend as far and the decay rate is much more rapid near the anvil edge [6] than previously believed. Cloud charges decay in time in the absence of active charge generation and, real-time radar reflectivity readings and calculations may be used to confirm that the electric field has, in fact, subsided to acceptable levels.

The FAA will not require a launch operator to wait 30 minutes when temperature and VAHIRR readings satisfy the criteria for attached and detached non-transparent anvil clouds when the flight path is between 0 and 3 nautical miles. As described above, statistical analysis of the ABFM II measurements for all anvils shows that, even for highly electrified anvils with electric fields much greater than 3 kV/m inside the cloud, the electric field outside of the anvil cloud falls off very rapidly and once falling to low levels remains small at greater distances. O'Brien. et. al. at 9. For attached and detached non-transparent anvil clouds and debris clouds, when the electric field is strong, namely, when it exceeds 3 kV/m, the radar reflectivity in the same location over the ABFM II data set is invariably greater than approximately 10 dBZ. As noted, the Weibull distribution and extreme value analysis for anvil and debris clouds showed that, when VAHIRR is ≤ 10 dBZ-km, the probability of having electric fields in excess of 3 Kv/m is very small (on the order of 10^{-4} or lower). Based on these results, the FAA finds that a launch that meets the VAHIRR criterion obviates concerns regarding electric fields in excess of 3 kV/m. Strong electric fields are known to occur in the melting zone of many precipitating layer clouds.[7] Satisfaction of the temperature requirement ensures that this type of electric charging within the melting zone will not occur.

3. Codification of Measurement Criteria

New section G417.25 represents a codification of three different sets of measurement specifications. Section G417.25(a) contains requirements for accurate and reliable radar reflectivity measurements that qualify for use throughout the other sections of this appendix. In addition to VAHIRR calculations, such uses include all radar measurements of the location, spatial extent, and intensity of clouds and precipitation. Such specifications are currently applied by the U.S. Air Force and NASA at the Federal ranges and can also be met by correct application of data from the national Next-Generation Radar (NEXRAD) network.[8] If the available radar does not meet these requirements, a launch operator must fall back on visual and other observations to convincingly demonstrate that the rules are not violated.

Section G417.25(b) applies specifically to VAHIRR calculations and explains how valid VAHIRR measurements must be made. These specifications are the same as those used during the ABFM II of 2000 and 2001 from which a safe VAHIRR threshold of ≤10 dBZ-km was statistically determined for anvil and debris clouds. Because there is no guarantee that this threshold would be safe if VAHIRR were calculated operationally in a different way, the FAA is codifying these specifications here. See below, however, for an alternative calculation that is currently in use by the U.S. Air Force and NASA at the Eastern Range and that satisfies section G417.1(c) by being at least as safe as the FAA's requirements.

Finally, section G417.25(c) specifies the measurement techniques for electric fields to qualify for use in this appendix. Again, these are the specifications currently used by the federal launch ranges.

Section G417.25(a) requires that a licensee who relies on radar reflectivity measurements, including the calculation of VAHIRR, to increase launch availability must satisfy a number of requirements. The Federal launch ranges satisfy the requirements of paragraph (a) of this section because they employ meteorological radar,[9] and they ensure that—

(1) The radar wavelength is greater than or equal to 5 centimeters in order that attenuation by intervening clouds and/or precipitation not be significant; [10]

(2) Any reflectivity measurement is of a meteorological target, such as a cloud or precipitation, and not of some other objects, such as birds or insects, nor due to "anomalous propagation"; [11]

(3) The spatial accuracy and resolution of a reflectivity measurement is one kilometer or better in order that the locations and spatial extent of clouds—especially their critical altitudes and thicknesses—and of precipitation can be determined with sufficient accuracy for use in this appendix; [12]

(4) Any attenuation caused by precipitation or an accumulation of water or ice on the radome that protects the radar antenna is less than or equal to 1 dBZ because the requirements in this appendix can be met only with that degree of accuracy; [13] and

(5) A reflectivity measurement contains no portion of the cone of silence or other blocked out portion so that it is not giving a bogus indication.[14]

A launch operator who relies on VAHIRR to increase launch availability under this appendix must satisfy the requirements of both sections G417.25(a) and (b), or must otherwise ensure that its estimates of VAHIRR are at least as large as those that would result from section G417.25(b) to ensure that its invocation of any VAHIRR exceptions to these rules are at least as safe. The current requirements for calculating VAHIRR at the Federal launch ranges satisfy section G417.1(c) because they are more conservative, even though there are certain requirements of section G417.25(b) that they do not satisfy. The Federal launch ranges do not, as required by paragraph (b)(1), ensure that a digital signal processor provide radar reflectivity measurements on a three-dimensional

[6] Dye, J. E., *et al.* (2007), Electric fields, cloud microphysics, and reflectivity in anvils of Florida thunderstorms. J. Geophys. Res., 112, D11215, doi:10.1029/2006JD007550.

[7] *Rationales for Lightning Criteria,* at 123.

[8] NEXRAD is a network of 159 high-resolution Doppler weather radars operated by the National Weather Service, an agency of the National Oceanic and Atmospheric Administration (NOAA) within the United States Department of Commerce.

[9] The Federal launch ranges employ meteorological radars because other radars do not provide sufficient granularity in depicting reflectivity on a gridded representation.

[10] The radar used at the Eastern and Western Ranges is WSR–88D and WSR–74C. They meet this criterion.

[11] 45th Weather Squadron, Steps for Evaluating VAHIRR, par. 6 (March 2005).

[12] Blakeslee, R.J., H.J. Christian, and B. Vonnegut (1989), Electrical measurements over thunderstorms, J. Geophys. Res., 94, 135–140.

[13] 45th Weather Squadron, Steps for Evaluating VAHIRR, Par. 2, (March 2005).

[14] *A History of the Lightning Criteria,* 124, par. 25.

Cartesian grid having a maximum grid-point-to-grid-point spacing of one kilometer in each of the three dimensions. The ranges do, as required by paragraph (b)(2), ensure that the specified volume is bounded in the horizontal by vertical plane, perpendicular sides located 5.5 kilometers (3 nautical miles) north, east, south, and west of the point where VAHIRR is to be evaluated; on the bottom by the 0 degree Celsius level; and on the top by an altitude of 18 kilometers.[15] Note that the specified volume need not contain the VAHIRR evaluation point, which may be either below the lower boundary of that volume (as when the vehicle is on the launch pad) or above the upper boundary (as when the vehicle is flying high above an anvil cloud) of the specified volume.

To calculate VAHIRR a launch operator must compute both a volume averaged radar reflectivity and an average cloud thickness in a specified volume before multiplying them to obtain a value for VAHIRR. Neither of these quantities is available yet as an output product of the WSR–88D.[16] or WSR–74C radar systems that the Federal ranges use to support commercial launches.[17] Instead, the Federal ranges and NASA rely on Interim Instructions[18] for computing these quantities, which are more conservative and, thus, afford less launch availability than allowed by section G417.25(b).

Paragraph (c) of section G417.25 requires a launch operator who measures an electric field to comply with this appendix to—

- Employ a ground-based field mill in order to obtain a reliable and easily calibrated measurement with a relatively low-maintenance instrument;
- Use only the one-minute arithmetic average of the instantaneous readings from that field mill to minimize the effects of local space charge and lightning field changes;
- Ensure that all field mills are calibrated so that the polarity of the electric field measurements is the same as the polarity of a voltage placed on a test plate above the sensor as discussed in more detail below;
- Ensure that the altitude of the flight path of the launch vehicle is equal to or less than 20 kilometers (66 thousand feet) everywhere above a horizontal circle of 5 nautical miles centered on the field mill being used as discussed further below, and
- Use only direct measurements from a field mill. A launch operator may not interpolate based on electric-field contours because interpolation schemes are highly variable and can give unexpected results.

The Federal launch ranges use electric field mills that satisfy each of the requirements of paragraph (c) of section G417.25. Accordingly, no new methodology is being codified here.

Regarding the polarity of an electric field measurement, note that the required polarity is the opposite of the so-called "physics sign convention" that is now used almost exclusively in the atmospheric electricity literature. This older sign convention is retained here, however, because it has been in exclusive use at the Kennedy Space Center and the Eastern Range since the early days of the Launch Pad Lightning Warning System and it remains in use today.

The FAA is relaxing the requirements for field measurement by limiting the altitude of the flight path of the launch vehicle to less than 20 kilometers (66 thousand feet) everywhere above a horizontal circle of 5 nautical miles centered on the field mill. Electric field measurements above 20 kilometers are to be ignored.

Small Business Regulatory Enforcement Fairness Act

The Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996 requires the FAA to comply with small entity requests for information or advice about compliance with statutes and regulations within its jurisdiction. Therefore, any small entity that has a question regarding this document may contact their local FAA official, or the person listed under **FOR FURTHER INFORMATION CONTACT**. You can find out more about SBREFA on the Internet at *http://www.faa.gov/regulations_policies/rulemaking/sbre_act/.*

IV. Regulatory Analyses

Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that the FAA consider the impact of paperwork and other information collection burdens imposed on the public. The FAA has determined that this final rule has no new additional burden to respondents over and above that which the Office of Management and Budget already approved under the existing rule titled, "Commercial Space Transportation Licensing Regulations" (OMB 2120–0608).

International Compatibility

The FAA has determined that a review of the Convention on International Civil Aviation Standards and Recommended Practices is not warranted because there is not a comparable rule under ICAO standards.

Regulatory Evaluation, Regulatory Flexibility Determination, International Trade Regulatory Flexibility Determination

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs that each Federal agency may propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 (Pub. L. 96–354) requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act (Pub. L. 96–39) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. In developing U.S. standards, the Trade Act requires agencies developing standards to consider international standards and, where appropriate, that they be the basis of U.S. standards. Fourth, the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4) requires agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local, or tribal governments, in the aggregate, or by the private sector, of $100 million or more annually (adjusted for inflation with base year of 1995). This portion of the preamble summarizes the FAA's analysis of the economic impacts of this direct final rule.

Department of Transportation Order DOT 2100.5 prescribes policies and procedures for simplification, analysis, and review of regulations. If the expected cost impact is so minimal that a proposed or final rule does not warrant a detailed evaluation, this order permits that a statement to that effect and the basis for it be included in the preamble if a full regulatory evaluation of the cost and benefits is not prepared. Such a determination has been made for this direct final rule. The reasoning for this determination follows. Note that the following discussion represents a gross simplification of the new requirements and that there is no safe substitute for reading the rules themselves.

These changes are being made because studies and data that were not available when the current regulations

[15] *Id.*

[16] Technical name for NEXRAD is WSR–88D, which stands for Weather Surveillance Radar, 1988, Doppler.

[17] *A History of the Lightning Criteria,* 124, par. J.

[18] *Id.* (describing the interim methodology).

were established have led the FAA to conclude that the intended level of safety can be maintained with fewer constraints on launch through and near anvil and debris clouds.

The FAA concluded from studies that a launch vehicle will not trigger lightning in a steady electric field with a magnitude of less than 3 kV/m. Furthermore, the Lightning Advisory Panel performed analyses which support the conclusion that the possibility of encountering electric field magnitudes of more than 3 kV/m is very small if the flight path is more than 3 nautical miles from an anvil or debris cloud's edge, provided that all other sections of Appendix G are also satisfied. Furthermore, quantitative studies from the LAP indicate that, if the VAHIRR is less than 10 dBZ-km (about 33 dBZ-kft), the probability of an electric field of greater than 3 kV/m occurring is less than 1 in 10,000 under these conditions.

With this rule, launch initiation may occur sooner and certainly no later than under current regulations. There will be fewer constraints on launch initiation because in some situations, fewer conditions will be needed to meet criteria for launch initiation and in other situations; alternative conditions that meet prescribed criteria will be accepted for launch initiation. Therefore, the rule will increase launch availability and likely decrease costs.

The direct final rule adds a section (G417.25) which describes the methods for calculating the VAHIRR currently accepted by the FAA. These precise methods are not prescribed in the current Code of Federal Regulations. The direct final rule codifies VAHIRR calculation methods and recognizes as acceptable the method used by the federal launch ranges, and therefore increases clarity. The direct final rule also reorganizes rule language and adds and changes definitions to enhance clarity of the rule language.

Since this direct final rule will be cost relieving without degrading safety, a regulatory evaluation was not prepared. FAA has, therefore, determined that this direct final rule is not a "significant regulatory action" as defined in section 3(f) of Executive Order 12866, and is not "significant" as defined in DOT's Regulatory Policies and Procedures.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (Pub. L. 96–354) (RFA) establishes "as a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration." The RFA covers a wide-range of small entities, including small businesses, not-for-profit organizations, and small governmental jurisdictions.

Agencies must perform a review to determine whether a rule will have a significant economic impact on a substantial number of small entities. If the agency determines that it will, the agency must prepare a regulatory flexibility analysis as described in the RFA.

However, if an agency determines that a rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the RFA provides that the head of the agency may so certify and a regulatory flexibility analysis is not required. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

This direct final rule is cost relieving, and thus is not expected to have a significant economic impact. Therefore as FAA Administrator, I certify this rule will not have a significant economic impact on a substantial number of small entities.

International Trade Impact Assessment

The Trade Agreements Act of 1979 (Pub. L. 96–39), as amended by the Uruguay Round Agreements Act (Pub. L. 103–465), prohibits Federal agencies from establishing standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Pursuant to these Acts, the establishment of standards is not considered an unnecessary obstacle to the foreign commerce of the United States, so long as the standard has a legitimate domestic objective, such as the protection of safety, and does not operate in a manner that excludes imports that meet this objective. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards. The FAA has found no comparable international standards. The FAA has assessed the potential effect of this direct final rule and determined that it will have only a domestic impact and therefore no affect on international trade.

Unfunded Mandates Assessment

Title II of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4) requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in an expenditure of $100 million or more (in 1995 dollars) in any one year by State, local, and tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a "significant regulatory action." The FAA currently uses an inflation-adjusted value of $140.8 million in lieu of $100 million. This direct final rule does not contain such a mandate; therefore, the requirements of Title II of the Act do not apply.

Executive Order 13132, Federalism

The FAA has analyzed this final rule under the principles and criteria of Executive Order 13132, Federalism. We determined that this action will not have a substantial direct effect on the States, or the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, we determined that this final rule does not have federalism implications.

Environmental Analysis

FAA Order 1050.1E identifies FAA actions that are categorically excluded from preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act in the absence of extraordinary circumstances. The FAA has determined this rulemaking action qualifies for the categorical exclusion identified in Chapter 3, paragraph 312d, governing rulemakings such as this, and involves no extraordinary circumstances.

Regulations That Significantly Affect Energy Supply, Distribution, or Use

The FAA has analyzed this final rule under Executive Order 13211, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use, 66 FR 28355 (May 18, 2001). We have determined that it is not a "significant energy action" under the executive order because it is not a "significant regulatory action" under Executive Order 12866, and it is not likely to have a significant adverse effect on the supply, distribution, or use of energy.

List of Subjects in 14 CFR Part 417

Space Safety, Space transportation and exploration.

The Amendments

In consideration of the foregoing, the Federal Aviation Administration amends Chapter I of Title 14 Code of Federal Regulations as follows:

PART 417—LAUNCH SAFETY

■ 1. The authority citation for part 417 is revised to read as follows:

Authority: 51 U.S.C. 50901–50923.

■ 2. Revise Appendix G to read as follows:

Appendix G to Part 417—Natural and Triggered Lightning Flight Commit Criteria

G417.1 General

This appendix provides flight commit criteria for mitigating against natural lightning strikes and lightning triggered by the flight of a launch vehicle through or near an electrified environment. A launch operator may not initiate flight unless the weather conditions at the time of launch satisfy all lightning flight commit criteria of this appendix.

(a) In order to meet the lightning flight commit criteria, a launch operator must employ any:

(1) Weather monitoring and measuring equipment needed, and

(2) Procedures needed to verify compliance.

(b) When equipment or procedures, such as a field mill or calculation of the volume-averaged, height-integrated radar reflectivity (VAHIRR) of clouds, are used with the lightning flight commit criteria to increase launch opportunities, a launch operator must evaluate all applicable measurements to determine whether the measurements satisfy the criteria. A launch operator may not turn off available instrumentation to create the appearance of meeting a requirement and must use all radar reflectivity measurements within a specified volume for a VAHIRR calculation.

(c) If a launch operator proposes any alternative lightning flight commit criteria, the launch operator must clearly and convincingly demonstrate that the alternative provides an equivalent level of safety to that required by this appendix.

G417.3 Definitions

For the purpose of this appendix:

Anvil cloud means a stratiform or fibrous cloud formed by the upper-level outflow or blow-off from a thunderstorm or convective cloud.

Associated means two or more clouds are caused by the same disturbed weather or are physically connected.

Bright band means an enhancement of radar reflectivity caused by frozen hydrometeors falling and beginning to melt at any altitude where the temperature is 0 degrees Celsius or warmer.

Cloud means a visible mass of suspended water droplets or ice crystals, or a combination of water droplets and ice crystals. The cloud is the entire volume containing such particles.

Cloud layer means a vertically continuous array of clouds, not necessarily of the same type, whose bases are approximately at the same altitude.

Cone of silence means the volume within which a radar cannot detect any object, and is an inverted circular cone centered on the radar antenna. A cone of silence consists of all elevation angles greater than the maximum elevation angle reached by the radar.

Debris cloud means any cloud, except an anvil cloud, that has become detached from a parent cumulonimbus cloud or thunderstorm, or that results from the decay of a parent cumulonimbus cloud or thunderstorm.

Disturbed weather means a weather system where a dynamical process destabilizes the air on a scale larger than the individual clouds or cells. Examples of disturbed weather include fronts, troughs, and squall lines.

Electric field means a vertical electric field (Ez) at the surface of the Earth.

Field mill means an electric-field sensor that uses a moving, grounded conductor to induce a time-varying electric charge on one or more sensing elements in proportion to the ambient electrostatic field.

Flight path means a launch vehicle's planned flight trajectory, and includes the trajectory's vertical and horizontal uncertainties resulting from all three-sigma guidance and performance deviations.

Horizontal distance means a distance that is measured horizontally between a field mill or electric field measurement point and the nearest part of the vertical projection of an object or flight path onto the surface of the Earth.

Moderate precipitation means a precipitation rate of 0.1 inches/hr or a radar reflectivity of 30 dBZ.

Non-transparent means that one or more of the following conditions apply:

(1) Objects above, including higher clouds, blue sky, and stars, are blurred, indistinct, or obscured when viewed from below when looking through a cloud at visible wavelengths; or objects below, including terrain, buildings, and lights on the ground, are blurred, indistinct, or obscured when viewed from above when looking through a cloud at visible wavelengths;

(2) Objects above an observer are seen distinctly only through breaks in a cloud; or

(3) The cloud has a radar reflectivity of 0 dBZ or greater.

Precipitation means detectable rain, snow, hail, graupel, or sleet at the ground; virga; or a radar reflectivity greater than 18 dBZ.

Radar reflectivity means the radar reflectivity factor due to hydrometeors, in dBZ.

Slant distance means the shortest distance between two ports, whether horizontal, vertical, or inclined, in three dimensional space.

Thick cloud layer means one or more cloud layers whose combined vertical extent from the base of the bottom cloud layer to the top of the uppermost cloud layer exceeds 4,500 feet. Cloud layers are combined with neighboring layers for determining total thickness only when they are physically connected by vertically continuous clouds.

Thunderstorm means any convective cloud that produces lightning.

Transparent means that any of the following conditions apply:

(1) Objects above, including higher clouds, blue sky, and stars, are not blurred, are distinct and are not obscured when viewed at visible wavelengths; or objects below, including terrain, buildings, and lights on the ground, are clear, distinct, and not obscured when viewed at visible wavelengths; (2) Objects identified in paragraph (1) of this definition are seen distinctly not only through breaks in a cloud; and (3) The cloud has a radar reflectivity of less than 0 dBZ.

Triboelectrification means the transfer of electrical charge between ice particles and a launch vehicle when the ice particles collide with the vehicle during flight.

Volume-averaged, height integrated radar reflectivity (VAHIRR) means the product, expressed in units of dBZ-km or dBZ-kft, of a volume-averaged radar reflectivity and an average cloud thickness in a specified volume corresponding to a point.

G417.5 Lightning

(a) A launch operator must wait 30 minutes to initiate flight after any type of lightning occurs in a thunderstorm if the flight path will carry the launch vehicle at a slant distance of less than or equal to 10 nautical miles from that thunderstorm. This paragraph does not apply to an anvil cloud that is attached to a parent thunderstorm.

(b) A launch operator must wait 30 minutes to initiate flight after any type of lightning occurs at a slant distance of less than or equal to 10 nautical miles from the flight path, unless:

(1) The non-transparent part of the cloud that produced the lightning is at a slant distance of greater than 10 nautical miles from the flight path;

(2) There is at least one working field mill at a horizontal distance of less than or equal to 5 nautical miles from each such lightning discharge; and

(3) The absolute values of all electric field measurements at a horizontal distance of less than or equal to 5 nautical miles from the flight path and at each field mill specified in paragraph (b)(2) of this section have been less than 1000 volts/meter for at least 15 minutes.

G417.7 Cumulus Clouds

(a) This section applies to non-transparent cumulus clouds, except for cirrocumulus, altocumulus, or stratocumulus clouds. This section does not apply to an anvil cloud that is attached to a parent cumulus cloud.

(b) A launch operator may not initiate flight if the slant distance to the flight path is less than or equal to 10 nautical miles from any cumulus cloud that has a top at an altitude where the temperature is colder than or equal to −20 degrees Celsius.

(c) A launch operator may not initiate flight if the slant distance to the flight path is less than or equal to 5 nautical miles from any cumulus cloud that has a top at an altitude where the temperature is colder than or equal to −10 degrees Celsius.

(d) A launch operator may not initiate flight if the flight path will carry the launch vehicle through any cumulus cloud with its top at an altitude where the temperature is colder than or equal to −5 degrees Celsius.

(e) A launch operator may not initiate flight if the flight path will carry the launch vehicle through any cumulus cloud that has a top at an altitude where the temperature is colder than or equal to +5, and warmer than −5 degrees Celsius unless:

(1) The cloud is not producing precipitation;

(2) The horizontal distance from the center of the cloud top to at least one working field mill is less than 2 nautical miles; and

(3) All electric field measurements at a horizontal distance of less than or equal to 5 nautical miles of the flight path and at each field mill specified in paragraph (e)(2) of this section have been between −100 volts/meter and +500 volts/meter for at least 15 minutes.

G417.9 Attached Anvil Clouds

(a) This section applies to any non-transparent anvil cloud formed from a parent cloud that has a top at an altitude where the temperature is colder than or equal to −10 degrees Celsius.

(b) Flight path through cloud: If a flight path will carry a launch vehicle through any attached anvil cloud, the launch operator may not initiate flight unless:

(1) The portion of the attached anvil cloud at a slant distance of less than or equal to 5 nautical miles from the flight path is located entirely at altitudes where the temperature is colder than 0 degrees Celsius; and

(2) The volume-averaged, height-integrated radar reflectivity is less than +10 dBZ-km (+33 dBZ-kft) at every point at a slant distance of less than or equal to 1 nautical mile from the flight path.

(c) Flight path between 0 and 3 nautical miles from cloud: If a flight path will carry a launch vehicle at a slant distance of greater than 0, but less than or equal to 3, nautical miles from any attached anvil cloud, a launch operator must wait 3 hours to initiate flight after a lightning discharge in or from the parent cloud or anvil cloud, unless:

(1) The portion of the attached anvil cloud at a slant distance of less than or equal to 5 nautical miles from the flight path is located entirely at altitudes where the temperature is colder than 0 degrees Celsius; and

(2) The volume-averaged, height-integrated radar reflectivity is less than +10 dBZ-km (+33 dBZ-kft) at every point at a slant distance of less than or equal to 1 nautical mile from the flight path.

(d) Flight path between 3 and 5 nautical miles from cloud: If a flight path will carry a launch vehicle at a slant distance of greater than 3 and less than or equal to 5 nautical miles from any attached anvil cloud, a launch operator must wait 3 hours to initiate flight after every lightning discharge in or from the parent cloud or anvil cloud, unless the portion of the attached anvil cloud at a slant distance of less than or equal to 5 nautical miles from the flight path is located entirely at altitudes where the temperature is colder than 0 degrees Celsius.

(e) Flight path between 5 and 10 nautical miles from cloud: If the flight path will carry the launch vehicle at a slant distance of greater than 5 and less than or equal to 10 nautical miles from any attached anvil cloud, the launch operator must wait to initiate flight for 30 minutes after every lightning discharge in or from the parent cloud or anvil cloud, unless the portion of the attached anvil cloud at a slant distance of less than or equal to 10 nautical miles from the flight path is located entirely at altitudes where the temperature is colder than 0 degrees Celsius.

G417.11 Detached Anvil Clouds

(a) This section applies to any non-transparent anvil cloud formed from a parent cloud that had a top at an altitude where the temperature was colder than or equal to −10 degrees Celsius.

(b) Flight path through cloud: If the flight path will carry the launch vehicle through a detached anvil cloud, the launch operator may not initiate flight unless:

(1) The launch operator waits 4 hours after every lightning discharge in or from the detached anvil cloud; and observation shows that 3 hours have passed since the anvil cloud detached from the parent cloud; or

(2) Each of the following conditions exists:

(i) Any portion of the detached anvil cloud at a slant distance of less than or equal to 5 nautical miles from the flight path is located entirely at altitudes where the temperature is colder than 0 degrees Celsius; and

(ii) The VAHIRR is less than +10 dBZ-km (+33 dBZ-kft) everywhere in the flight path.

(c) Flight path between 0 and 3 nautical miles from cloud: If a flight path will carry a launch vehicle at a slant distance of greater than 0 and less than or equal to 3 nautical miles from a detached anvil cloud, the launch operator must accomplish both of the following:

(1) Wait 30 minutes to initiate flight after every lightning discharge in or from the parent cloud or anvil cloud before detachment of the anvil cloud, and after every lightning discharge in or from the detached anvil cloud after detachment, unless:

(i) The portion of the detached anvil cloud less than or equal to 5 nautical miles from the flight path is located entirely at altitudes where the temperature is colder than 0 degrees Celsius; and

(ii) The VAHIRR is less than +10 dBZ-km (+33 dBZ-kft) at every point at a slant distance of less than or equal to 1 nautical mile from the flight path; and

(2) If a launch operator is unable to initiate flight in the first 30 minutes under paragraph (c)(1) of this section, the launch operator must wait to initiate flight for 3 hours after every lightning discharge in or from the parent cloud or anvil cloud before detachment of the anvil cloud, and after every lightning discharge in or from the detached anvil cloud after detachment, unless:

(i) All of the following are true:

(A) There is at least one working field mill at a horizontal distance of less than or equal to 5 nautical miles from the detached anvil cloud;

(B) The absolute values of all electric field measurements at a horizontal distance of less than or equal to 5 nautical miles from the flight path and at each field mill specified in paragraph (c)(2)(i)(A) of this section have been less than 1000 V/m for at least 15 minutes; and

(C) The maximum radar reflectivity from any part of the detached anvil cloud at a slant distance of less than or equal to 5 nautical miles from the flight path has been less than +10 dBZ for at least 15 minutes; or

(ii) Both of the following are true:

(A) The portion of the detached anvil cloud at a slant distance of less than or equal to 5 nautical miles from the flight path is located entirely at altitudes where the temperature is colder than 0 degrees Celsius; and

(B) The volume-averaged, height-integrated radar reflectivity is less than +10 dBZ-km (+33 dBZ-kft) at every point at a slant distance of less than or equal to 1 nautical mile from the flight path.

(d) Flight path between 3 and 10 nautical miles from cloud: If a flight path will carry a launch vehicle at a slant distance of greater than 3 and less than or equal to 10 nautical miles from a detached anvil cloud, the launch operator must wait 30 minutes to initiate flight after every lightning discharge in or from the parent cloud or anvil cloud before detachment, and after every lightning discharge in or from the detached anvil cloud after detachment, unless the portion of the detached anvil cloud at a slant distance of less than or equal to 10 nautical miles from the flight path is located entirely at altitudes where the temperature is colder than 0 degrees Celsius.

G417.13 Debris Clouds

(a) This section applies to any non-transparent debris cloud whose parent cumuliform cloud has had any part at an altitude where the temperature was colder than −20 degrees Celsius or to any debris cloud formed by a thunderstorm. This section does not apply to a detached anvil cloud.

(b) A launch operator must calculate a "3-hour period" as starting at the latest of the following times:

(1) The debris cloud is observed to be detached from the parent cloud;

(2) The debris cloud is observed to have formed by the collapse of the parent cloud top to an altitude where the temperature is warmer than −10 degrees Celsius; or

(3) Any lightning discharge occurs in or from the debris cloud.

(c) Flight path through cloud: If a flight path will carry a launch vehicle through a debris cloud, the launch operator may not initiate flight during the "3-hour period," of paragraph (b) of this section, unless:

(1) The portion of the debris cloud at a slant distance of less than or equal to 5 nautical miles from the flight path is located entirely at altitudes where the temperature is colder than 0 degrees Celsius; and

(2) The VAHIRR is less than +10 dBZ-km (+33 dBZ-kft) everywhere in the flight path.

(d) Flight path between 0 and 3 nautical miles from cloud: If the flight path will carry the launch vehicle at a slant distance of greater than or equal to 0 and less than or equal to 3 nautical miles from the debris cloud, the launch operator may not initiate flight during the "3-hour period," unless one of the following applies:

(1) A launch operator may initiate flight during the "3-hour period," of paragraph (b) of this section if:

(i) There is at least one working field mill at a horizontal distance of less than or equal to 5 nautical miles from the debris cloud;

(ii) The absolute values of all electric field measurements at a horizontal distance of less than or equal to 5 nautical miles from the flight path and at each field mill specified in paragraph (d)(1)(i) of this section have been less than 1000 volts/meter for at least 15 minutes; and

(ii) The maximum radar reflectivity from any part of the debris cloud less than or equal to a slant distance of 5 nautical miles from the flight path has been less than +10 dBZ for at least 15 minutes; or

(2) A launch operator may initiate flight during the "3-hour period," of paragraph (b) of this section if:

(i) The portion of the debris cloud at a slant distance of less than or equal to 5 nautical miles from the flight path is located entirely at altitudes where the temperature is colder than 0 degrees Celsius; and

(ii) The VAHIRR is less than + 10 dBZ-km (+33 dBZ-kft) at every point at a slant distance of less than or equal to 1 nautical mile from the flight path.

G417.15 Disturbed Weather

A launch operator may not initiate flight if the flight path will carry the launch vehicle through a non-transparent cloud associated with disturbed weather that has clouds with tops at altitudes where the temperature is colder than 0 degrees Celsius and that contains, at a slant distance of less than or equal to 5 nautical miles from the flight path, either:

(a) Moderate or greater precipitation; or

(b) Evidence of melting precipitation such as a radar bright band.

G417.17 Thick Cloud Layers

(a) This section does not apply to either attached or detached anvil clouds.

(b) A launch operator may not initiate flight if the flight path will carry the launch vehicle through a non-transparent cloud layer that is:

(1) Greater than or equal to 4,500 feet thick and any part of the cloud layer in the flight path is located at an altitude where the temperature is between 0 degrees Celsius and −20 degrees Celsius, inclusive; or

(2) Connected to a thick cloud layer that, at a slant distance of less than or equal to 5 nautical miles from the flight path, is greater than or equal to 4,500 feet thick and has any part located at any altitude where the temperature is between 0 degrees Celsius and −20 degrees Celsius, inclusive.

(c) A launch operator may initiate flight despite paragraphs (a)(1) and (a)(2) of this section if the thick cloud layer:

(1) Is a cirriform cloud layer that has never been associated with convective clouds,

(2) Is located entirely at altitudes where the temperature is colder than or equal to −15 degrees Celsius, and

(3) Shows no evidence of containing liquid water.

G417.19 Smoke Plumes

(a) A launch operator may not initiate flight if the flight path will carry the launch vehicle through any non-transparent cumulus cloud that has developed from a smoke plume while the cloud is attached to the smoke plume, or for the first 60 minutes after the cumulus cloud is observed to be detached from the smoke plume.

(b) This section does not apply to non-transparent cumulus clouds that have formed above a fire but have been detached from the smoke plume for more than 60 minutes. Section G417.7 applies.

G417.21 Surface Electric Fields

(a) A launch operator must wait 15 minutes to initiate flight after the absolute value of any electric field measurement at a horizontal distance of less than or equal to 5 nautical miles from the flight path has been greater than or equal to 1500 volts/meter.

(b) A launch operator must wait 15 minutes to initiate flight after the absolute value of any electric field measurement at a horizontal distance of less than or equal to 5 nautical miles from the flight path has been greater than or equal to 1000 volts/meter, unless:

(1) All clouds at a slant distance of less than or equal to 10 nautical miles from the flight path are transparent; or

(2) All non-transparent clouds at a slant distance less than or equal to 10 nautical miles from the flight path:

(i) Have tops at altitudes where the temperature is warmer than or equal to +5 degrees Celsius, and

(ii) Have not been part of convective clouds with cloud tops at altitudes where the temperature was colder than or equal to −10 degrees Celsius for 3 hours.

G417.23 Triboelectrification

(a) A launch operator may not initiate flight if the flight path will carry the launch vehicle through any part of a cloud at any altitude where:

(1) The temperature is colder than or equal to −10 degrees Celsius; and

(2) The launch vehicle's velocity is less than or equal to 3000 feet/second,

(b) Paragraph (a) of this section does not apply if either:

(1) The launch vehicle is treated for surface electrification so that:

(i) All surfaces of the launch vehicle susceptible to ice particle impact are such that the surface resistivity is less than 10^9 Ohms per square; and

(ii) All conductors on surfaces, including dielectric surfaces that have been coated with conductive materials, are bonded to the launch vehicle by a resistance that is less than 10^5 ohms; or

(2) A launch operator demonstrates by test or analysis that electrostatic discharges on the surface of the launch vehicle caused by triboelectrification will not be hazardous to the launch vehicle or the spacecraft.

G417.25 Measurement of Cloud Radar Reflectivity, Computation of VAHIRR, and Measurement of Electric Field

(a) *Radar reflectivity measurement.* A launch operator who measures radar reflectivity to comply with this appendix must employ a meteorological radar and ensure that—

(1) The radar wavelength is greater than or equal to 5 cm;

(2) A reflectivity measurement is due to a meteorological target;

(3) The spatial accuracy and resolution of a reflectivity measurement is 1 kilometer or better;

(4) Any attenuation caused by intervening precipitation or by an accumulation of water or ice on the radome is less than or equal to 1 dBZ; and

(5) A reflectivity measurement contains no portion of the cone of silence above the radar antenna, nor any portion of any sector that is blocked out for payload safety reasons.

(b) *Computation of VAHIRR.* A launch operator who measures VAHIRR to comply with this appendix must ensure that—

(1) A digital signal processor provides radar reflectivity measurements on a three-dimensional Cartesian grid having a maximum grid-point-to-grid-point spacing of one kilometer in each of the three dimensions;

(2) The specified volume is the volume bounded in the horizontal by vertical, plane, perpendicular sides located 5.5 kilometers (3 nautical miles) north, east, south, and west of the point where VAHIRR is to be evaluated; on the bottom by the 0 degree Celsius level; and on the top by an altitude of 20 kilometers;

(3) Volume-averaged radar reflectivity is the arithmetic average of the radar reflectivity measurements in dBZ at grid points within the specified volume. A launch operator must include each grid point within the specified volume in the average if and only if that grid point has a radar reflectivity measurement equal to or greater than 0 dBZ. If fewer than 10% of the grid points in the specified volume have radar reflectivity measurements equal to or greater than 0 dBZ, then the volume-averaged radar reflectivity is either the maximum radar reflectivity measurement in the specified volume, or 0 dBZ, whichever is greater.

(4) Average cloud thickness is the difference in kilometers or thousands of feet between an average top and an average base of all clouds in the specified volume, computed as follows:

(i) The cloud base to be averaged is the higher, at each horizontal position, of either

(A) The 0 degree Celsius altitude, or

(B) The lowest altitude of all radar reflectivity measurements of 0 dBZ or greater.

(ii) The cloud top to be averaged is the highest altitude of all radar reflectivity measurements of 0 dBZ or greater at each horizontal position.

(iii) A launch operator must—

(A) Take the cloud base at any horizontal position as the altitude of the corresponding base grid point minus half of the grid-point vertical separation;

(B) Take the cloud top at that horizontal position as the altitude of the corresponding top grid point plus half of this vertical separation.

(5) All VAHIRR-evaluation points in the flight path itself are:

(i) Greater than a slant distance of 10 nautical miles from any radar reflectivity of 35 dBZ or greater at altitudes of 4 kilometers or greater above mean sea level; and

(ii) Greater than a slant distance of 10 nautical miles from any type of lightning that has occurred in the previous 5 minutes.

(iii) A launch operator need not apply paragraph (b)(5) of this section to VAHIRR evaluation points outside the flight path but within one nautical mile of the flight path.

(6) VAHIRR is the product, expressed in units of dBZ-km or dBZ-kft, of the volume-averaged radar reflectivity defined in paragraph (b)(3) of this section and the average cloud thickness defined in paragraph (b)(4) of this section in the specified volume defined in paragraph (b)(2) of this section.

(c) *Electric field measurement.* A launch operator who measures an electric field to comply with this appendix must—

(1) Employ a ground-based field mill,

(2) Use only the one-minute arithmetic average of the instantaneous readings from that field mill,

(3) Ensure that all field mills are calibrated so that the polarity of the electric field measurements is the same as the polarity of a voltage placed on a test plate above the sensor,

(4) Ensure that the altitude of the flight path of the launch vehicle is equal to or less than 20 kilometers (66 thousand feet) everywhere above a horizontal circle of 5 nautical miles centered on the field mill being used,

(5) Use only direct measurements from a field mill, and

(6) Not interpolate based on electric-field contours.

Issued in Washington, DC, on May 23, 2011.

J. Randolph Babbitt,

Administrator.

[FR Doc. 2011–14146 Filed 6–7–11; 8:45 am]

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Office of Commercial Space Transportation; Finding of No Significant Impact: Launch Operator License for Atlas V Evolved Expendable Launch Vehicles at Vandenberg Air Force Base, California

AGENCY: Federal Aviation Administration (FAA)

ACTIONS: Finding of No Significant Impact

SUMMARY: The FAA Office of Commercial Space Transportation (AST) is issuing this Finding of No Significant Impact (FONSI) for the issuance, renewal, or modification of Launch Operator Licenses for Atlas V launch vehicles covered under the Evolved Expendable Launch Vehicle (EELV) Program from Space Launch Complex-3 East (SLC-3E) at Vandenberg Air Force Base (VAFB), California.

In 1998, the U.S. Air Force (USAF) prepared the *Final Environmental Impact Statement for the EELV Program* (1998 FEIS) in accordance with the National Environmental Policy Act (NEPA) of 1969, 42 United States Code (U.S.C) § 4321-4347 (as amended) and Council on Environmental Quality (CEQ) NEPA implementing regulations (40 Code of Federal Regulations [CFR Parts 1500-1508]) to evaluate the potential environmental impacts of the development, deployment, and operation of EELV systems (later known as the Atlas V and Delta IV launch vehicle families) to replace the Atlas II, Delta II, and Titan IV launch systems at Cape Canaveral Air Force Station, Florida, and SLC-3 West (SLC-3W) at VAFB. In 2000, the USAF prepared the *Supplemental Environmental Impact Statement for the EELV Program* (2000 SEIS) to evaluate the potential environmental impacts of adding up to five solid-propellant strap-on rocket motors to the Atlas V launch vehicle and larger solid-propellant strap-on rocket motors on the Delta IV vehicle. The FAA participated as a cooperating agency in preparation of both the 1998 FEIS and 2000 SEIS because both documents discussed the possibility of both FAA/AST-licensed and non-FAA/AST licensed or government launches of Atlas V and Delta IV vehicles from Cape Canaveral Air Force Station and SLC-3W at VAFB.

Subsequent to preparation of the 1998 FEIS and 2000 SEIS, the USAF determined that SLC-3W would be unavailable as a launch site for the Atlas V program. As a result, in November 2003, the USAF prepared the *Final Environmental Assessment for the Atlas V System from SLC-3E, Vandenberg Air Force Base, California* (hereafter referred to as the 2003 EA) to analyze the environmental impacts of developing, deploying, and operating the Atlas V System from SLC-3E at VAFB. The 2003 EA tiered its analyses from the 1998 FEIS and 2000 SEIS, and therefore both documents were incorporated by reference into the 2003 EA.

Under the Proposed Action in the 2003 EA, the USAF would conduct infrastructure improvements in the vicinity of SLC-3E in order to successfully implement the Atlas V System. These improvements would include modifications to exisiting facilities and equipment within SLC-3E, installation of new facilities and equipment within SLC-3E, widening of a parking lot and several roads near the launch complex, and replacement of an electrical feeder along a cross-country power line. In addition to these construction activities, the 2003 EA evaluated the potential environmental impacts of up to four Atlas V launches per year from SLC-3E.

In accordance with the requirements of FAA Order 1050.1E, Change 1, paragraph 410, the FAA has independently evaluated the information contained in the 2003 EA and has verified the continued validity of the analysis contained in the EA. The FAA has determined that the discussion of Atlas V launch operations in the 2003 EA (Chapters 2.1.1, 4.1.1.2, 4.1.2.2, 4.1.3.2, 4.1.4.2, 4.2.1.2, 4.3.1.2, and 4.10.1) sufficiently addresses the concerns of the FAA and complies with FAA requirements for implementing NEPA as stated in FAA Order 1050.1E, Change 1. The FAA has determined that there is no new information or analysis that would require preparation of a new or supplemental EA or EIS according to the CEQ Regulations (40 CFR § 1502.9(c)(1)). Therefore, the FAA issues this FONSI concurring with the analysis of impacts and findings in the 2003 EA and formally adopts the launch operations discussion in the EA in compliance with the requirements at 40 CFR § 1506.3 to support the issuance, renewal, or modification of Launch Operator Licenses for Atlas V launch operations from SLC-3E at VAFB. The 2003 EA is incorporated by reference and is summarized as necessary in this FONSI. Much of the analysis in the 1998 FEIS and 2000 SEIS was incorporated into the 2003 EA by reference and because the FAA was a cooperating agency for both of these documents, this information will not be restated here. As a result, this FONSI will only summarize the unique analysis pertaining to Atlas V launch operations presented in the 2003 EA.

FOR MORE INFORMATION CONTACT: Mr. Daniel Czelusniak, Environmental Program Lead, Office of Commercial Space Transportation, Federal Aviation Administration, 800 Independence Ave, SW, Suite 325, Washington, DC 20591, by telephone at (202) 267-5924 or by email at Daniel.Czelusniak@faa.gov.

PURPOSE AND NEED: The purpose of FAA's Proposed Action is to fulfill FAA/AST's responsibilities under the Commercial Space Launch Act, 51 U.S.C. Ch. 509, §§ 50901-23 (2011) and Executive Order (EO) 12465, *Coordination and Encouragement of Commercial Expendable Launch Vehicle Activities*, for oversight of commercial space launch activities, including licensing of launch and reentry activities. The issuance, renewal, or modification of Launch Operator Licenses for Atlas V launch operations from SLC-3E at VAFB is consistent with the agency's responsibilities under Chapter 509 and EO 12465.

The need for action results from the statutory direction from Congress, FAA's regulations, and a Presidential Executive Order, to encourage, facilitate, and promote commercial space launches and reentries by the private sector and facilitate the strengthening and expansion of the U.S. space transportation infrastructure, in accordance with the applicable requirements.[1]

PROPOSED ACTION: Under the FAA's Proposed Action, FAA/AST could issue, renew, or modify a Launch Operator License for Atlas V launch operations from SLC-3E at VAFB. A Launch Operator License would authorize launches of Atlas V vehicles over the 5-year term of the license.

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[1] The Commercial Space Launch Act, 51 U.S.C. Ch. 509, §§ 50901-23 (2011), the Commercial Space Transportation Competitiveness Act of 2000 (Public Law 106-405); Executive Order 12465, Coordination and Encouragement of Commercial Expendable Launch Vehicle Activities (February 24, 1984); CFR Title 14, Aeronautics and Space, Parts 400-450, Commercial Space Transportation, Federal Aviation Administration, Department of Transportation; the Commercial Space Act of 1998 (Public Law 105-303); the U.S. Space Transportation Policy of 2004; and the National Space Policy of 2010.

Under the Proposed Action in the 2003 EA, the USAF considered the environmental impacts of both the construction activities required to support Atlas V launches from SLC-3E, as well as the impacts of Atlas V launch operations from SLC-3E. As the the FAA's Proposed Action only comprises a subset of the USAF's Proposed Action (i.e., Atlas V launch operations), the FAA has determined that it may appropriately use the USAF's analysis of impacts resulting from Atlas V launch operations in the 2003 EA and this FONSI to support the issuance, renewal, or modification of Launch Operator Licenses for Atlas V launch operations from SLC-3E at VAFB.

The activities associated with FAA's Proposed Action are described in detail in Chapter 2.1.1 of the 2003 EA and are summarized in this FONSI. The 2003 EA evaluated the potential environmental impacts of up to four Atlas V launches per year from SLC-3E at VAFB. The Atlas V System comprises a family of three launch vehicles, the Atlas V 300/400 Series, the Atlas V 500 series, and the Atlas V Heavy. Each variation of the Atlas V uses a common booster core powered by kerosene (rocket propellant 1) and liquid oxygen (LOX). Each configuration also has a cryogenic upper stage, which uses LOX and liquid hydrogen as propellants. Of these configurations, the Atlas V-400 and the Atlas V-500 would be launched from SLC-3E at VAFB under the FAA's Proposed Action. The Atlas V 400 series vehicles have a 4.2-meter (13.8-foot) diameter payload fairing. They are designed to use between zero and four, 1.6-meter (5.1-foot) diameter solid rocket motors (SRMs) that strap on to the common core booster and are powered by solid propellant consisting of ammonium perchlorate, powdered aluminum, and hydroxyl-terminated polybutadiene. The Atlas 500 series vehicles have a 5-meter (16.4-foot) diameter payload fairing and are designed to carry between zero and five strap-on SRMs. Each SRM would include approximately 94,000 pounds of solid propellant. In addition, the Atlas V family of launch vehicles is equipped with a flight termination system which provides range safety personnel the ability to terminate a vehicle undergoing erratic flight in the event of a major malfunction.

ALTERNATIVES CONSIDERED: Alternatives considered by the FAA/AST include the Proposed Action and the No Action Alternative. Under the No Action Alternative, the FAA would not issue, renew, or modify Launch Operator Licenses for Atlas V launch operations from SLC-3E at VAFB. Without a license, there could not be any commercial launches of Atlas V vehicles from SLC-3E at VAFB; however, government launches or other launches of these vehicles that do not require a license could continue from SLC-3E at VAFB.

ENVIRONMENTAL IMPACTS: The following presents a brief summary of the potential environmental impacts considered in the 2003 EA. This FONSI incorporates the USAF's 2003 EA by reference, summarizes those findings where appropriate, and is based on the potential impacts discussed in the EA. In the 2003 EA, the environmental impacts discussion for many resource areas was based on the analyses presented in the 1998 FEIS and 2000 SEIS (which were incorporated into the 2003 EA by reference). Where unique analysis was presented in the 2003 EA, this discussion was focused on the potential environmental impacts resulting from construction activities at SLC-3E. The only resource area discussions related to Atlas V launch operations that are unique in the 2003 EA are the discussion of biological resources and the discussion of cumulative impacts. As a result, only the biological resources and cumulative impact discussions will be summarized in this FONSI.

The FAA has determined the analysis of impacts related to Atlas V launch operations presented in the 2003 EA represent the best available information regarding the potential impacts associated with the FAA's regulatory responsibilities described in this FONSI. In addition, this

FONSI presents any relevant newly available data on existing conditions, potential impacts, and measures to mitigate those impacts.

Biological Resources

No significant impacts to biological resources are expected from Atlas V launch operations from SLC-3E at VAFB. As stated in the 2003 EA, launch activities could result in impacts to native plant communities in the vicinity of SLC-3E through localized, foliar scorching and spotting of vegetation due to high temperatures and fire, and defoliation of vegetation due to acid deposition from exhaust emissions of hydrogen chloride. However, as these impacts would be temporary due to the infrequent number of launches (up to four per year) and the observed recovery of vegetation between launches, the 2003 EA concluded that these impacts would not affect the long-term composition of the vegetation community.

Sensitive plant communities such as Coast Maritime Chaparral and Beach layia are present in the vicinity of SLC-3E and could be affected by fire resulting from launch activities. However, brush management practices and standard fire prevention and response procedures are in place at VAFB to reduce the risk of such an event.

Noise and vibration produced by launch operations, as well as the visual impact of rocket flight paths, could disturb or startle wildlife and migratory birds in the vicinity of SLC-3E. This could result in a temporary interruption of foraging and nesting activities in the immediate area of the launch pads. As stated in the 2003 EA, these effects would be short-term and would not be considered significant. Loss of habitat could result from fire in areas adjacent to the launch duct; however, brush management practices are in place at VAFB to minimize the risk of such an event.

The 2003 EA noted that a variety of special status wildlife species listed under the Federal Endangered Species Act may be present in the vicinity of SLC-3E. These species include the unarmored threespine stickleback, tidewater goby, California red-legged frog, California brown pelican, western snowy plover, California least tern, southwestern willow flycatcher, least Bell's vireo, southern sea otter, pacific harbor seal, California sea lion, northern elephant seal, northern fur seal, and the Steller sea lion. As discussed above, these species could be adversely affected by exhaust and noise emissions resulting from ground-level rocket launches. In 1999, as a result of the potential impacts to these species from prior Atlas IIAS launch activities at SLC-3E, the USAF initiated Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS). In December of 1999, the USFWS issued a Biological Opinion stating that the Atlas IIAS program would not adversely affect federally listed species or critical habitat, and outlining monitoring requirements to assess the level of noise impacts to listed bird species. In September of 2003, the USAF requested concurrence from the USFWS that the Atlas V program would also not affect federally listed species or critical habitat. The USFWS issued their concurrence with this determination in October of 2003, stating that the Atlas V program would not adversely affect federally listed species or critical habitat in a manner or to an extent not already considered in the 1999 Biological Opinion. As a result of this concurrence, Atlas V launch operations are not expected to result in impacts to listed species in the vicinity of SLC-3E.

In addition, the 2003 EA states that launches from VAFB require an incidental take permit from the National Marine Fisheries Service (NMFS) to address the harassment of marine mammals under the Marine Mammal Protection Act. As of 2003, VAFB held a 5-year programmatic incidental take permit consolidating different launch programs that allowed for the incidental harassment of marine mammals (including pacific harbor seals, California sea lions, northern elephant seals, and northern fur seals) to occur during associated launches. This agreement between the USAF and NMFS was renewed most recently on February 7, 2011, and permits up to 20 annual rocket launches of ten different rocket types from VAFB, including launches of the Atlas V vehicle at SLC-3E.

Cumulative Impacts

Atlas V launch operations would not result in significant cumulative impacts to any resource. The 2003 EA analyzed the environmental impacts of all past, present, and reasonably foreseeable future activities at VAFB in 2003. As stated in the 2003 EA, other activities planned in the vicinity of SLC-3E include flights of SpaceX's Falcon launch vehicle at SLC-3W. However, because the Falcon vehicle is smaller than the Atlas V vehicle, and the combined launch rates for the Falcon and Atlas launch programs would be small (a maximum of seven launches per year), the 2003 EA concluded that the combined environmental impacts of the two launch programs would not be significant. There has been no substantial change in launch projections at VAFB since the publication of the 2003 EA; as a result, the Proposed Action would not be expected to have a significant cumulative impact.

DETERMINATION: The 2003 EA examined the potential for significant environmental impacts related to Atlas V launch operations from SLC-3E at VAFB. The 2003 EA determined that exhaust emissions and noise produced during rocket launches could have adverse impacts on biological resources in the vicinity of SLC-3E. However, because launches would be infrequent, emissions quantities would be inappreciable, and noise and air emissions would be temporary and likely to disperse quickly, Atlas V launch operations would not result in significant impacts to the environment.

The FAA independently evaluated the information contained in the 2003 EA and verified the continued validity of the analysis contained in the document. Through the evaluation, the FAA determined that there is no new information or analysis that would require preparation of a new or supplemental EA or Environmental Impact Statement according to the CEQ Regulations (40 CFR § 1502.9 (c)(1)). The FAA is therefore adopting the launch operations discussion in the 2003 EA, and is using this document to support its finding on the Proposed Action.

After careful and thorough consideration of the facts contained herein, the undersigned finds that the proposed Federal action is consistent with existing national environmental policies and objectives as set forth in Section 101 of NEPA and other applicable environmental requirements and will not significantly affect the quality of the human environment or otherwise include any condition requiring consultation pursuant to Section 102(2)(c) of NEPA.

Issued in Washington, DC on: 8/12/11

Dr. George C. Nield

Associate Administrator for

Commercial Space Transportation

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Office of Commercial Space Transportation; Record of Decision to document the Federal Aviation Administration's final approval for issuing, renewing, or modifying Launch Operator Licenses for launch vehicles covered under the Evolved Expendable Launch Vehicle Program, which include Atlas V and Delta IV vehicles, from Cape Canaveral Air Force Station and Vandenberg Air Force Base.

AGENCY: The Federal Aviation Administration

ACTIONS: Record of Decision

SUMMARY: The Federal Aviation Administration (FAA) Office of Commercial Space Transportation (AST) prepared this Record of Decision (ROD) to document the FAA's final approval for issuing, renewing, or modifying Launch Operator Licenses for launch vehicles covered under the Evolved Expendable Launch Vehicle (EELV) Program, which include Atlas V and Delta IV vehicles, from Cape Canaveral Air Force Station (CCAFS) and Vandenberg Air Force Base (VAFB). The Federal action selected in this ROD is the FAA's issuance, renewal, or modification of Launch Operator Licenses for launch vehicles covered under the EELV Program from CCAFS and VAFB.

The FAA participated as a cooperating agency with the U.S. Air Force (USAF) in the preparation of the 1998 Final Environmental Impact Statement for the EELV Program (1998 FEIS) and the 2000 Supplemental Environmental Impact Statement for the EELV Program (2000 SEIS) in accordance with the National Environmental Policy Act (NEPA) of 1969, 42 United States Code (U.S.C) § 4321-4347 (as amended) and Council on Environmental Quality (CEQ) NEPA implementing regulations (40 Code of Federal Regulations [CFR Parts 1500-1508]) to evaluate the potential environmental impacts of the development, deployment, and operation of EELV systems to replace the Atlas II, Delta II, and Titan IV launch systems at CCAFS and VAFB. The FAA served as a cooperating agency because the 1998 FEIS and 2000 SEIS discussed the possibility of both FAA/AST-licensed launches and non-FAA/AST licensed or government launches of Atlas V and Delta IV vehicles from CCAFS and VAFB.

In November 2003, the USAF published a Final Environmental Assessment (EA) for the Atlas V System from SLC-3E at VAFB (2003 EA). The FAA did not participate as a cooperating agency in the development of this Environmental Assessment, but has independently evaluated the information contained in the 2003 EA and has verified the continued validity of the analysis contained in the document. Through this re-revaluation, the FAA determined that there is no new information or analysis that would require the preparation of a new or supplemental EA according to the CEQ Regulations (40 CFR § 1502.9(c)(1)). The FAA has therefore, adopted the 2003 EA and issued a Finding of No Significant Impact. The 2003 EA is incorporated by reference into this ROD.

The FAA has independently evaluated the information contained in the 1998 FEIS and 2000 SEIS and has verified the continued validity of the analysis contained in both documents. Through this re-evaluation, the FAA has determined that there is no new information or analysis that would require preparation of a new or supplemental EIS according to the CEQ Regulations (40 CFR § 1502.9(c)(1)). The FAA is therefore adopting the 1998 FEIS and 2000 SEIS, and is using these documents to support its decision on the Proposed Action.

FOR MORE INFORMATION CONTACT: Mr. Daniel Czelusniak, Environmental Program Lead, Office of Commercial Space Transportation, Federal Aviation Administration, 800 Independence Ave, SW, Suite 325, Washington, DC 20591, by telephone at (202) 267-5924 or by email at Daniel.Czelusniak@faa.gov.

PURPOSE AND NEED: The purpose of the Proposed Action is to fulfill FAA/AST's responsibilities under the Commercial Space Launch Act, 51 U.S.C. Ch. 509, §§ 50901-23 (2011) and Executive Order 12465, *Commercial Expendable Launch Vehicle Activities*, for oversight of commercial space launch activities, including licensing of launch and reentry activities. The issuance, renewal, or modification of Launch Operator Licenses for the launch of Atlas V and Delta IV expendable launch vehicles from CCAFS and VAFB would be consistent with the agency's responsibilities under the CSLAA.

The need for action results from the statutory direction from Congress to encourage, facilitate, and promote commercial space launches and reentries by the private sector and facilitate the strengthening and expansion of the U.S. space transportation infrastructure, in accordance with the applicable requirements.[1]

PUBLIC AND AGENCY INVOLVEMENT: *1998 FEIS.* Public participation in the NEPA process promotes better decision-making and provides for and encourages open communication between FAA and the public. The Notice of Intent to prepare an EIS for EELV systems was published in the *Federal Register* on February 19, 1997. The USAF held scoping meetings on March 11 and 13, 1997 to receive comments from the public regarding the scope of issues to be addressed and to identify significant issues related to the proposal. A Draft EIS was filed with the U.S. Environmental Protection Agency (EPA) on December 12, 1997, and public hearings on the Draft EIS were held on January 13 and 15, 1998, where the USAF presented the findings of the Draft EIS and invited public comments. All public comments received during the 45-day public comment period following the publication of the Draft EIS were considered in developing the Final EIS. The Final EIS was filed with the EPA on May 1, 1998 and a Notice of Availability was published in the *Federal Register* on May 8, 1998.

2000 SEIS. Following proposed modifications to the launch vehicles analyzed in the 1998 FEIS, a Notice of Intent to prepare the Draft Supplemental EIS was published in the *Federal Register* on April 12, 1999. The public scoping period for the Draft Supplemental EIS began on April 13,

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1 The Commercial Space Launch Amendments Act of 2004 (Public Law 108-492), the Commercial Space Transportation Competitiveness Act of 2000 (Public Law 106-405); Executive Order 12465, Commercial Expendable Launch Vehicle Activities (February 24, 1984); CFR Title 14, Aeronautics and Space, Parts 400-450, Commercial Space Transportation, Federal Aviation Administration, Department of Transportation; the Commercial Space Act of 1998 (Public Law 105-303); the U.S. Space Transportation Policy of 2004; and the National Space Policy of 1996 and 2006.

1999, and ended on May 31, 1999. The USAF published the Notice of Availability of the Draft Supplemental EIS for public review in the *Federal Register* on November 12, 1999, initiating a 45-day comment period, which closed on December 27, 1999. In addition, the USAF placed ads in newspapers of the affected communities notifying the public of their opportunities to participate in the comment period. During the comment period, the USAF held public hearings at Cape Canaveral, Florida, on December 7, 1999, and at Lompoc, California, on December 9, 1999, where the USAF presented the findings in the Draft Supplemental EIS. The USAF filed the Final Supplemental EIS with EPA on April 7, 2000, and published a Notice of Availability in the *Federal Register* on April 14, 2000.

2003 EA. As a result of a program restructure in September of 2000, the USAF terminated plans for development of the EELV launch pad on SLC-3W and the implementation of the Atlas V System from VAFB. However, in 2003 changes in USAF programs resulted in the reinstatement of the Atlas V System, but the program needed to be implemented from SLC-3E on South VAFB rather than SLC-3W as originally planned. SLC-3E was selected for the Atlas V System because SLC-3W was no longer available due to an earlier signed agreement between Space X Corporation and the USAF and because the 21-month schedule levied on the proponent prevented the design of a new launch pad. The 2003 EA analyzed the environmental impacts associated with the proposed action of modifying existing facilities and roadways and launching the Atlas V from SLC-3E at VAFB. The FAA did not participate as a cooperating agency with the USAF in preparation of the 2003 EA. The analysis from the 2003 EA and the FAA's findings on that analysis are incorporated by reference in this ROD, and therefore references from the 1998 FEIS and 2000 SEIS to SLC-3W at VAFB have been revised to read "SLC-3E" throughout this ROD.

PROPOSED ACTION AND ALTERNATIVES CONSIDERED: The Proposed Action and Alternatives considered are described in detail in Chapter 2 of the 1998 FEIS and 2000 SEIS; and they are summarized in this ROD. As noted earlier, this ROD provides the FAA's final approval for issuing, renewing, or modifying Launch Operator Licenses for launch vehicles covered under the EELV Program, which include Atlas V and Delta IV vehicles, from CCAFS and VAFB. The 1998 FEIS and 2000 SEIS discussed the possibility of both FAA-licensed and non-licensed or government launches of the Atlas V and Delta IV vehicles from CCAFS and VAFB.

1998 FEIS Proposed Action and Alternatives

Under the Proposed Action in the 1998 FEIS, CCAFS and VAFB would be used for launch activities under the EELV program. Delta IV launches would occur from Space Launch Complex-37 (SLC-37) at CCAFS and from SLC-6 at VAFB; the Atlas V launches would occur from SLC-41 at CCAFS and from SLC-3E at VAFB.[2] Use of these complexes could require new construction and facility modification in order to adapt the complexes to the launch vehicles. Operational activities at the complexes would involve launches of both medium and

[2] The 1998 FEIS and 2000 SEIS state that SLC-3W would be used for Atlas V launches, but in 2003 the USAF decided to use SLC-3E as the launch site for the Atlas V. The USAF analyzed the potential environmental impacts of using SLC-3E in the 2003 EA and the FAA has independently evaluated that analysis and issued its own finding of no significant impact. Therefore, SLC-3E will be cited as the launch site for Atlas V launches in this ROD.

heavy lift expendable, orbital "concept vehicles." The three alternatives analyzed in the 1998 FEIS included: 1) use of only the Concept A family of vehicles (later identified as Lockheed Martin Commercial Launch Services, Inc. [Lockheed Martin]'s Atlas V family of vehicles); 2) use of only the Concept B family of vehicles (later identified as The Boeing Company [Boeing]'s Delta IV family of vehicles); and 3) use of both Concept A and B vehicles. Under the third alternative, a maximum of 30 combined FAA-licensed launches and non-licensed launches of Atlas V and Delta IV would occur in one year from VAFB and CCAFS, combined. Under the No Action Alternative, the USAF would not proceed with the development and deployment of the EELV program, and Atlas IIA, Delta II, and Titan IVB launch vehicles would continue to be used to support space launches to meet the requirements of the government. These launch vehicles would provide the Department of Defense's source of expendable medium and heavy spacelift transportation to orbit through 2020. The No Action Alternative did not include analysis of FAA-licensed launches.

The USAF issued a ROD on June 8, 1998, which presented the agency's decision to select the third alternative, the use of both Concept A and B vehicles, and permit the continued development and deployment of the EELV program. The ROD stated that the USAF would adopt all practicable means to avoid or minimize the environmental harm resulting from the Proposed Action, including appropriate mitigation and monitoring measures, as set forth in the ROD.

2000 SEIS Proposed Action and Alternatives

Under the Proposed Action in the 2000 SEIS, up to five solid-propellant strap-on rocket motors (SRMs) would be added to the Atlas V medium lift vehicle and larger SRMs would be used on the Delta IV vehicle. The Atlas V vehicle would launch from SLC-41 at CCAFS and SLC-3E at VAFB, and the Delta IV vehicle would launch from SLC-37 at CCAFS and SLC-6 at VAFB. While use of SRM-assisted vehicles was considered in the 1998 FEIS, the 2000 SEIS considered a higher proportion of vehicles using SRM-assisted vehicles than the 1998 FEIS. Under the Proposed Action, a maximum of 33 combined FAA-licensed launches and non-licensed launches of Atlas V and Delta IV would occur in one year from VAFB and CCAFS, combined. Under the No Action Alternative, the EELV program would continue, except that SRMs would not be added to the Atlas V launch vehicles and smaller SRMs would be used on Delta IV launch vehicles.

The USAF issued a ROD on May 25, 2000, which presented the agency's decision to permit the use of additional and larger SRMs in support of the EELV program. This ROD noted that while the environmentally preferred alternative was the No Action Alternative, the USAF would implement all practicable means to avoid or minimize the environmental harm resulting from the Proposed Action, including appropriate mitigation and monitoring measures, as set forth in the ROD.

FAA/AST Proposed Action/Preferred Alternative

The FAA/AST served as a cooperating agency in the preparation of the 1998 FEIS and 2000 SEIS due to its role in issuing Launch Operator Licenses to operate launch vehicles at CCAFS and VAFB, and because FAA-licensed launches of both the Atlas V and Delta IV launch vehicles were included in the Proposed Action of both documents. Under the FAA's Proposed Action, FAA/AST could issue, renew, or modify Launch Operator Licenses for Atlas V and Delta IV operations at CCAFS and VAFB. The FAA's Proposed Action is also the FAA's Preferred Alternative. The 1998 FEIS and 2000 SEIS analyzed the full potential scope of the operations that could be covered under a Launch Operator License for Atlas V and Delta IV at CCAFS and VAFB. The FAA may use the analysis in the 1998 FEIS, 2000 SEIS, and this ROD to support the issuance, renewal, or modification of Launch Operator Licenses for Atlas V and Delta IV expendable launch vehicles at CCAFS and VAFB.

In accordance with the requirements of FAA Order 1050.1E, Change 1, paragraph 515, the FAA has independently evaluated the information contained in the 1998 FEIS and 2000 SEIS and has verified the continued validity of the analysis contained in both documents. The FAA has determined that the 1998 FEIS and 2000 SEIS sufficiently address the concerns of the FAA and comply with FAA requirements for implementing NEPA as stated in FAA Order 1050.1E, Change 1. The FAA has determined that there is no new information or analysis that would require the preparation of a new or supplemental EIS according to the CEQ Regulations (40 CFR § 1502.9(c)(1). The FAA is therefore adopting the 1998 FEIS and 2000 SEIS, and is using these documents to support its decision in this ROD. The USAF's 1998 FEIS and 2000 SEIS are incorporated by reference and summarized as necessary in this ROD.

FAA/AST No Action Alternative

Under the No Action Alternative, the FAA would not issue, renew, or modify Launch Operator Licenses for Atlas V or Delta IV expendable launch vehicles at CCAFS and VAFB. Without a license, there could not be any commercial launches of Atlas V or Delta IV vehicles from CCAFS or VAFB; however, non-licensed or government launches of these vehicles could continue from both locations.

Environmentally Preferable Alternative

The FAA/AST No Action Alternative is the environmentally preferable alternative. Under the FAA's No Action Alternative, the FAA would not issue licenses, renewals, or modifications of Launch Operator Licenses for Atlas V and Delta IV expendable launch vehicles at CCAFS or VAFB. Although, the environmentally preferable alternative is the FAA's No Action Alternative, all practicable means to avoid or minimize the environmental harm resulting from the FAA's Proposed Action/Preferred Alternative, including appropriate mitigation and monitoring measures, would be implemented as set forth in this ROD.

ENVIRONMENTAL IMPACTS UNDER THE PROPOSED ACTION: The following presents a brief summary of the potential environmental impacts considered in the 1998 FEIS and 2000 SEIS. This ROD incorporates the USAF's 1998 FEIS and 2000 SEIS by reference, summarizes those findings where appropriate, and is based on the potential impacts discussed in those documents. The FAA has determined the analysis of impacts presented in the 1998 FEIS and 2000 SEIS represents the best available information regarding the potential impacts associated with the FAA's regulatory responsibilities described in this ROD. In addition, this ROD presents any relevant newly available data on existing conditions, potential impacts, and measures to mitigate those impacts.

Air Quality

The proposed launch vehicle operations at CCAFS and VAFB would not result in significant impacts to local atmospheric air quality. Air quality impacts from nominal launches and launch failures of the Atlas V and Delta IV vehicles would include a temporary increase in hydrogen chloride, carbon monoxide, PM_{10}, and $PM_{2.5}$.[3] The use of SRMs would generate emission of aluminum oxide, nitrogen oxides, and chlorine compounds into the stratosphere that would affect stratospheric ozone. Temporary local ozone losses would occur. Cumulative global impacts to stratospheric ozone would depend on the future rate of launches. Atlas V and Delta IV launch vehicle operations at CCAFS and VAFB would not be expected to have a significant impact on air quality.

Biological Resources

The proposed operations at CCAFS and VAFB for the Atlas V and Delta IV launch program could result in impacts to vegetation and wildlife. These impacts could occur if a post-launch ground cloud or launch noise were to affect biological resources. Species protected by National Marine Fisheries Service could be affected by launch activities at VAFB; however, all FAA-licensed launches would comply with all pertinent monitoring and mitigation measures. In order to comply with the requirements of the Endangered Species Act and the Marine Mammal Protection Act and avoid significant adverse impacts to species, the licensee would be required to adhere to all requirements that CCAFS or VAFB implements as a result of the past, current, and ongoing consultations with the USFWS and NMFS, including conditions of the current Biological Opinions that CCAFS and VAFB are operating under. With these measures, the Proposed Action would not be expected to have a significant impact on biological resources. The effects of hydrogen chloride and aluminum oxide deposition from launches would be minimal. Plant species are expected to recover from short-term launch impacts. Damaged vegetation resulting from a launch anomaly would be expected to recover within the same growing season because no lingering effects would be present. No significant impacts to vegetation are anticipated as a result of the Proposed Action. Atlas V and Delta IV launches would not be expected to have a significant impact on biological resources at CCAFS and VAFB.

Cultural Resources

An increase in the number of launches associated with the Proposed Action would not affect registered or eligible cultural resources at CCAFS and VAFB or alter their character or setting. Archaeological surveys at VAFB have identified more than 2,200 prehistoric and historic cultural sites ranging from prehistoric village sites and temporary encampments to Cold War

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[3] As the EPA did not finish setting NAAQS for $PM_{2.5}$ until 2006, it was not evaluated in the 1998 FEIS or 2000 SEIS. However, as $PM_{2.5}$ is a component of PM_{10}, a conservative estimate of emission concentrations from a Delta IV or Atlas V launch can be made by assuming the PM_{10} concentrations reported in the 2000 FSEIS equal $PM_{2.5}$ concentrations. A similar methodology can be used to estimate annual $PM_{2.5}$. Using these methods, the FAA has determined that $PM_{2.5}$ emissions would not exceed the NAAQS standards, and therefore no significant impacts to $PM_{2.5}$ are anticipated as a result of the Proposed Action.

infrastructure. However, activities associated with the Proposed Action would not result in any new ground disturbances and would not represent a new type of activity in the area that would affect the character or setting of a cultural resource. Under the Proposed Action no adverse impacts would be anticipated at SLC-37 or SLC-41 at CCAFS or SLC-3E or SLC-6 at VAFB. Therefore, the Proposed Action would not be expected to have a significant impact on cultural resources at CCAFS and VAFB.

Geology and Soils

The proposed launch vehicle operations at CCAFS and VAFB would not result in a significant impact to geology or soils. Since no new construction would occur under the FAA's Proposed Action, the risk of soil erosion and landslides would be minimal.

Land Use and Section 4(f) Resources

Atlas V and Delta IV launches would not result in significant impacts to land use compatibility at CCAFS and VAFB. Launch activities would occur at SLC-37 and SLC-41 at CCAFS, and SLC-3E and SLC-6 at VAFB, which are designated for space launch activities and are consistent with the base comprehensive plan. These SLCs are still active and currently designated for space launch operations, and the Proposed Action would not impact or require changes to land use. The proposed action would not require the use of Section 4(f) resources.

There are no public beaches on Cape Canaveral; therefore, no beach closures would occur as a result of the Proposed Action at CCAFS. Atlas V and Delta IV launches at VAFB could result in temporary beach closures. The Proposed Action could result in a maximum of 28 (from a maximum of 11[4] launches closing both Ocean Beach County Park and Jalama Beach County Park during low-azimuth launches from SLC-3E) potential public beach closures per year.

Noise

The proposed launch vehicle operations at CCAFS and VAFB would not result in significant impacts to noise. The relative isolation of CCAFS reduces the potential for noise to affect adjacent communities. The area surrounding VAFB primarily consists of undeveloped and rural land, and potential impacts to noise-sensitive receptors would not be expected under the Proposed Action. Atlas V and Delta IV launches from CCAFS and VAFB would be expected to occur infrequently (up to a combined total of 26 times per year at CCAFS and 11 times per year at VAFB), and the launch noise generated from each event would be temporary and brief. Noise levels resulting from launches at CCAFS and VAFB would not be expected to cause more than a slight annoyance to nearby communities. Although rocket launches could result in sonic booms, these would be directed out over the Atlantic and Pacific Oceans and would not be expected to affect the Florida and California coastlines. Exposure to short-term noise from launches could cause startle effects in marine mammals and bird species, but this impact would not be expected

[4] Although the 1998 FEIS analyzed up to a maximum of 14 EELV launches annually from VAFB, the 2003 EA only included a maximum of 4 Atlas V launches annually (3 fewer than was considered in the 1998 FEIS) and therefore, this written re-evaluation (WR) will consider a maximum of 11 combined EELV launches from VAFB.

to be significant. The Proposed Action would result in day-night average noise levels (DNL) at CCAFS and VAFB that are substantially less than the FAA's significance threshold of 65.

Physical Resources (Water Resources [Surface Water, Ground Water, Floodplains], Hazardous Materials, Pollution Prevention, and Solid Waste)

Water Resources

Significant impacts to water resources would not be expected from Atlas V and Delta IV launch operations at CCAFS and VAFB. Although the sites are near coastal waters and wetlands, there are no creeks or other natural surface waters present in the immediate vicinity of SLC-37 and SLC-41 at CCAFS, and SLC-3E and SLC-6 at VAFB. Launches would require the use of deluge, acoustic suppression, and wash down water. Any wastewater generated during launch activities would be monitored and properly disposed of in accordance with the current wastewater disposal regulations. Minimal deposition of hydrochloric acid associated with the use of solid rocket motors would be concentrated near the launch pad, and adverse impacts to surface water and groundwater are not anticipated. The Proposed Action would not be expected to have a significant impact on water resources.

Hazardous Materials, Pollution Prevention, and Solid Waste

Proposed launch vehicle operations at CCAFS and VAFB would not result in significant impacts to hazardous materials, hazardous waste management, or solid waste. Activities related to vehicle launch activities could result in hazardous materials and hazardous waste generation; however, no significant impacts would be expected as the licensee would adhere to existing standards for hazardous materials and waste management at CCAFS and VAFB. As a result, Atlas V and Delta IV launches would not pose significant impacts to hazardous materials and hazardous waste management.

Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety

Proposed launch vehicle operations at CCAFS and VAFB would not result in significant impacts to environmental justice, socioeconomics, or children's environmental health and safety. In addition, no impacts to surrounding populations, including minorities and low-income populations, would be expected under the Proposed Action.

Cumulative Impacts

The Proposed Action would not result in significant cumulative impacts to any resource. While some impacts to biological resources, especially marine mammals, are anticipated, these impacts are not expected to be significant. The Proposed Action would not affect any other actions at CCAFS and VAFB and the surrounding areas, and conversely the Proposed Action would not be affected by any other actions at these locations.

It is highly unlikely that the maximum 26 annual commercial launches at CCAFS or 11 annual commercial launches at VAFB would actually occur, as the Commercial Space Transportation

Advisory Committee and FAA/AST's 2010 forecast projects an average annual demand of 27.6 commercial space launches worldwide from 2010 to 2019. As a result, the number of Atlas V and Delta IV launches per year at CCAFS and VAFB would not be considered significant relative to the overall launch rate at these locations or worldwide, and thus no substantial cumulative impacts to any resources would be expected.

DECISION AND ORDER: Based on the potential environmental impacts identified in the 1998 FEIS and 2000 SEIS, applicable regulatory requirements, public and agency comments, and the FAA's responsibilities to support the continued growth and expansion of the U.S. space transportation industry, the FAA has decided to implement the FAA's Proposed Action (Preferred Alternative). The FAA believes the FAA's Proposed Action best fulfills the purpose and need identified in this ROD. In contrast, the FAA's No Action Alternative fails to meet the purpose and need identified in this ROD. For reasons summarized earlier in this ROD, the FAA has determined that the FAA's Proposed Action is a reasonable, feasible, practicable, and prudent alternative for a Federal decision in light of the established goals and objectives. An FAA decision to take the required actions and approvals is consistent with its statutory mission and policies supported by the findings and conclusions reflected in the environmental documentation and this ROD.

The FAA has independently evaluated the information contained in the 1998 FEIS and 2000 SEIS and has verified the continued validity of the analysis contained in both documents. Through this re-evaluation, the FAA has determined that there is no new information or analysis that would require preparation of a new or supplemental EIS according to the CEQ Regulations (40 CFR § 1502.9 (c)(1)). The FAA is therefore adopting the 1998 FEIS and 2000 SEIS, and is using these documents to support its decision on the Proposed Action.

After careful and thorough consideration of the facts contained herein and following consideration of the view of those Federal agencies having jurisdiction by law or special expertise with respect to the environmental impacts described, the undersigned finds that the proposed Federal action is consistent with existing national environmental policies and objectives as set forth in Section 101(a) of NEPA.

This ROD represents the FAA's final decision and approvals for the actions identified, including those taken under the provisions of the Commercial Space Launch Act, 51 U.S.C. Ch. 509, §§ 50901-23 (2011), Subtitle VII, Parts A and B. Based upon the record of this proposed Federal action, and under the authority delegated to me by the Administrator of the FAA, I find that this Record of Decision is reasonably supported.

FAA Decisionmaker:

Dr. George C. Nield
Associate Administrator for
Commercial Space Transportation

8/12/11
Date

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FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 1, 2, and 25

[ET Docket No. 10–142; FCC 11–57]

Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525–1559 MHz and 1626.5–1660.5 MHz, 1610–1626.5 MHz and 2483.5–2500 MHz, and 2000–2020 MHz and 2180–2200 MHz

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: In this document, the Commission amends its rules to make additional spectrum available for new investment in mobile broadband networks while also ensuring that the United States maintains robust mobile satellite service capabilities. First, this document adds co-primary Fixed and Mobile allocations to the Mobile Satellite Service (MSS) 2 GHz band, consistent with the International Table of Allocations, allowing more flexible use of the band, including for terrestrial broadband services, in the future. Second, to create greater predictability and regulatory parity with the bands licensed for terrestrial mobile broadband service, the document extends the Commission's existing secondary market spectrum manager spectrum leasing policies, procedures, and rules that currently apply to wireless terrestrial services to terrestrial services provided using the Ancillary Terrestrial Component (ATC) of an MSS system.

DATES: Effective June 30, 2011.

ADDRESSES: Federal Communications Commission, 445 12th Street, SW., Washington, DC 20554.

FOR FURTHER INFORMATION CONTACT: Kevin Holmes, Wireless Telecommunications Bureau at 202–418–2487 or *kevin.holmes@fcc.gov,* or Nicholas Oros, Office of Engineering and Technology at 202–418–0636 or *nicholas.oros@fcc.gov.*

SUPPLEMENTARY INFORMATION: This is a summary of the Commission's *Report and Order,* FCC 11–57, adopted on April 5, 2011, and released on April 6, 2011, as corrected by an erratum issued on April 15, 2011. The full text of this document is available for inspection and copying during normal business hours in the FCC Reference Information Center, Room CY–A257, 445 12th Street, SW., Washington, DC 20554. The complete text may be purchased from the Commission's duplicating contractor, Best Copy and Printing, Inc. (BCPI), Portals II, 445 12th Street, SW., Room CY–B402, Washington, DC 20554, (202) 488–5300, facsimile (202) 488–5563, or via e-mail at *fcc@bcpiweb.com.* The complete text is also available on the Commission's Web site at *http://wireless.fcc.gov/edocs_public/attachment/FCC-11-57A1doc.* This full text may also be downloaded at: *http://wireless.fcc.gov/releases.html.* Alternative formats (computer diskette, large print, audio cassette, and Braille) are available by contacting Brian Millin at (202) 418–7426, TTY (202) 418–7365, or via e-mail to *bmillin@fcc.gov.*

Summary

The Federal Communications Commission makes additional spectrum available for new investment in mobile broadband networks while also ensuring that the United States maintains robust MSS capabilities. This action is consistent with Recommendation 5.8.4 of the National Broadband Plan, which recommended that 90 megahertz of spectrum allocated to MSS could be made available for terrestrial mobile broadband use, while preserving sufficient MSS capability to serve rural areas, public safety, and other important national purposes. The rules adopted herein: (1) Add co-primary Fixed and Mobile allocations to the MSS 2GHz band, consistent with the International Table of Allocations, and (2) extend the Commission's existing secondary market spectrum manager spectrum leasing policies, procedures, and rules that currently apply to wireless terrestrial services to services provided using the ATC of an MSS system.

I. Background

1. *Mobile Satellite Service Spectrum Allocation.* MSS is a radiocommunications service involving transmission between mobile earth stations and one or more space stations. As we discussed in the *MSS NPRM,* three MSS frequency bands are capable of supporting broadband service: The 2 GHz band (''S-band'') from 2000–2020 MHz and 2180–2200 MHz, the Big LEO Band from 1610–1626.5 MHz and 2483.5–2500 MHz, and the L-band from 1525–1559 MHz and 1626.5–1660.5 MHz. 75 FR 49871 (August 16, 2010). Although the International Table of Allocations includes a primary Fixed and Mobile services allocation along with the primary Mobile-Satellite allocation in the S-band, such co-allocations do not exist in the U.S. Table. The Big LEO and L-bands are not allocated for Fixed and Mobile services either in the United States or on an international basis.

2. In addition, as noted in the *MSS NOI,* MSS has the capability to serve important needs, such as rural access and disaster recovery. 75 FR 49871 (August 16, 2010). MSS has the ability to provide communications to mobile

user terminals anywhere in the United States, including in remote areas where people are without basic telecommunications services. MSS is particularly well suited for meeting the needs of the transportation, petroleum, and other vital industries. MSS operators have the ability to operate when existing terrestrial infrastructure is non-existent or has been degraded or destroyed and therefore can meet public safety and emergency communication needs in times of national crises and natural disasters. For example, MSS satellite networks were utilized in the aftermath of the terrorist attacks of September 11, 2001, and during the hurricane season of 2005. MSS units provide interoperable connections between emergency responders and other communications networks, and can even link U.S. emergency response providers with counterparts in neighboring countries.

3. *Terrestrial Use of MSS Spectrum.* At present, use of these MSS bands for terrestrial mobile service is permitted only under the Commission's ATC rules and in association with the existing satellite system authority. The Commission adopted the ATC rules in 2003. ATC consists of terrestrial base stations and mobile terminals that re-use frequencies assigned for MSS operations. In the *MSS NPRM,* we noted that technological developments involving the use of MSS/ATC spectrum could soon lead to the provision of mobile broadband services similar to those provided by terrestrial mobile providers. In particular, we observed that SkyTerra (now LightSquared) plans to construct an integrated national satellite/terrestrial mobile broadband network, which would make use of both MSS spectrum and terrestrial spectrum that it has already leased in the secondary market, and that the services it would offer have the potential to expand services offered in the overall market of mobile terrestrial wireless services and to enhance competition in this larger mobile marketplace. In addition to LightSquared, three other MSS licensees have received ATC authority, although none of these currently has commercial terrestrial ATC stations in operation. We note that Globalstar's ATC authority has been suspended for failure to come into compliance with the ATC ''gating criteria'' as required pursuant to the temporary waiver granted in 2008.

4. *Secondary Market Policies and MSS Spectrum.* Currently, the Commission's secondary markets spectrum leasing framework, which applies to terrestrial Wireless Radio Services licenses, does not extend to ATC uses of MSS spectrum. In the *Secondary Markets First Report and Order* adopted in 2003, the Commission established policies and rules by which terrestrially-based Wireless Radio Service licensees could lease some or all of the spectrum usage rights associated with their licenses to third party spectrum lessees, which could then provide wireless services consistent with the underlying license authorization. 68 FR 66232 (November 25, 2003). The Commission provided for two different types of spectrum leasing arrangements for Wireless Radio Services: Spectrum manager leasing arrangements and *de facto* transfer leasing arrangements. Spectrum manager leasing arrangements require the licensee to maintain an active role in ensuring compliance with applicable Commission policies and rules but do not involve a transfer of *de facto* control under 47 U.S.C. 310(d), while *de facto* transfer leasing arrangements involve a transfer of *de facto* control and require Commission approval. In establishing these secondary market policies, the Commission sought to promote more efficient, innovative, and dynamic use of the spectrum, expand the scope of available wireless services and devices, enhance economic opportunities for accessing spectrum, promote competition among terrestrial wireless service providers, and eliminate regulatory uncertainty surrounding terrestrial spectrum leasing arrangements. At that time, however, the Commission decided not to extend these spectrum leasing policies and rules to satellite services. In particular, the Commission recognized that there already was a well-established set of policies and rules in effect for satellite-capacity transponder leasing, the kinds of leasing arrangements that were occurring in the context of satellite services. Satellite-capacity transponder leasing arrangements differ from spectrum leasing arrangements. Among other things, satellite-capacity transponder leasing does not involve the leasing of spectrum. Subsequently, the Commission extended the leasing framework to additional Wireless Radio Services and to Public Safety services, as well as to other terrestrial spectrum bands that became available.

5. More recently, as ATC services have begun to develop, the Commission has drawn guidance from the Wireless Radio Services secondary market leasing policies. In 2008, the Commission determined that its ATC policies specifically contemplated that MSS licensees could lease access to spectrum to third-party terrestrial providers so long as the requisite ATC gating requirements are met. Furthermore, the Commission found in one case that the particular ATC spectrum leasing arrangement at issue—which the parties had directly modeled on the requirements for spectrum manager leasing arrangements already available to terrestrial wireless services—was consistent with Commission policy, including the statutory requirement relating to transfers of control under 47 U.S.C. 310(d) that applied to Wireless Radio Services under the secondary market policies. Specifically, the Commission found that the leasing arrangement was consistent with a spectrum manager leasing arrangement under its spectrum leasing policies for Wireless Radio Services. Thus, even though the Commission did not adopt the terrestrial Wireless Radio Services spectrum leasing policies and rules for MSS/ATC spectrum leasing arrangements in a rulemaking context, it nonetheless applied the statutory interpretation relating to those policies and rules to the particular lease of MSS spectrum associated with an ATC authorization.

II. Discussion

A. Co-Primary Allocation of the MSS 2 GHz Band for Terrestrial and Fixed Services

6. As proposed in the *MSS NPRM,* we add Fixed and Mobile allocations to the 2000–2020 MHz and 2180–2200 MHz band. These allocations will be co-primary with the existing Mobile Satellite allocation. By adding these allocations to the band, we will be in a position to provide greater flexibility for use of this spectrum in the future. In addition, this change in allocation will bring our allocations for the band into harmony with the International Table of Allocations. We take no action on the proposal in the *MSS NPRM* that, in the event that a 2 GHz MSS license is returned or cancelled, the spectrum covered by the license should not be assigned to the remaining MSS licensee or made available to a new MSS licensee.

7. Our proposal to add Fixed and Mobile allocations to the 2 GHz MSS band received wide support from both satellite and terrestrial wireless licensees. Only Boeing opposed the proposal. Boeing argues that adding this allocation will undermine the ability of 2 GHz MSS licensees to provide service in rural areas, provide valuable service to public safety, and assist in disaster recovery. Boeing also points out that keeping MSS primary in the 2 GHz MSS band promotes the goal of international

harmonization with respect to satellite services. Boeing also claims that MSS networks provide the only means to create a next generation air traffic management (ATM) communication, navigation, and surveillance infrastructure. Boeing explains that it obtained a 2 GHz MSS license in 2001 with a goal of developing such a system but that economic conditions and other factors thwarted the plan. Boeing still believes that development of an ATM system is critical to the future of aviation.

8. We agree that MSS networks are a necessary and critical part of this nation's communications infrastructure, and serve an important role in meeting the needs of rural areas, the public safety community, and disaster recovery, but conclude that these needs can continue to be satisfied under the rules we adopt. MSS remains co-primary in the 2 GHz MSS band, which is consistent with international allocations. As we stated in the *MSS NPRM,* the addition of Fixed and Mobile allocations to the 2 GHz MSS band is merely a first step toward providing flexibility to allow greater use of the band for mobile broadband. The existing service rules that permit MSS and ATC operation in the band will not be altered solely by the addition of Fixed and Mobile allocations to the band. Both of the MSS licensees in the band will continue to operate under the terms of their existing licenses and must comply with all of the Commission's satellite and ATC rules. Furthermore, we are not altering the allocation for the Big LEO band or the L-band.

9. As to the development of an ATM system, we express no opinion as to the need for such a system, whether it should be satellite-based, or whether the 2 GHz band is a suitable location for it. As a practical matter, we note that Boeing has returned its 2 GHz MSS license. At the same time, there is evidence of exploding demand for spectrum for mobile broadband networks. Given all of the foregoing, we believe that adding Fixed and Mobile allocations to the 2 GHz MSS band will provide additional flexibility to meet this demand in the future and therefore is in the public interest.

10. We also modify three footnotes to the U.S. Table to be consistent with this change in allocation. Footnote US380 permits MSS operators to operate ATC in conjunction with MSS networks despite the fact that these bands have not been allocated for Fixed and Mobile uses. Because we have now added Fixed and Mobile allocations to the 2000–2020 MHz and 2180–2200 MHz band, US380 is no longer needed for this band. We amend footnote US380 to remove this band while keeping US380 in place for the MSS Big LEO and L-bands. Two footnotes, NG156 and NG168 permit certain Broadcast Auxiliary Service (BAS) and Fixed Service (FS) licensees, respectively, to continue to operate on a primary basis until December 9, 2013 (the sunset date for the band). Because the relocation of the BAS incumbents out of the 2000–2020 MHz band has been completed, footnote NG156 which addresses the status of the BAS incumbents is no longer needed. Therefore, we remove footnote NG156 from the U.S. Allocation Table. We amend footnote NG168 to clarify that existing Fixed and Mobile operations in the 2180–2200 MHz band (*i.e.* the pre-existing FS licensees) shall become secondary after the band sunset date while ATC operations by MSS will continue to be permitted on a primary basis after the sunset date.

11. In sum, we find that adding co-primary Fixed and Mobile allocations along with the MSS allocation in the 2 GHz band serves the public interest. Our actions bring the allocations into harmony with the international allocations. We also lay the foundation for more flexible use of the band in the future, thereby promoting investment in the development of new services and additional innovative technologies. In adding these co-primary allocations and in applying certain secondary market spectrum leasing rules to ATC leasing arrangements we have not altered in any way the existing ATC service rules and policies that the Commission previously adopted to guard against harmful interference. Furthermore, we conclude that adding co-primary Fixed and Mobile allocations in this band will not result in harmful interference, and would not inevitably lead to uses that would result in harmful interference. Finally, having added co-primary Fixed and Mobile allocations to the 2 GHz band, we anticipate issuing a notice of proposed rulemaking on subjects raised in the *MSS NOI,* including possible service rule changes that could increase investment and utilization of the band in a manner that further serves the public interest. We expect the staff will take advantage of industry technical expertise as it develops options, which may include potential synergies with neighboring bands, to inform our decision making process going forward.

B. Applying Terrestrial Secondary Market Spectrum Leasing Policies to ATC Spectrum Leasing Arrangements

12. As proposed in the *MSS NPRM,* we extend the Commission's general secondary market spectrum leasing policies, procedures, and rules to ATC spectrum leasing arrangements. As we discussed in the *MSS NPRM,* recent and planned near-term developments in the use of MSS spectrum for the provision of terrestrial services are increasing the potential that these services will become sufficiently similar to the services offered in the overall market of mobile terrestrial wireless services to enhance competition in this larger mobile marketplace. Accordingly, we find that a common set of policies, procedures, and rules—where consistent with ATC policies and rules—will promote greater consistency, regulatory parity, predictability, and transparency with respect to spectrum leasing arrangements involving terrestrially-based mobile service offerings.

13. The record contains widespread support for this action. Indeed, every commenter that addressed the issue supported the extension of the general secondary markets spectrum leasing rules and policies to ATC. For example, the Telecommunications Industry Association asserts that applying the Commission's secondary market rules and policies to ATC will encourage innovative arrangements and partnerships that will speed the development and deployment of wireless broadband to rural and other areas. Additionally, Inmarsat states that spectrum leasing arrangements would facilitate the ability of MSS operators to deploy ATC, which would increase the availability of terrestrial broadband services and advance the public interest. Echostar notes that ''efficient secondary markets * * * promote spectrum efficiency and create opportunities to maximize use of spectrum for mobile broadband services.'' We agree that applying these spectrum leasing policies and rules will help facilitate efficient and innovative new arrangements for using spectrum, including in both urban and rural areas. Moreover, commenters assert that by extending these spectrum leasing policies, the Commission would establish regulatory predictability and parity between similarly situated services.

14. *Spectrum Manager Leasing Arrangements.* Consistent with the Commission's ATC policies and rules, and the ancillary nature of ATC, we determine that MSS licensees and spectrum lessees may only enter into spectrum manager leasing arrangements. As discussed in the *MSS NPRM,* the Commission established several ''gating criteria'' that MSS operators must meet in order to be authorized to operate ATC stations. At their core, these gating criteria require the MSS licensee to provide substantial satellite service, as

well as an integrated satellite/terrestrial service. We conclude that ATC spectrum manager leasing arrangements, which would require the MSS licensee to maintain an active role in ensuring compliance with all of these requirements, are the best means of ensuring that terrestrial leasing arrangements in MSS spectrum remains consistent with the underlying ATC policies and rules. We believe that the spectrum manager leasing rules will enable significant flexibility for the provision of terrestrial mobile broadband as part of an MSS/ATC service offering.

15. Under a spectrum manager leasing arrangement, the MSS licensee retains *de facto* control of the MSS spectrum at all times, remaining primarily responsible for ensuring compliance with the underlying ATC requirements (including the underlying authorization) as well as for the spectrum lessee's compliance with those requirements. This responsibility includes maintaining reasonable operational oversight over the leased spectrum so as to ensure that each lessee complies with all applicable technical and service rules, including frequency coordination requirements and resolution of interference-related matters. Permitting only spectrum manager leasing arrangements ensures that the MSS licensee retains primary responsibility for MSS, including the provision of substantial satellite service (including all gating criteria) as well as the coordination of any terrestrial use with satellite use so that the terrestrial use is consistent with the MSS service and interference rules. Requiring spectrum manager leasing arrangements also address the concerns, expressed by Inmarsat, that the MSS licensee should retain ultimate control over the use of MSS spectrum in order to enhance its ability to coordinate operations and avoid harmful interference.

16. *De facto* transfer leasing arrangements, in contrast, would effectively transfer primary responsibilities for meeting these obligations to the spectrum lessee(s), which are not in a position to meet many of the underlying obligations of the MSS license, such as meeting the gating criteria obligations to provide substantial satellite service and to provide integrated mobile satellite/terrestrial service. Transferring *de facto* control over the use of the spectrum to a spectrum lessee also could sever the relationship between the provision of the satellite and the terrestrial service. We are not persuaded by the commenters that assert generally that we should permit MSS licensees to enter into *de facto* transfer leasing arrangements, but do not address how such arrangements would be fully consistent with the ATC gating criteria.

17. We also will apply the general policies and rules that pertain to the spectrum manager leasing arrangements, as set forth in the Commission's secondary market policies and rules. Accordingly, we agree with TerreStar that an MSS licensee may lease spectrum for ATC use in varying amounts and in any geographic area or at any site encompassed by the license when entering into a spectrum manager leasing arrangement.

18. *Notification procedures.* MSS licensees and potential spectrum lessees seeking to enter into spectrum manager leasing arrangements will be required to file the same information and certifications as required under the Commission's rules for Wireless Radio Service. As proposed in the *MSS NPRM,* we will require that leasing parties submit specified information and certifications (including information about the parties, the amount and geographic location of the spectrum involved, and other overlapping terrestrial-use spectrum holdings of the parties) to the Commission in advance of any operations that would be permitted pursuant to the proposed transaction. As is required with respect to a spectrum leasing arrangement involving Wireless Radio Services, each party to a proposed ATC spectrum manager leasing arrangement must have correct and up-to-date ownership information on file with the Commission (using FCC Form 602) as of the date that the notification of the spectrum manager leasing arrangement is filed.

19. As with spectrum manager leasing arrangements involving Wireless Radio Services, to the extent a proposed ATC spectrum manager leasing arrangement does not raise potential public interest concerns, the transaction would be subject to immediate processing, whereas to the extent potential public interest concerns were raised (*e.g.,* potential competitive harms, as discussed below, or foreign ownership concerns) the transaction would be subject to streamlined procedures as the Commission evaluated whether the public interest would be served by the proposed transaction. We hereby delegate to the Wireless Telecommunications Bureau (WTB) and the International Bureau (IB) the authority to resolve implementation and administrative issues relating to these notification requirements, which will include revisions to FCC Form 608 and the Commission's Universal Licensing System (ULS).

20. *Potential competitive concerns.* Assessing potential competitive effects of proposed secondary market transactions is an important element of the Commission's policies to promote competition and guard against the harmful effects of anticompetitive behavior. As the Commission recognized in the *Secondary Markets First Report and Order,* spectrum leasing arrangements potentially raise competitive concerns, and the Commission applied its general competition policies for terrestrially-based mobile services to these arrangements. Specifically, the Commission observed that it may consider the use of leased spectrum as a relevant factor when examining marketplace competition. In assessing the potential competitive effects of spectrum leasing arrangements, the Commission stated that it would determine, based on a case-by-case review of all relevant factors, whether services provided over both leased and licensed spectrum in specific product and geographic markets should be taken into account.

21. We conclude that spectrum leasing arrangements involving ATC also potentially raise competitive concerns, as several commenters assert. As we discussed above, technological advances will enable MSS licensees and their spectrum lessees to use ATC authority to provide mobile services similar to those provided by terrestrial mobile providers. While we recognize that in the past the Commission has not viewed MSS as a substitute for terrestrial mobile services, we have recently observed that the mobile satellite service industry currently is undergoing major technological advances and structural changes. In particular, we note that several MSS providers have, at various times, articulated their plans to offer high-speed data services, especially in connection with terrestrial networks using their ATC authority, and that such services in the future could affect, and potentially enhance, competition in the provision of terrestrial mobile services. Spectrum lessees using ATC therefore appear increasingly likely to provide services that could affect competition in the mobile telephony/broadband services product market. Accordingly, to the extent that we determine that particular ATC spectrum leasing arrangements can be used to provide such services, the procedures we will adopt allow us to assess these arrangements in the context of our existing competitive analysis framework

for mobile telephony/broadband services, consistent with our general authority to ensure that the public interest would be served by proposed transactions. We note that these procedures also enable us to assess each proposed spectrum manager leasing arrangement to determine whether any other type of competitive issue might arise in the context of the MSS/ATC transaction, such as leasing arrangements between different MSS operators.

22. *Existing ATC spectrum leasing arrangements.* We conclude that MSS licensees and ATC lessees must conform any existing spectrum leasing arrangement to the spectrum leasing policies adopted in this *Report and Order.* We note that providing this information and submitting the notification is consistent with the Commission's approach when it first evaluated an MSS/ATC spectrum leasing arrangement, as discussed above. We direct parties to submit notification to the Commission of any existing MSS/ATC spectrum leasing arrangements no later than thirty (30) days of the effective date of this *Report and Order.* This would include any spectrum leasing arrangement that parties may seek to enter prior to the effective date of the rules adopted herein.

23. *U.S. GPS Industry Council's Request.* In its comments, the U.S. GPS Industry Council expresses concern about the need to protect the Radionavigation-Satellite Service (RNSS) operating in the 1559–1610 MHz band, including the Global Positioning System (GPS), from interference from terrestrial operations in the MSS bands. The U.S. GPS Industry Council is concerned that applying existing secondary market rules to the use of MSS spectrum could lead to denser deployment of terrestrial services using MSS spectrum, which in turn would increase the probability of harmful interference to GPS. It also requests that the Commission codify the technical operating parameters applicable to MSS licensees under their respective ATC authorizations to ensure greater clarity and certainty about the interference rules applicable to secondary market arrangements. The U.S. GPS Industry Council expresses particular concern about potential interference to GPS that could result from adjacent terrestrial operations by an MSS L-band operator (LightSquared Subsidiary LLC). The National Telecommunications and Information Administration (NTIA) also has expressed concern about the potential for adverse impact of ATC operations in the L-band on GPS and other Global Navigation Satellite System (GNSS) receivers.

24. The addition of co-primary Fixed and Mobile allocations to the MSS 2 GHz band and the secondary market policies and rules that we adopt herein do not in any way change the obligations that attach to each MSS licensee to comply with the applicable technical and operational rules for ATC operations pursuant to its license. Under the spectrum manager leasing arrangements that we are permitting, the MSS licensee continues to have primary responsibility for ensuring compliance of any terrestrial operations with the obligations associated with its authorization, and each spectrum lessee would be obligated to ensure its operations comply with the particular technical and operational requirements applicable to the MSS licensee from which it is leasing spectrum.

25. To the extent that potential interference concerns arise with respect to MSS/ATC operations in particular MSS bands, concerns will be addressed on a licensee and band-specific basis. We note that, as regards the interference concerns raised by the U.S. GPS Industry Council and NTIA about LightSquared's operations in the MSS L-band, LightSquared is working with the GPS community by establishing a technical working group to fully study the potential for harmful interference from its base station operations in the MSS L-band spectrum to GPS receivers in the adjacent 1559–1610 MHz band and to identify measures necessary to prevent harmful interference to GPS. Pursuant to the January 26, 2011 *LightSquared Waiver Order,* LightSquared cannot commence offering a commercial terrestrial service on its MSS L-band frequencies until the Commission, after consultation with NTIA, concludes that the harmful interference concerns have been resolved.

26. We emphasize that responsibility for protecting services rests not only on new entrants but also on incumbent users themselves, who must use receivers that reasonably discriminate against reception of signals outside their allocated spectrum. In the case of GPS, we note that extensive terrestrial operations have been anticipated in the L-band for at least 8 years. We are, of course, committed to preventing harmful interference to GPS and we will look closely at additional measures that may be required to achieve efficient use of the spectrum, including the possibility of establishing receiver standards relative to the ability to reject interference from signals outside their allocated spectrum.

27. *Foreign Ownership.* T-Mobile requests that, in applying the Commission's secondary markets spectrum leasing rules and policies to ATC, we extend the availability of the immediate processing/approval procedures to prospective lessees with indirect foreign ownership exceeding 25 percent, if that ownership has previously been approved by the Commission. We decline to revisit this issue here. T-Mobile's request is a reiteration of similar previous requests, including requests made in the Commission's earlier wireless secondary markets proceeding, which the Commission has denied. This Report and Order neither re-examines the wireless secondary market rules and policies generally nor establishes independent ATC secondary market rules and policies.

III. Procedural Matters

28. *Paperwork Reduction Analysis:* This document does not contain proposed information collection requirements subject to the Paperwork Reduction Act of 1995, Public Law 104–13. In addition, therefore, it does not contain any proposed information collection burden ''for small business concerns with fewer than 25 employees,'' pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107–198, *see* 44 U.S.C. 3506(c)(4).

IV. Final Regulatory Flexibility Analysis

29. As required by the Regulatory Flexibility Act of 1980, as amended (RFA), an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525–1559 MHz and 1626.5–1660.5 MHz, 1610–1626.5 MHz and 2483.5–2500 MHz, and 2000–2020 MHz and 2180 MHz *Notice of Proposed Rulemaking and Notice of Inquiry (Notice).* 75 FR 49871 (August 16, 2010). The Commission sought written public comment on the proposals in the Notice, including comment on the IRFA. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.

A. Need for, and Objectives of, the Report and Order

30. This *Report and Order* continues the Commission's efforts to enhance competition and speed the deployment of terrestrial mobile broadband. While ensuring the United States maintains robust mobile satellite service capabilities, in the *Report and Order* the Commission takes steps to make additional spectrum available for new

investment in terrestrial mobile broadband networks.

31. The *Report and Order* takes two actions. First, we add co-primary Fixed and Mobile allocations to the Table of Frequency Allocations for the 2 GHz band, consistent with the International Table of Allocations. Under this allocation, Fixed and Mobile services will have equal status to MSS. This allocation modification is a precondition for more flexible licensing of terrestrial services within the band and lays the groundwork for providing additional flexibility in use of the 2 GHz spectrum in the future. The *Report and Order* does not change the status of the existing MSS licensees nor grant authority for terrestrial operations in the band beyond what is currently permitted under the ATC rules.

32. Second, the Report and Order applies the Commission's secondary markets policies and rules applicable to terrestrial wireless radio services to spectrum leasing arrangements involving the use of MSS bands for terrestrial services. Specifically, the Report and Order specifies requirements for licensees entering into spectrum manager leasing arrangements involving ATC, which will increase competition, improve spectrum efficiency, and allow small entities greater access to spectrum.

B. Summary of Significant Issues Raised by Public Comments in Response to the IRFA

33. There were no comments filed that specifically addressed the rules and policies presented in the IRFA.

C. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply

34. The RFA directs agencies to provide a description of, and, where feasible, an estimate of the number of small entities that may be affected by the rules and policies adopted herein. The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction." In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act. A "small business concern" is one which: (1) Is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.

35. *Satellite Telecommunications and All Other Telecommunications.* Two economic census categories address the satellite industry. The first category has a small business size standard of $15 million or less in average annual receipts, under SBA rules. The second has a size standard of $25 million or less in annual receipts.

36. The category of Satellite Telecommunications "comprises establishments primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or reselling satellite telecommunications." Census Bureau data for 2007 show that 512 Satellite Telecommunications firms operated for that entire year. Of this total, 464 firms had annual receipts of under $10 million, and 18 firms had receipts of $10 million to $24,999,999. Consequently, the Commission estimates that the majority of Satellite Telecommunications firms are small entities that might be affected by our action.

37. The second category, *i.e.* "All Other Telecommunications" comprises "establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation. This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems. Establishments providing Internet services or voice over Internet protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry." For this category, Census Bureau data for 2007 show that there were a total of 2,383 firms that operated for the entire year. Of this total, 2,347 firms had annual receipts of under $25 million and 12 firms had annual receipts of $25 million to $49,999,999. Consequently, the Commission estimates that the majority of All Other Telecommunications firms are small entities that might be affected by our action.

38. *Mobile Satellite Service Carriers.* Neither the Commission nor the U.S. Small Business Administration has developed a small business size standard specifically for mobile satellite service licensees. The appropriate size standard is therefore the SBA standard for Satellite Telecommunications, which provides that such entities are small if they have $15 million or less in annual revenues. Currently, the Commission's records show that there are 31 entities authorized to provide voice and data MSS in the United States. The Commission does not have sufficient information to determine which, if any, of these parties are small entities. The Commission notes that small businesses are not likely to have the financial ability to become MSS system operators because of high implementation costs, including construction of satellite space stations and rocket launch, associated with satellite systems and services. Nonetheless, it might be possible that some are small entities affected by this *Report and Order* and therefore we include them in this section of the FRFA.

39. *Wireless Telecommunications Carriers (except satellite).* The *Report and Order* applies the Commission's secondary market policies and rules to terrestrial service in the MSS bands. We cannot predict who may in the future lease spectrum for terrestrial use in these bands. In general, any wireless telecommunications provider would be eligible to lease spectrum from the MSS licensees. Since 2007, the SBA has recognized wireless firms within this new, broad, economic census category. Prior to that time, such firms were within the now-superseded categories of Paging and Cellular and Other Wireless Telecommunications. Under the present and prior categories, the SBA has deemed a wireless business to be small if it has 1,500 or fewer employees. For this category, census data for 2007 show that there were 1,383 firms that operated for the entire year. Of this total, 1,368 firms had employment of 999 or fewer employees and 15 had employment of 1000 employees or more. Similarly, according to Commission data, 413 carriers reported that they were engaged in the provision of wireless telephony, including cellular service, Personal Communications Service (PCS), and Specialized Mobile Radio (SMR) Telephony services. Of these, an estimated 261 have 1,500 or fewer employees and 152 have more than 1,500 employees. Consequently, the Commission estimates that approximately half or more of these firms can be considered small. Thus, using available data, we estimate that the majority of wireless firms can be considered small.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities

40. This Report and Order applies the Commission's secondary markets policies and rules applicable to terrestrial wireless services to spectrum management leasing transactions

involving the use of MSS bands for terrestrial wireless services. Leasing parties will be required to submit specified information and certifications (including information about the parties, the amount and geographic location of the spectrum involved, and other overlapping terrestrial-use spectrum holdings of the parties) to the Commission in advance of any operations that would be permitted pursuant to the proposed transaction. These changes affect small and large companies equally. To give these rules any meaning, this information must be generated by small and large entities alike. Otherwise, wireless service providers seeking to lease MSS/ATC spectrum would not have all of the information available to make educated leasing agreements.

E. Steps Taken To Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

41. The RFA requires an agency to describe any significant alternatives that it has considered in developing its approach, which may include the following four alternatives (among others): ''(1) The establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities; (3) the use of performance rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof, for such small entities.'' 5 U.S.C. 603(c)(1)–(c)(4).

42. In the *Report and Order,* we add Fixed and Mobile allocations to the 2000–2020 MHz and 2180–2200 MHz bands. By adding these allocations to the band, we will be in a position to provide greater flexibility for use of this spectrum in the future, which may provide small entities with greater opportunity to lease spectrum. Only one party, Boeing, opposed the proposal, arguing the allocation will undermine the ability of 2 GHz MSS to provide service in rural areas, provide valuable service to public safety, and assist in disaster recovery. Boeing also suggested that keeping MSS primary in the 2 GHz MSS band promotes the goal of international harmonization with respect to satellite services. Boeing also claimed that MSS networks provide the only means to create a next generation air traffic management (ATM) communication, navigation, and surveillance infrastructure. We agree with Boeing that MSS has an important role in meeting the needs or rural areas, the public safety community, and disaster recovery, but conclude that these needs can continue to be satisfied under the rules we adopt. Furthermore, we do not think it prudent to limit future flexible use of the 2 GHz band based on speculation that an ATM communication system may be developed in the band at some unspecified date, particularly in light of evidence of exploding demand for spectrum for mobile broadband networks. We believe that adding Fixed and Mobile allocations to the 2 GHz MSS band will provide additional flexibility to meet this demand in the future and therefore is in the public interest.

43. In the *Report and Order,* we take steps that may affect small entities that provide specific information pursuant to the Commission's secondary market leasing rules and policies. The requirements we adopt will require parties to an MSS/ATC spectrum leasing arrangement to file the same type of notification information that other parties to current spectrum leases must file. MSS licensees that propose to enter into MSS/ATC spectrum manager leasing arrangements must file the FCC Form 608. Additionally, all parties to such a proposed spectrum manager leasing arrangement must submit an FCC Form 602, which details ownership information, to the extent that a current version of this form is not already on file with the Commission. The extension of secondary markets rules and policies to MSS/ATC spectrum will promote competition in wireless terrestrial broadband and will benefit small entities in their efforts to compete against other wireless service providers, both large and small, in the provision of wireless broadband services. We believe that, on balance, the benefits to small entities of our actions in the *Report and Order* far outweigh any burdens this order places on small entities.

44. The record makes clear that broad support exists for extending the Commission's secondary markets rules and policies to MSS/ATC spectrum. Our actions in the *Report and Order* should benefit wireless broadband service providers seeking additional terrestrial spectrum, many of which may be small entities, by providing access to an increased amount of spectrum. Our actions benefit the public interest by promoting competition, innovation, and investment.

45. In extending the Commission's secondary markets rules and policies to MSS/ATC spectrum, we limit that extension to spectrum manager spectrum leasing arrangements. While several parties recommend we allow both spectrum manager and *de facto* transfer spectrum leasing arrangements, we reject those arguments. *De facto* transfer leasing arrangements would effectively transfer primary responsibilities for meeting the obligations of the MSS licensee to the spectrum lessee(s), which are not in a position to meet many of the underlying obligations of the MSS license authorization, such as meeting the gating criteria obligations to provide substantial satellite service and to provide integrated mobile satellite/terrestrial service. Transferring *de facto* control over the use of the spectrum to a spectrum lessee also could sever the relationship between the provision of the satellite and terrestrial service. Thus, we do not extend *de facto* transfer spectrum leasing arrangements to the MSS/ATC spectrum.

V. Report to Congress

46. The Commission will send a copy of the *Report and Order,* including this FRFA, in a report to be sent to Congress pursuant to the Congressional Review Act. In addition, the Commission will send a copy of the *Report and Order,* including this FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the *Report and Order* and the FRFA (or summaries thereof) will also be published in the **Federal Register.**

VI. Ordering Clauses

47. Accordingly, it is ordered, that pursuant to sections 1, 4(i) and (j), 301, 303, and 310 of the Communications Act of 1934, as amended, 47 U.S.C. 151, 154(i), 154(j), 301, 303, and 310, this *Report and Order* is adopted.

48. It is further ordered, that pursuant to the authority contained in sections 1, 4(i) and (j), 301, 303, and 310 of the Communications Act of 1934, as amended, 47 U.S.C. 151, 154(i), 154(j), 301, 303, and 310, the Commission's rules are amended.

49. It is further ordered that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, shall send a copy of this *Report and Order,* including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

50. It is further ordered that the Commission shall send a copy of this *Report and Order* in a report to be sent to Congress and the General Accounting Office pursuant to the Congressional Review Act, *see* 5 U.S.C. 801(a)(1)(A).

List of Subjects

47 CFR Parts 1 and 25

Administrative practice and procedure, Communications common carriers, Radio, Reporting and recordkeeping requirements, Satellites, Telecommunications.

47 CFR Part 2

Communications equipment, Disaster assistance, Radio, Reporting and recordkeeping requirements, Telecommunications.

Federal Communications Commission.

Marlene H. Dortch,

Secretary.

For the reasons discussed in the preamble, the Federal Communications Commission amends 47 CFR parts 1, 2, and 25 as follows:

PART 1—PRACTICE AND PROCEDURE

■ 1. The authority citation for part 1 continues to read as follows:

Authority: 15 U.S.C. 79 *et seq.;* 47 U.S.C. 151, 154(i), 154(j), 155, 157, 225, 303(r), and 309.

■ 2. Section 1.9001 is amended by revising paragraph (a) to read as follows:

§ 1.9001 Purpose and scope.

(a) The purpose of part 1, subpart X is to implement policies and rules pertaining to spectrum leasing arrangements between licensees in the services identified in this subpart and spectrum lessees. This subpart also implements policies for private commons arrangements. These policies and rules also implicate other Commission rule parts, including parts 1, 2, 20, 22, 24, 25, 26, 27, 80, 90, 95, and 101 of title 47, chapter I of the Code of Federal Regulations.

* * * * *

■ 3. Section 1.9005 is amended by revising the introductory text and by adding paragraph (jj) to read as follows:

§ 1.9005 Included services.

The spectrum leasing policies and rules of this subpart apply to the following services, which include Wireless Radio Services in which commercial or private licensees hold exclusive use rights and the Ancillary Terrestrial Component (ATC) of a Mobile Satellite Service:

* * * * *

(jj) The ATC of a Mobile Satellite Service (part 25 of this chapter).

■ 4. Section 1.9020 is amended by revising paragraphs (d)(2)(i) and (e)(2)(i)(A) to read as follows:

§ 1.9020 Spectrum manager leasing arrangements.

* * * * *

(d) * * *

(2) * * *

(i) The spectrum lessee must meet the same eligibility and qualification requirements that are applicable to the licensee under its license authorization, with the following exceptions. A spectrum lessee entering into a spectrum leasing arrangement involving a licensee in the Educational Broadband Service (*see* § 27.1201 of this chapter) is not required to comply with the eligibility requirements pertaining to such a licensee so long as the spectrum lessee meets the other eligibility and qualification requirements applicable to 47 CFR part 27 services (*see* § 27.12 of this chapter). A spectrum lessee entering into a spectrum leasing arrangement involving a licensee in the Public Safety Radio Services (*see* part 90, subpart B and § 90.311(a)(1)(i) of this chapter) is not required to comply with the eligibility requirements pertaining to such a licensee so long as the spectrum lessee is an entity providing communications in support of public safety operations (*see* § 90.523(b) of this chapter). A spectrum lessee entering into a spectrum leasing arrangement involving a licensee in the Mobile Satellite Service with ATC authority (see part 25) is not required to comply with the eligibility requirements pertaining to such a licensee so long as the spectrum lessee meets the other eligibility and qualification requirements of paragraphs (d)(2)(ii) and (d)(2)(iv) of this section.

* * * * *

(e) * * *

(2) * * *

(i) * * *

(A) The license does not involve spectrum that may be used to provide interconnected mobile voice and/or data services under the applicable service rules and that would, if the spectrum leasing arrangement were consummated, create a geographic overlap with spectrum in any licensed Wireless Radio Service (including the same service), or in the ATC of a Mobile Satellite Service, in which the proposed spectrum lessee already holds a direct or indirect interest of 10% or more (*see* § 1.2112), either as a licensee or a spectrum lessee, and that could be used by the spectrum lessee to provide interconnected mobile voice and/or data services;

* * * * *

■ 5. Add § 1.9049 to read as follows:

§ 1.9049 Special Provisions relating to spectrum leasing arrangements involving the Ancillary Terrestrial Component of Mobile Satellite Services.

(a) A license issued under part 25 of the Commission's rules that provides authority for an ATC will be considered to provide ''exclusive use rights'' for purpose of this subpart of the rules.

(b) For the purpose of this subpart, a Mobile Satellite Service licensee with an ATC authorization may enter into a spectrum manager leasing arrangement with a spectrum lessee (*see* § 1.9020). Notwithstanding the provisions of §§ 1.9030 and 1.9035, a MSS licensee is not permitted to enter into a *de facto* transfer leasing arrangement with a spectrum lessee.

(c) For purposes of § 1.9020(d)(8), the Mobile Satellite Service licensee's obligation, if any, concerning the E911 requirements in § 20.18 of this chapter, will, with respect to an ATC, be specified in the licensing document for the ATC.

(d) The following provision shall apply, in lieu of § 1.9020(m), with respect to spectrum leasing of an ATC:

(1) Although the term of a spectrum manager leasing arrangement may not be longer than the term of the ATC license, a licensee and spectrum lessee that have entered into an arrangement, the term of which continues to the end of the current term of the license may, contingent on the Commission's grant of a modification or renewal of the license to extend the license term, extend the spectrum leasing arrangement into the new license term. The Commission must be notified of the extension of the spectrum leasing arrangement at the same time that the licensee submits the application seeking an extended license term. In the event the parties to the arrangement agree to extend it into the new license term, the spectrum lessee may continue to operate consistent with the terms and conditions of the expired license, without further action by the Commission, until such time as the Commission makes a final determination with respect to the extension or renewal of the license.

(2) Reserved.

PART 2—FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

■ 6. The authority citation for part 2 continues to read as follows:

Authority: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

■ 7. Section 2.106, the Table of Frequency Allocations, is amended as follows:

■ a. Page 36 is revised.

■ b. In the list of United States (US) Footnotes, footnote US380 is revised.

■ c. In the list of non-Federal Government (NG) Footnotes, footnote NG156 is removed and footnote NG168 is revised.

The revisions read as follows:

§ 2.106 Table of Frequency Allocations.

* * * * *

1980-2010 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.351A 5.388 5.389A 5.389B 5.389F			1980-2025	NG177	
				2000-2020 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space)	Satellite Communications (25)
2010-2025 FIXED MOBILE 5.388A 5.388B 5.388	2010-2025 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.388 5.389C 5.389E	2010-2025 FIXED MOBILE 5.388A 5.388B 5.388		2020-2025 FIXED MOBILE NG177	
2025-2110 SPACE OPERATION (Earth-to-space) (space-to-space) EARTH EXPLORATION-SATELLITE (Earth-to-space) (space-to-space) FIXED MOBILE 5.391 SPACE RESEARCH (Earth-to-space) (space-to-space) 5.392			2025-2110 SPACE OPERATION (Earth-to-space) (space-to-space) EARTH EXPLORATION-SATELLITE (Earth-to-space) (space-to-space) SPACE RESEARCH (Earth-to-space) (space-to-space) 5.391 5.392 US90 US222 US346 US347 US393	2025-2110 FIXED NG118 MOBILE 5.391 5.392 US90 US222 US346 US347 US393	TV Auxiliary Broadcasting (74F) Cable TV Relay (78) Local TV Transmission (101J)
2110-2120 FIXED MOBILE 5.388A 5.388B SPACE RESEARCH (deep space) (Earth-to-space) 5.388			2110-2120 US252	2110-2120 FIXED MOBILE US252	Public Mobile (22) Wireless Communications (27) Fixed Microwave (101)
2120-2170 FIXED MOBILE 5.388A 5.388B 5.388	2120-2160 FIXED MOBILE 5.388A 5.388B Mobile-satellite (space-to-Earth) 5.388	2120-2170 FIXED MOBILE 5.388A 5.388B 5.388	2120-2200	2120-2180 FIXED MOBILE NG153 NG178	
	2160-2170 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.388 5.389C 5.389E				
2170-2200 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A 5.388 5.389A 5.389F				2180-2200 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) NG168	Satellite Communications (25) Page 36

* * * * *

United States (US) Footnotes

* * * * *

US380 In the bands 1525–1544 MHz, 1545–1559 MHz, 1610–1645.5 MHz, 1646.5–1660.5 MHz, and 2483.5–2500 MHz, a non-Federal licensee in the mobile-satellite service (MSS) may also operate an ancillary terrestrial component in conjunction with its MSS network, subject to the Commission's rules for ancillary terrestrial component and subject to all applicable conditions and provisions of its MSS authorization.

* * * * *

Non-Federal Government (NG) Footnotes

* * * * *

NG168 Except as permitted below, the use of the 2180–2200 MHz band is limited to the MSS and ancillary terrestrial component offered in conjunction with an MSS network, subject to the Commission's rules for ancillary terrestrial components and subject to all applicable conditions and provisions of an MSS authorization. In the 2180–2200 MHz band, where the receipt date of the initial application for facilities in the fixed and mobile services was prior to January 16, 1992, said facilities shall operate on a primary basis and all later-applied-for facilities shall operate on a secondary basis to the mobile-satellite service (MSS); and not later than December 9, 2013, all such facilities shall operate on a secondary basis.

* * * * *

PART 25—SATELLITE COMMUNICATIONS

■ 8. The authority citation for part 25 continues to read as follows:

Authority: 47 U.S.C. 701–744. Interprets or applies sections 4, 301, 302, 303, 307, 309 and 332 of the Communications Act, as amended, 47 U.S.C. Sections 154, 301, 302, 303, 307, 309 and 332, unless otherwise noted.

■ 9. Section 25.149 is amended by adding paragraph (g) to read as follows:

§ 25.149 Application requirements for ancillary terrestrial components in the mobile-satellite service networks operating in the 1.5./1.6 GHz, 1.6/2.4 GHz and 2 GHz mobile-satellite service.

* * * * *

(g) *Spectrum leasing.* Leasing of spectrum rights by MSS licensees or system operators to spectrum lessees for ATC use is subject to the rules for spectrum manager leasing arrangements (*see* § 1.9020) as set forth in part 1, subpart X of the rules (*see* § 1.9001 *et seq.*). In addition, at the time of the filing of the requisite notification of a spectrum manager leasing arrangement using Form 608 (*see* §§ 1.9020(e) and 1.913(a)(5)), both parties to the proposed arrangement must have a complete and accurate Form 602 (*see* § 1.913(a)(2)) on file with the Commission.

[FR Doc. 2011–13379 Filed 5–27–11; 8:45 am]

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FEDERAL COMMUNICATIONS COMMISSION

47 CFR Part 25

[IB Docket No. 95–91; FCC 10–82]

Establishment of Rules and Policies for the Satellite Digital Audio Radio Service in the 2310–2360 MHz Frequency Band

AGENCY: Federal Communications Commission.

ACTION: Final rules; announcement of effective date.

SUMMARY: In this document, the Commission announces that the Office of Management and Budget (OMB) has approved, for a period of three years, the information collection requirements contained in the Satellite Digital Audio Radio Service (SDARS) Second Report and Order. The information collection requirements were approved on July 5, 2011 by OMB.

DATES: The amendments to 47 CFR 25.144(e)(3), 25.144(e)(8), 25.144(e)(9), 25.263(b) and 25.263(c), published at 75 FR 45058, August 2, 2010, are effective on September 19, 2011.

FOR FURTHER INFORMATION CONTACT: For additional information contact Cathy Williams on (202) 418–2918 or via e-mail to: *cathy.williams@fcc.gov.*

SUPPLEMENTARY INFORMATION: This document announces that on July 5, 2011 OMB approved, for a period of three years, the information collection requirements contained in 47 CFR 25.144 and 25.263. The Commission publishes this document to announce the effective date of these rule sections. *See* Satellite Digital Audio Radio Service (SDARS) Second Report and Order (FCC 10–82; IB Docket No. 95–91), 75 FR 45058, August 2, 2010.

Synopsis

As required by the Paperwork Reduction Act of 1995, (44 U.S.C. 3507), the Commission is notifying the public that it received OMB approval on July 5, 2011, for the information collection requirement contained in 47 CFR 25.144 and 25.263. Under 5 CFR part 1320, an agency may not conduct or sponsor a collection of information unless it displays a current, valid OMB Control Number.

No person shall be subject to any penalty for failing to comply with a collection of information subject to the Paperwork Reduction Act that does not display a valid OMB Control Number.

The OMB Control Number is 3060–1153 and the total annual reporting burdens for respondents for this information collection are as follows:

Title: Satellite Digital Audio Radio Service (SDARS).

Form Number: Not applicable.

Type of Review: New collection.

OMB Control Number: 3060–1153.

OMB Approval Date: 07/05/2011.

OMB Expiration Date: 07/31/2014.

Respondents: Business or other for-profit entities.

Number of Respondents: 1 respondent; 74 responses.

Estimated Time per Response: 4–12 hours

Frequency of Response: On occasion filing requirement, recordkeeping requirement and third party disclosure requirement.

Obligation to Respond: The information collection requirements accounted for in this collection are necessary to determine the technical and legal qualifications of SDARS applicants or licensees to operate a station, transfer or assign a license, and to determine whether the authorization is in the public interest, convenience, and necessity. The statutory authority for this information collection is contained in Sections 4, 301, 302, 303, 307, 309 and 332 of the Communications Act, as amended, and 47 U.S.C. 154, 301, 302a, 303, 307, 309, and 332.

Total Annual Burden: 400 hours.

Annual Cost Burden: $171,320.

Privacy Act Impact Assessment: No impact(s).

Nature and Extent of Confidentiality: There is no need for confidentiality with this information collection.

Needs and Uses: On May 20, 2010, the Commission adopted and released a Second Report and Order titled, ''In the Matter of Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310–2360 MHz Frequency Band,'' IB Docket No. 95–91, GEN Docket No. 90–357, RM–8610, 25 FCC Rcd 11710 (2010). In this Second Report and Order, the Commission adopted a framework for the regulation of SDARS terrestrial repeaters. First, the Commission adopted technical rules governing the operation of SDARS repeaters that will not unduly constrain the deployment of SDARS repeaters, but that will, at the same time, limit the potential for harmful interference to adjacent spectrum users in the Wireless Communications Service (WCS). Second, the Commission adopted a blanket-licensing regime to facilitate the flexible deployment of SDARS repeaters, which are necessary to ensure a high quality service to the public, while ensuring that such repeater operations comply with the Commission's rules regarding RF safety, antenna marking and lighting, and equipment authorization, as well as with international agreements. The Commission adopted a site-by-site licensing regime for repeater operations that did not qualify for blanket licensing. Finally, the Commission addressed other issues regarding SDARS repeater operations that are not associated with the interference concerns raised by WCS licensees. Specifically, the Commission adopted rules to ensure that SDARS repeaters remain truly complementary to a satellite-based service, and that SDARS terrestrial repeaters are not used to transmit local programming or advertising.

47 CFR 25.144(e)(3)—SDARS licensee shall, before deploying any new, or modifying any existing, terrestrial repeater, notify potentially affected WCS licensees pursuant to the procedure set forth in 25.263.

47 CFR 25.144(e)(8)—SDARS licensees must file an earth station application using Form 312 to obtain blanket authority for terrestrial repeaters operating at 12 kW EIRP (average) or less and in compliance with FCC rules; application must include certain parameters of operation and a certification that the proposed SDARS terrestrial repeater operations will comply with all the rules adopted for such operations.

47 CFR 25.144(e)(9)—The operation of non-compliant repeaters and/or repeaters operating above 12 kW EIRP (average) must be applied for and authorized under individual site-by-site licenses using Form 312 and appropriate waiver of the Commission's rules.

47 CFR 25.263(b)—SDARS licensees are required to provide informational notifications as specified in 25.263, including requirement that SDARS licensees must share with WCS licensees certain technical information at least 10 business days before operating a new repeater, and at least 5 business days before operating a modified repeater.

47 CFR 25.263(c); Recordkeeping/ Third party disclosure—SDARS licensees operating terrestrial repeaters must maintain an accurate and up-to-date inventory of terrestrial repeaters operating above 2 W EIRP, including the information set forth in 25.263(c)(2) for each repeater, which shall be made available to the Commission upon request. Requirement can be satisfied by maintaining inventory on a secure Web site that can be accessed by authorized Commission staff.

Not codified (para. 278 of Order)—SDARS licensees must provide potentially affected WCS licensees with an inventory of their terrestrial repeater infrastructure.

Federal Communications Commission.

Avis Mitchell,

Federal Register Liaison, Office of the Secretary, Office of Managing Director.

[FR Doc. 2011–23846 Filed 9–16–11; 8:45 am]

BILLING CODE 6712–01–P

Commercial Market Assessment for Crew and Cargo Systems

Pursuant to

Section 403 of the NASA Authorization Act of 2010 (P.L. 111-267)

April 27, 2011

Table of Contents

Executive Summary

NASA prepared this commercial market assessment in response to direction in Section 301b of the National Aeronautics and Space Administration Authorization Act of 2010 (P.L. 111-267). The specific requirements of this report are outlined below and are applicable to NASA's current exploration program.

SEC. 403. Commercial Market Assessment

> *(2) COMMERCIAL MARKET ASSESSMENT.—Not later than 180 days after the date of the enactment of this Act, the Administrator shall submit to the appropriate committees of Congress an assessment, conducted, in coordination with the Federal Aviation Administration's Office of Commercial Space Transportation, for purposes of this paragraph, of the potential non-Government market for commercially-developed crew and cargo transportation systems and capabilities, including an assessment of the activities a ssociated with potential private sector utilization of the ISS research and technology development capabilities and other potential activities in low-Earth orbit.*

In performing this assessment, NASA, in consultation with the Federal Aviation Administration's (FAA) Office of Commercial Space Transportation, incorporated the following assumptions:

- A 10-year time horizon was used.
- The assessment was limited to non-U.S. Government markets (i.e., commercial markets and demand from other countries), per the Authorization Act.
- The assessment focused on commercial crew and cargo "systems" defined as systems intended to deliver crew and cargo to the ISS or other destinations, not elements of the system such as launch vehicles and spacecraft, per the Authorization Act. Thus, systems that deliver communications satellites or similar payloads to orbit were not considered.
- NASA and the FAA relied primarily on publicly-available data sources.
- A range of outcomes is provided, with a lower end reflecting historical trends and an upper end reflecting industry inputs on growth.

This report groups likely commercial cargo and crew markets as follows:

- **National Interests**: This category includes countries lacking indigenous human space transportation capability who desire to send astronauts and cargo into space to perform scientific research, acquire technical knowledge, and increase national prestige.
- **Space Tourism**: This category includes spaceflight participants who are not flying under the direct employment or financial sponsorship of a company or government organization.
- **Applied Research and Technology Development**: This category includes customers interested in space-based research activities aboard in-space platforms, such as the International Space Station (ISS). Such research activities may lead to downstream commercial and/or societal application.
- **Other markets**: This category includes satellite servicing, media and entertainment and education markets.

Based on our review, the estimated total aggregated size of these markets, for non- U.S. Government commercial crew and cargo services over a 10-year period, is reflected in Figure 1:

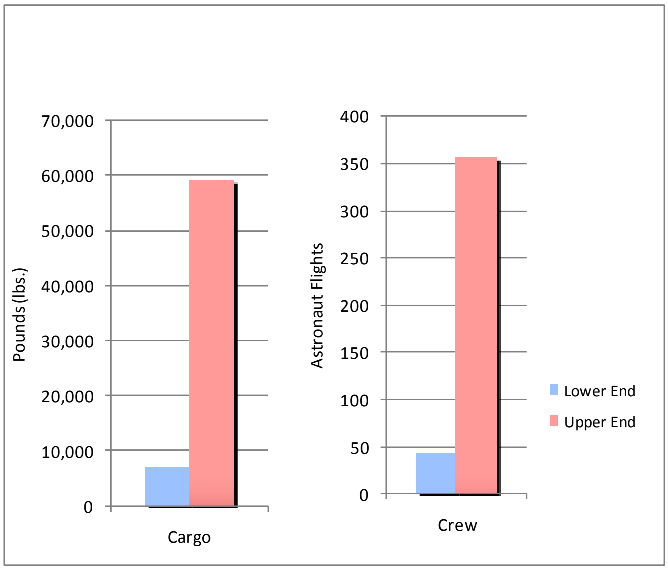

Figure 1: Aggregated Non-U.S. Governmental Markets, Ten Year Total

The "lower end" of the projection is essentially an extrapolation of historical flight rates, assuming there is no change in the historically-demonstrated flight rates for crew and cargo transportation services. The "upper end" of the projection incorporates industry inputs on the potential growth of the markets since industry has done the most analysis on the actual size of the markets and how those markets contribute to their specific business cases. Most likely, the actual flight rates for commercial cargo and crew systems over the next ten years will fall within the lower and upper end of the range. A precise forecast of flight rates would have limited utility at this time because of the major unknowns associated with the systems such as price, availability date, and the technical characteristics of the systems.

To be clear, this report does not characterize the "demand" for commercial cargo and crew services – something that is difficult to quantify at this stage. Instead, this report will show what is best described as "flight rate projections" of cargo and crew systems, constrained in many cases by the available supply and other factors. The actual demand for cargo and crew services could be many times the flight rate projections shown in this report. In addition, these projections do not include NASA ISS crew and cargo needs.

NASA believes that the projections described in this report are more than sufficient to justify Government support for the development and demonstration of commercial cargo and crew systems, especially considering that the U.S. Government has a demonstrated need for commercial cargo and crew transportation to/from the ISS. According to one established aerospace company involved in NASA's commercial crew efforts, this base Government market alone is sufficient to close its business case. The commercial markets assessed in this report provide a potential upside further strengthening the potential for success. NASA also believes its approach to cargo and crew system development will be more cost effective than a more traditional approach to space system development. (Please see Appendix B.)

NASA's commercial crew and cargo programs are intended to provide technical and financial assistance to the U.S. industry to develop commercial space transportation capabilities. Additional support is provided by NASA being a long-term customer, providing a market base for commercial crew and cargo services. If successful, these programs will not only help NASA by providing assured access to the ISS and allowing NASA to focus its limited resources on exploring beyond low-Earth orbit (LEO), but it will also help the Nation by strengthening our industrial base, developing a new high-tech industry, and strengthening our economy.

Section 1.0: Introduction

While NASA's commercial cargo efforts have been underway since 2005, and NASA has been purchasing commercial services for robotic spacecraft launches since 1988, NASA is just beginning its Commercial Crew Program. The primary objective of this program is to facilitate the development of a U.S. commercial crew space transportation capability with the goal of achieving safe, reliable, and cost effective access to and from LEO and the ISS. Once the capability is matured and available to customers, NASA plans to purchase transportation services to meet its ISS crew rotation and emergency return needs.

NASA plans to follow an alternative business method that allows U.S. industry more design ownership of their space systems and requires those companies to invest private capital to complement Government funds. This is similar to the approach NASA is using for the commercial cargo effort. NASA plans to award competitive, pre-negotiated, milestone-based agreements that support the development, testing, and demonstration of multiple commercial crew systems with a fixed Government investment. NASA also plans to use a unique Government insight/oversight model featuring a core team of sustaining engineering and discipline experts who closely follow the development of the vehicles. Additionally, NASA plans to use tailored human rating requirements, standards, and processes, with NASA providing the final crew transportation system certification.

This strategy is more of a "commercial like" approach to the development of a crew transportation system than NASA has traditionally pursued. One of the primary benefits of using this approach is its potential for cost effectiveness. NASA has seen the initial signs that this approach does, in fact, reduce costs through the commercial cargo efforts. (Please see Appendix B for a discussion of the cost effectiveness of the commercial cargo activity.)

To reduce the cost to the Government of a commercial program, it is important that the Government not be the only customer. Therefore, NASA is establishing a framework for the commercial crew program that could support multiple customers (e.g., U.S. and international astronauts and personnel, scientists, spaceflight participants) for a variety of reasons (e.g., science, research, station operations, tourism), including NASA personnel as crew or participants. In doing so, the question of other customers becomes important and that is the subject of this report.

Section 2.0: Commercial Crew and Cargo Transportation Systems – Not a New Concept.

The concept of commercial crew and cargo transportation systems has been studied for decades. Through much of the history of the Space Shuttle Program, for example, there have been studies about turning over operations of some or all of the orbiters to the private sector, in order to fly missions for private customers as well as for NASA.

In the mid-2000s, several studies and activities provided new impetus for commercial crew and cargo efforts. The 2004 "Vision for Space Exploration" directed NASA to "pursue commercial opportunities for providing transportation and other services supporting the ISS and exploration missions beyond low

Earth orbit (LEO) …" In 2004, the final report of the President's Commission on Implementation of the U.S. Space Exploration Policy (popularly known as the Aldridge Commission) recommended that the Government take steps to stimulate development of commercial space capabilities, specifically recommending that "NASA recognize and implement a far larger presence of private industry in space operations with the specific goal of allowing private industry to assume the primary role of providing services to NASA, and most immediately in accessing LEO."

In 2005, NASA initiated the Commercial Orbital Transportation Services (COTS) project, an effort to invest financial and technical resources to stimulate efforts within industry to develop and demonstrate safe, reliable, and cost-effective space transportation capabilities, using a fixed Government investment along with industry financial investment to augment the total funding. Under COTS, two companies, Orbital Sciences Corporation and Space Exploration Technologies, Inc. (SpaceX), are actively developing new privately owned and operated cargo transportation systems, including both spacecraft and launch vehicles, which are planned to transport cargo to and from the ISS.

The NASA Authorization Act of 2005 (PL 109-155) directed NASA to study "the means, other than the Space Shuttle and the Crew Exploration Vehicle, including commercial vehicles, that may be used to ferry crew and cargo to and from the ISS." In 2008, the U.S. Congress passed the NASA Authorization Act of 2008 (PL 110-422), which stipulated, "*In order to stimulate commercial use of space, help maximize the utility and productivity of the ISS and enable a commercial means of providing crew transfer and crew rescue services for the International Space Station, NASA shall - - make use of commercially provided International Space Station crew transfer and rescue services to the maximum extent practicable*…"

In 2009, the Review of U.S. Human Spaceflight Plans Committee (commonly referred to as the Augustine Committee) included commercial crew transportation systems in its assessment of options for future human spaceflight activities and found that such systems are "within reach" given industry's current capabilities. "While this presents some risk, it could provide an earlier capability at lower initial and life-cycle costs than government could achieve," the report stated.

In 2010, NASA invested $50 million of stimulus funds under the Commercial Crew Development (CCDev) initiative in five partners to mature commercial crew technologies, concepts, and capabilities (Blue Origin, Boeing, Paragon, Sierra Nevada, United Launch Alliance). On February 1, 2010, the Administration released its Fiscal Year 2011 budget request, which provided $6 billion over the next five years to support the development, testing, and demonstration of multiple commercial crew systems. This was followed in June 2010 by a new U.S. National Space Policy, which directed NASA to "seek partnerships with the private sector to enable safe, reliable, and cost-effective commercial spaceflight capabilities and services for the transport of crew and cargo to and from the ISS."

After considerable debate in Congress, a commercial crew development program was formally endorsed in the NASA Authorization Act of 2010 (PL 111-267), which was signed by the President on October 11, 2010. The law stated, "Congress restates its commitment … to the development of commercially developed launch and delivery systems to the ISS for crew and cargo missions. Congress reaffirms that NASA shall make use of United States commercially provided ISS crew transfer and crew rescue services to the maximum extent practicable."

Section 3.0: A Look at how NASA and the FAA Developed this Report

This study makes a number of assumptions in order to complete a feasible, reasonable market assessment within the time frame of the Congressional language. These assumptions include:

- **A 10-year time horizon**: This report looks out for the next 10 years on the markets. The United States has committed to operating the ISS through 2020, which makes estimates on potential market size extremely uncertain beyond that timeframe. In addition, other uncertainties about the rate of technology development, changes in financial markets, and unforeseen innovations or other disruptions make assessments beyond a 10-year horizon of limited utility. However, potential trends in the markets beyond 10 ten years are discussed later in this report for completeness.
- **Limit to non-U.S. Government markets:** Per the NASA Authorization Act of 2010, NASA is directed to conduct an assessment "of the potential non-Government market" for commercial crew and cargo systems. For the purposes of this report, the term "non-Government" includes commercial users as well as other governments outside the United States.
- **Focus on commercial crew and cargo systems**: The NASA Authorization Act of 2010 specifically mentions "commercial crew and cargo transportation systems", which for this report is interpreted to mean the crew or cargo spacecraft in conjunction with its launch vehicle. In some cases, launch vehicles being developed or upgraded to support commercial crew and cargo systems may have additional applications, most notably satellite launches. Those additional markets are not included in the market assessment, as they do not require the complete crew/cargo system. These markets are discussed later in this report for completeness.
- **Reliance on publicly-available data sources**: Given the 180-day deadline provided in the NASA Authorization Act of 2010, NASA relied on readily available data sources that could be disseminated publicly. Thus, the assumptions and conclusions in this report reflect the current body of knowledge regarding commercial crew and cargo markets as of early March 2011.
- **A range of outcomes is provided:** Because of the uncertainties associated with future commercial crew and cargo markets (described later in this report), the output of this assessment is provided in ranges. The lower ends of the ranges are essentially extrapolations of historical flight rates assuming there is no change in the historically-demonstrated flight rates for crew and cargo transportation services. The upper end of the ranges incorporates industry estimates of the potential growth of the individual markets based on available data, or data willingly shared with NASA for the purposes of this report. Most likely, the actual flight rates for commercial cargo and crew systems over the next 10 years will fall within the lower and upper end of the range.

As mentioned, the upper ends of the ranges were developed by leveraging primarily industry inputs regarding the potential size of the various markets. Industry, not NASA, will bear the ultimate responsibility for developing the commercial markets described in this report; and private industry, not NASA, is where the expertise for market analysis resides. Government estimates of the future size and growth rate of commercial markets have usually been of very limited value. The U.S. Government can facilitate and help enable these markets to grow. But, private industry will have to make it happen.

It should also be noted that the assessment contained in this report does not characterize "demand" for cargo and crew services. Market demand is extremely difficult to assess. For space tourism, the only professional, publicly-available study of demand was the 2002 Futron Space Tourism Market Study. Instead, the assessment in this report incorporates available data and industry assumptions of supply, demand, and other factors to produce flight rate projections for cargo and crew markets. The cargo market is characterized in terms of pounds of cargo flown to space; the crew market is characterized in terms of astronaut flights, also known as “seats.” In some cases, actual “demand” could be significantly higher than the flight rate projections shown in this report because demand for commercial cargo and crew transportation will almost certainly be constrained over the next decade by the limited availability of transportation systems, i.e., supply.

Section 4.0: Definition of a Market

The emergence of a price-based market where firms compete to provide crew transportation into orbit around the Earth to private American citizens and corporations has yet to occur. Nonetheless, American aerospace leaders – including Presidents, Members of Congress, NASA Administrators, corporate executives and aerospace engineers – have long discussed and foreseen the emergence of such a market. The question is not so much whether a non-Governmental market for commercial human spaceflight will emerge, but when and how we should expect such a market to develop. This report assesses the near-term potential for non-Governmental markets for spaceflight capabilities. This section provides a brief discussion of the nature of markets and how the forces of demand and supply interact to create them in the context of spaceflight.

Discussions of non-Governmental markets for spaceflight are complicated in part because the term “market” is itself variable and is often used to refer to quite different concepts. In economic terms, a market is a structure that allows for the exchange of goods and services by buyers and sellers. A critical component of a true market is existence of known prices for the goods and services exchanged within it. A market is also defined by having more than one buyer, and more than one seller.

Markets form because they are an efficient way to connect the demand of buyers with the supply of sellers. A critical question with regard to commercial markets for spaceflight thus pertains to the potential non-Governmental demand for spaceflight. When questions are asked regarding the extent of the market for a product, often the heart of that question pertains to the extent of the *demand* for that product. The demand for a product is most commonly expressed as the amount of a product that buyers would like to purchase at a given price.

We have information on the private demand for a one-week stay on the ISS but only when that week costs approximately $35 million, requires six months of training in Russia and when the supply schedule of flights is extremely constrained. What would the demand be if the price was below $10 million, or if the price were more than $100 million, or with more limited training on American soil, or with a more responsive supply system? These questions cannot be answered definitively until the capabilities exist to provide human spaceflight products with actual prices and features.

However, we know that a significant number of people desire to travel into space and we know that many have expressed a willingness to pay significant prices to do so. Given that there is at least some demonstrated demand for non-Governmental human spaceflight, the current lack of commercial spaceflight capabilities may seem to be evidence that the cost and/or other barriers to entry have thus far been too high. But, the development and supply of spaceflight technologies takes time, and it is worth noting that over the past ten years, beginning roughly around the time of the first commercial flights to the ISS, American entrepreneurs and corporations have invested hundreds of millions of dollars of private capital to develop the technologies, production process, and organizations that they believe can profitably supply a market for space transportation, within an acceptable time horizon to the investors. As the knowledge, technologies, processes and communities capable of spaceflight become ever more widespread and competitive, the emergence of non-Governmental markets for human spaceflight is inevitable.

Factors Affecting the Size of Markets

The potential size of the market for commercial crew and cargo transportation is dependent on a variety of factors, including technical, schedule, financial, regulatory, political, accident rates, and miscellaneous. The uncertainties associated with these factors prohibit a single, quantitative forecast of the demand associated with these markets, which is why the size of the markets is characterized as a range of flight rate projections in this report. A discussion of the uncertainties and how they can help or hinder the development of these markets are addressed in the following sections.

Technical Factors

Technical capabilities, including vehicle capabilities and concepts of operation, will play a major role in addressing potential markets enabled by commercial crew and cargo systems. Companies have proposed or are developing a diverse range of crew and cargo vehicle concepts, and each will have its own unique set of capabilities, pricing, training requirements, passenger profiles, and constraints. In addition, NASA is some years away from selecting specific service providers. All of these uncertainties will affect the actual size and growth of the markets for these systems.

Orbital Platforms and Free-Flying Services

The availability of destinations in LEO for these vehicles, including the ISS as well as other proposed commercial destinations, will also affect the timing and size of non-Government markets. In the near-term, the likely primary destination for commercial cargo and crew spacecraft will be the ISS. In addition to the ISS, the development of commercial orbital habitats has been proposed in recent years, most notably by Bigelow Aerospace of Las Vegas, which has thus far invested $215 million of its own money to pursue this market via the development of a next-generation private sector space station that leverages expandable habitat technology (a technology originally conceived of by NASA but developed and put into practice by Bigelow Aerospace). Bigelow launched and fully tested in space two subscale prototypes of its expandable modules and has proposed a series of increasingly ambitious facilities in Earth orbit and beyond using larger versions of those modules. The company has publically announced its plans to deploy an initial space station as early as 2015, with a larger one to follow as early as 2017, pending availability of commercial crew and cargo transportation systems.

Some services would not require a separate orbital platform to visit, i.e., LEO could be considered a destination itself. Space tourism flights, for example, could be carried out by a crewed vehicle without visiting the ISS or another orbital destination; such free flights would be best suited for short-duration missions. SpaceX has proposed a concept called DragonLab that would turn the Dragon spacecraft into a free-flying laboratory carrying experiments for missions ranging from one week to two years in duration before returning to Earth. The wide range of potential platforms and free flying capabilities could greatly affect the size of the commercial crew and cargo markets.

Schedule Factors

Within the 10-year time period analyzed in this study, the size of the commercial cargo and crew markets are dependent on when services become available. NASA has contracted with both Orbital and SpaceX for initial operational flights to ISS, to occur before the end of 2012. From that point forward, those companies will also have the capacity to provide services to other buyers. Both companies have experienced delays, and if operational dates slip further into the future, the amount of flights that could be provided through 2020 will shrink. Beyond the limits of this study, if the lifetime of the ISS is extended, the market for ISS cargo would continue as well.

The availability date of commercial crew services is less clear. Funding availability and technical progress will both play a very large part in when services will become available.

Financial Factors

A major factor affecting market size is the cost to develop the system and the associated price that will be offered to customers. For commercial cargo, most of the development has been completed for the Falcon 9/Dragon and the Taurus II/Cygnus. Also, the initial price that NASA will pay for cargo transportation services has already been determined via the CRS contract awards.

Development costs for potential commercial crew systems are more uncertain. NASA has not requested detailed cost estimates from industry for commercial crew transportation services and selections are some years away. For example, NASA's Commercial Crew Transportation (CCT) Request for Information published on May 21, 2010, included the request: "What is the approximate dollar magnitude of the minimum NASA investment necessary to ensure the success of your company's CCT development and demonstration effort?" Industry responses were proprietary and cannot be released to the public. However, costs estimates from industry had a range of more than 700 percent from the lowest to the highest estimates. The magnitude of the development costs directly relates to the eventual price for services.

Additional uncertainty exists for commercial crew systems because NASA is planning to require industry to provide investment funds as part of any development agreement. The amount of private capital will vary between partners, and this capital could be provided from sources such as private investment, company revenue or venture capitalists.

All these unknowns (development costs, amount of private capital, ROI levels, and payback periods) contribute to a large range and uncertainty in the eventual price that will be established for commercial crew transportation services, which will have a major impact on the market size.

Regulatory and Certification Factors

Commercial spaceflight presents a number of liability risks to providers addressed to varying degrees by the current regulatory regime. Risks associated with the uninvolved public are already addressed by existing regulations. The regulatory regime is far less certain regarding spaceflight participants. Current U.S. law (the Commercial Space Launch Amendments Act of 2004) does require operators of crewed vehicles to obtain the informed consent of any spaceflight participants to be flown prior to launch. However, informed consent may be insufficient to protect commercial crew vehicle operators from liability claims in the event of an accident. This uncertainty may make it difficult for providers to address this liability through insurance or other means.

Not only is the regulatory regime for human space transportation to LEO in development, but NASA's crew transportation system certification requirements that will be used to certify the systems as safe for transporting NASA and NASA-sponsored personnel to and from the ISS are also in development. In December 2010, NASA released the "Commercial Crew Transportation System Requirements for NASA LEO Missions" document that provides a consolidated set of requirements, standards, and processes that will be applied to the certification of a specific commercial crew transportation system for LEO missions. However, the specific certification requirements applied to systems transporting crew to the ISS are still in work, which contributes to uncertainty in costs, pricing, and ultimately market size.

Accident Factors

An accident involving a commercial crew transportation system, particularly a crewed system, would have an adverse impact on both the vehicle operator as well as the overall commercial spaceflight industry. One potential outcome in the near-term, based on experience with accidents involving crewed government-operated spacecraft, is a stand-down of operations while the accident is investigated and corrective actions implemented. The operator would suffer a loss of revenue because of the lack of flights during the post-accident hiatus, as well as expenses involved in implementing corrective actions as a result of an investigation and repair or replacement of the vehicle involved in the accident. The company could also be liable for accident claims from families of the crew and/or spaceflight participants on the vehicle, or business losses from vehicle customers.

These risks could be mitigated at least in part through regulations, such as laws in some states that immunize commercial spaceflight providers to liability claims from spaceflight participants in the event of injury or death, as well as through insurance. However, it is important to note that every mode of transportation has risk that results in loss of human life. If the U.S. is ever to achieve the goal of <u>routine</u> commercial human access to space, then the industry must be able to respond to accidents likes all the other modes of transportation.

Miscellaneous Factors

Other external factors could also influence the market for commercial crew and cargo systems. One such factor is the development of similar systems outside the United States, subsidized partially or entirely by other governments, competing in the same commercial markets as U.S.-developed vehicles. For example, Russia has sold seats on Soyuz spacecraft to commercial customers. In January 2011, Space Adventures, the American company that markets Soyuz seats to commercial customers, announced that Russia would increase the production rate of Soyuz spacecraft from four per year to five, starting in 2013; this could make additional seats available for flights to the ISS. On the other hand, markets sometimes expand faster when there is more competition which may offset some of the affect of more providers.

Development of commercial crew and cargo markets depend in large part on the existence of the ISS as an anchor customer to support development of systems that can also serve those markets. An accident or other situation that diminishes the capabilities of the ISS, resulting in a reduction in crew and cargo requirements, or the worst-case scenario of the abandonment of the station, would adversely limit the U.S. Government's need for commercial cargo and crew services. Space environment hazards such as the increase of orbital debris also pose risks that could adversely affect the market for commercial providers if a significant collision occurred.

<u>Section 5.0 Non-Government Markets</u>

As described in Section 3.0, NASA's study featured analysis of available data sources to identify potential non-Government markets that could be addressed by commercial crew and cargo systems within a 10-year time horizon. This analysis found four market segments most likely to be enabled by such systems in that time period:

- **National Interests**: This category includes countries lacking indigenous human space transportation capability who desire to send astronauts and cargo into space to perform scientific research, acquire technical knowledge, and increase national prestige.

- **Space Tourism**: This category includes spaceflight participants who are not flying under the direct employment or financial sponsorship of a company or government organization.
- **Applied Research and Technology Development**: This category includes customers interested in space-based research activities aboard in-space platforms, such as the ISS. Such research activities may lead to downstream commercial and/or societal application.
- **Other markets**: This category includes satellite servicing, media, and entertainment and education markets.

Therefore, this section provides background and a description of those markets, describes the lower end of the market range based on historical flight rates, describes the upper end of the market range (i.e., market potential), and provides a discussion of unique constraints on the growth of the individual markets that may inhibit the realization of the market potential.

National Interests

Thirty-one nations without indigenous human spaceflight capabilities have sent 96 astronauts into orbit between 1978 and 2010. This total excludes Expedition flights of ISS Partner crew members flown pursuant to the ISS Partner Intergovernmental Agreement\Memoranda of Understanding. "National Interests" have sent astronauts into space on vehicles operated by Russia and the United States primarily through space agency-to-space agency or government-to-government exchanges, but in some cases through cash payments. Countries desire to send astronauts into space to perform scientific research, acquire technical knowledge, and increase national prestige. Historically, astronauts from such nations have performed missions that can be classified into three basic categories: short-duration visits to space stations, short-duration spacecraft missions such as those performed by the Space Shuttle, and long-duration expeditions to space stations. Figure 2 summarizes the historical national interest flights. A more detailed description of these flights is provided in Appendix A.

Short Duration Space Station Visits – Salyut, Mir, ISS[1]	Space Shuttle Flights, excluding Flights to MIR and ISS[2]	Long Duration Space Station Visits - Mir and ISS Expeditions[3]
Total: 26 countries	Total: 13 countries	Total: 2 countries
54 astronaut flights	39 astronaut flights	3 astronaut flights

[1] Space Station visits (first column) were relatively short-duration missions including Soyuz or Shuttle flights to the Salyut, Mir, and ISS with an average amount of time in space of approximately 12 days. These missions are performed primarily to increase national prestige, but may also include modest scientific research and technical knowledge objectives.

[2] Thirteen countries participated in Space Shuttle astronaut flights (second column), excluding Shuttle flights to Mir and ISS. The average duration of a Space Shuttle mission was about 11 days. Space Shuttle flights performed a range of missions. The Space Shuttle represented a unique capability with its large cargo bay and crew carrying capability. In some sense it was a self-contained space station.

[3] Long-duration space station missions consisting of crew that keep a space station operating and perform some utilization are referred to as "expeditions" (third column). By the nature of their long duration in space, expedition members are conducting research on how the human body adapts. In addition, expedition crew members have the opportunity to tend long-duration science and technology experiments. German and French astronauts have served aboard Mir and ISS as Expedition crew members. The average duration of Expeditions missions was about 180 days.

Overall Total Countries: 31
Astronaut flights: 96

Figure 2: National Interests

Based on this historical experience, it is likely that the market for national interests of countries without indigenous human spaceflight capability will consist of at least two client types. The first type will be interested in short-duration missions to LEO, the ISS, or other space station for national prestige and scientific and technical research. A second type may be interested in longer-duration flights ranging from two weeks to six months. This sovereign client may desire to be the primary occupant of a space station or work as part of a mixed crew with astronauts from other nations.

Historical Experience (Lower End of Range)

Figure 3 shows the historical number of astronaut flights for the National Interests market with a trend line:

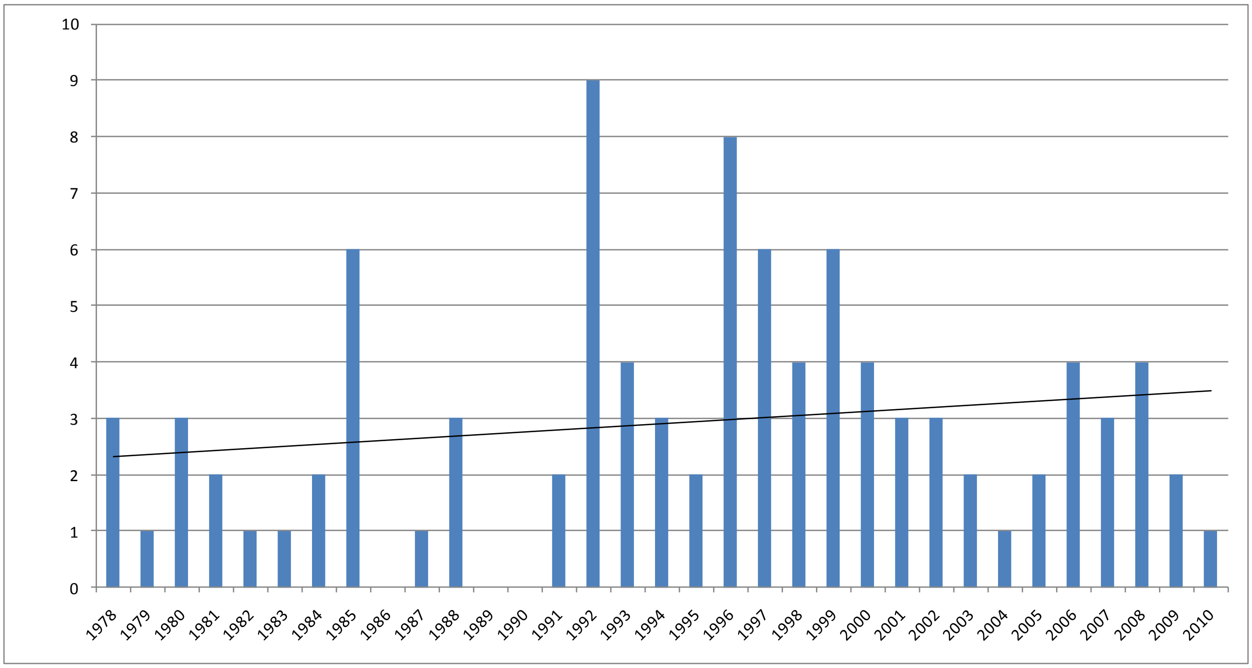

Figure 3: Historical Flight Rate of National Interests (Excluding the United States, Russia and China, and excluding ISS Partner crew members flown pursuant to ISS Partner Intergovernmental Agreement\Memoranda of Understanding.)

In order to establish the "Lower End" of the range for this market, the linear historical growth rate of the number of astronaut flights occurring annually (i.e., the trend line) was extrapolated into the future. This assumes that the historical flight experience will remain unchanged during the next 10 years. Based on this linear growth rate, the number of astronaut flights is projected to be 36 during the assessment period.

Cargo transportation will be required in order to support these astronaut flights. Cargo includes items such as water, food, clothing, personal items, and life support maintenance consumables. It does not include cargo demand required to support other types of space station maintenance, propulsion, or research activity. Basic crew resupply requirements necessary to support a single astronaut can be approximated based on NASA and Russian human spaceflight experience. The generic cargo resupply rate to support astronauts on the ISS is 10.3 lbs/day per crew member.

Based on historical data shown in Figure 2, approximately 97 percent of the projected astronaut flights, or 35 astronaut flights, will be short-duration missions. One astronaut flight will be a long-duration expedition-type mission. Based on a cargo estimate of 10.3 lbs/day per crew member, 35 short-duration missions of 12 days each would generate cargo demand of approximately 4,326 pounds. One long-duration expedition mission of 180 days would therefore generate cargo demand of approximately 1,854 pounds, for a grand total of 6,180 pounds.

Market Potential (Upper End of Range)

The market for nations without indigenous human spaceflight capability to purchase a flight to LEO, time onboard the ISS, or time onboard private space stations builds upon a history of such nations partnering with nations that operate human space transportation systems in order to travel into space. Historically, nations faced a fairly high cost barrier when pursuing human spaceflight. A commercial human space transportation system to LEO, in combination with an affordable space destination, may enable a much larger market for national interests.

The upper end of the range for the National Interests market is based on input provided to NASA for the purposes of this report by Bigelow Aerospace. Bigelow Aerospace is targeting the National Interests market (also known as the Sovereign Client market) as a key part of its business strategy. Bigelow estimates that 30 flights will be accomplished during the assessment period to support its first operational space station. A second, larger space station is planned to be launched two years later and will require 45 - 60 flights will be accomplished to support that station during the assessment period. Each flight is planned to include three to five passengers total.

For the purposes of the upper-end estimation, NASA assumed two of the passengers on each flight are part of the National Interests market segment, this results in a total of 150 to 180 astronaut flights over the assessment period. Adding the lower end of the range of 36 astronaut flights, which represents flights to the ISS for visits or short duration flights to LEO, the grand total for the upper end of the range is 186 to 216 astronaut flights over the assessment period. Using the cargo estimate of 10.3 lbs/day per crew member and assuming 12 day missions, the total for cargo to support the astronaut flights is projected to be approximately 18,540 to 22,248 pounds. By adding the lower end cargo estimate to this projection, a grand total of 24,720 to 28,430 pounds is projected.

A strong positive indicator for this growth is the fact that Bigelow Aerospace has executed seven Memoranda of Understanding (MOUs) with a variety of national space agencies, companies, and governmental entities. These MOUs were signed with organizations in Japan, the United Arab Emirates, the Netherlands, Sweden, the United Kingdom, Singapore, and Australia. These MOUs demonstrate the strong potential for international clientele to utilize such systems, particularly given the current lack of existing commercial crew transportation. Additionally, these MOUs demonstrate that foreign interest is not limited or necessarily tied exclusively to the ISS.

The lower- and upper-end assessments of crew transportation and associated cargo to support the crew over the 10-year period is summarized in Figure 4.

National Interests Market	Number of Astronaut Flights	Amount of Cargo (lbs)
Lower End of Range	36	6,180

Upper End of Range	186 - 216	24,720 - 28,430

Figure 4: Summary of the National Interests Commercial Market (Cumulative over 10-Year Assessment)

Constraints on Market Growth

The market for transportation services to support national interests will be strongly impacted by the availability of an affordable destination and transportation services to deploy astronauts and provisions. Commercially operated space crew transportation systems would be a new mode of operation for these customers. To date, all national interest missions have been conducted by government-operated transportation systems. Nations would need to become comfortable with the use of commercially operated transportation systems in order for commercial operators to grow this market.

Section 5.1: Space Tourism

In the last decade, space tourism emerged as a new and potentially promising commercial spaceflight market. In April 2001, Dennis Tito became the first individual to pay his own way into space, flying on a Soyuz taxi flight to the ISS. Several other people have followed -- each paying tens of millions of dollars to spend a week or more on the ISS.

For purposes of this report, the term "space tourist" refers to a spaceflight participant who is not flying under the direct employment or financial sponsorship of a company or government organization. Spaceflight participants employed or financially sponsored by government organizations, such as national space agencies, for research and other activities are covered under the National Interests section. Space tourists, by comparison, either purchase a spaceflight opportunity themselves or through another private funding source (e.g., as a gift from a friend or family member, or through a sweepstakes). Tourists may engage in a variety of activities on their flights, based on experience from those who have flown in the last decade.

Historical Experience (Lower End of Range)

Figure 5 lists those space tourists who have flown since 2001 and reported prices, based on published accounts of their flights:

Name	Reported Trip Price	Date Launched	Date Returned	Trip Duration
Dennis Tito	$20M	4/28/2001	5/6/2001	9 days
Mark Shuttleworth	$20M	04/25/2002	5/5/2002	11 days
Gregory Olsen	$19M	11/1/2005	11/11/2005	11 days
Anousheh Ansari	$20M	9/18/2006	9/29/2006	12 days
Charles Simonyi	$25M	4/7/2007	4/21/2007	15 days
Richard Garriott	$30M	11/12/2008	11/23/2008	12 days
Charles Simonyi	$35M	3/26/2009	4/8/2009	14 days
Guy Laliberte	$35M	9/30/2009	10/11/2009	12 days

Figure 5: Space Tourists, 2001-2010

The lower end of the range for the space tourist market over the next 10 years is estimated to be eight astronaut flights (i.e., seats), by simply extrapolating the average historical flight rate. For cargo, the same assumption regarding the basic crew resupply requirements necessary to support astronauts on the ISS was used for spaceflight participants (10.3 lbs/day per crew member). Assuming that each flight lasts 12 days (the same as the historical experience), the associated cargo market cumulatively over the 10-year forecast period is projected to be approximately 990 pounds.

Market Potential (Upper End of Range)

The future market for space tourism has engendered much speculation recently. However, most studies conducted to date suggest that market demand above the historical supply rate exists, although the lack of available crew transportation systems has delayed its development. In order to estimate the upper end of the space tourism market, input provided to NASA for the purposes of this report by Space Adventures was leveraged.

Space Adventures, the company which brokered every ISS space tourist flight to date, has developed its own forecast of future space tourist flights, taking into account development of commercial crew vehicles as well as the existence of orbiting space facilities besides the ISS. Their forecast calls for approximately 143 passengers flying through 2020 (including direct sales to individuals, lottery/media, corporate business and research, education and institutions). NASA projects the associated cargo to support those 143 astronaut flights to be approximately 17,700 pounds, based on an average stay time of 12 days and assuming the basic crew resupply requirements to equal those necessary to support astronauts on the ISS (10.3 lbs/day per crew member). Figure 6 provides a summary of the space tourism market projections for crew and associated support cargo.

Space Tourism Market	Number of Astronaut Flights	Amount of Cargo (lbs)
Lower End of Range	8	990
Upper End of Range	143	17,700

Figure 6: Summary of Space Tourism Commercial Market (Cumulative Over 10-Year Assessment)

Constraints on Market Growth

Currently, there are several growth constraints to the space tourism market:

- The availability of crew transportation systems for non-professional astronauts;
- The cost to the customer; and
- The current lack of a destination besides the ISS.

There are several other factors that hamper the orbital space tourism market such as the long training time. While these constraints might be reduced in coming years, it is unlikely that all will cease to be important in the next decade.

The availability of transportation is a significant limiting factor as only the Russian Soyuz is available to service this market and seats aboard the Soyuz are extremely limited. Following the late-2009 flight of Guy Laliberté, the Russian Federal Space Agency, Roscosmos, announced that there would be a hiatus on space tourism because all available Soyuz seats would be used for ISS crew rotations. Additional Soyuz seats may be available for tourists in a few years, as Space Adventures announced in early 2011 an agreement with Roscosmos and RSC Energia to increase the Soyuz production rate from four to five a year and thus offer three seats commercially starting in 2013. On the other hand, if U.S. industry is successful in developing commercial crew transportation systems, the availability of seats for space tourists could dramatically increase.

Cost is another apparent factor limiting commercial human spaceflight, as both customers and launch providers seek to obtain the best value they can. History has demonstrated that buying a ticket aboard an orbital rocket has never been cheap, and so far the only individuals capable of doing so have largely been independently wealthy.

While the prices paid by space tourists to fly short-duration missions on the Russian Soyuz have reportedly increased in recent years, this reported price is lower than what NASA pays primarily because NASA requires services for long-duration missions above and beyond those required by space tourists. With existing ISS demand, Russia has little incentive to open up seats to space tourists. However, as mentioned above, Russian entities have publicly said they could increase Soyuz spacecraft production, pending completion of contracts, potentially freeing up seats for private tourists, provided they are willing to pay an as-yet-unspecified price.

Another constraint on the market is the availability of destinations in LEO that could be visited by tourists. Currently the only destination in LEO with life-support capabilities is the ISS; and, ISS crew aboard is currently limited to six long-duration crew based on crew rescue vehicle (Soyuz) capability. The crew assignments on the ISS are regulated by the ISS Partners, with each ISS Partner allocated a specified amount of ISS crew on the station in accordance with the ISS Partnership agreements. However, Bigelow Aerospace is planning to deploy a series of private facilities that, while oriented toward serving the research and non-U.S. national interests markets, could also host tourists for short- or long-duration stays, thus supporting increased demand beyond what the ISS can accommodate. In addition, the development of crew transportation systems capable of free-flying LEO flights would offset the need for additional LEO destinations.

Section 5.2: Applied Research and Technology Development

Applied research and technology development refers to the use of the microgravity environment and vantage point afforded by the ISS and other in-space platforms to conduct research activities that may lead to downstream commercial and/or societal application. Precursor basic research areas range across the spectrum of biology, chemistry and physics with applied research and technology development opportunities in medicine, materials, remote sensing, and future space technologies demonstration.

In general, research moves along a continuum from basic research activities through applied and translational research to product development and enhancement (see Figure 7). Generally, the continuum begins with research seeking to test a theory or hypothesis (basic research) and concludes with a sustainable and repeatable outcome that creates value in terms of economic or social returns. In practice, research can begin at any phase of the continuum, and can proceed in a non-linear fashion. However, a weak level of investment in the visionary end of the continuum is likely to forestall success in the translational and product end of the pathway. As a scientific investigation moves down the continuum, funding profiles change to include increasing amounts of private and commercial industries until a commercial product may emerge from the investigation – although this does not occur in all cases.

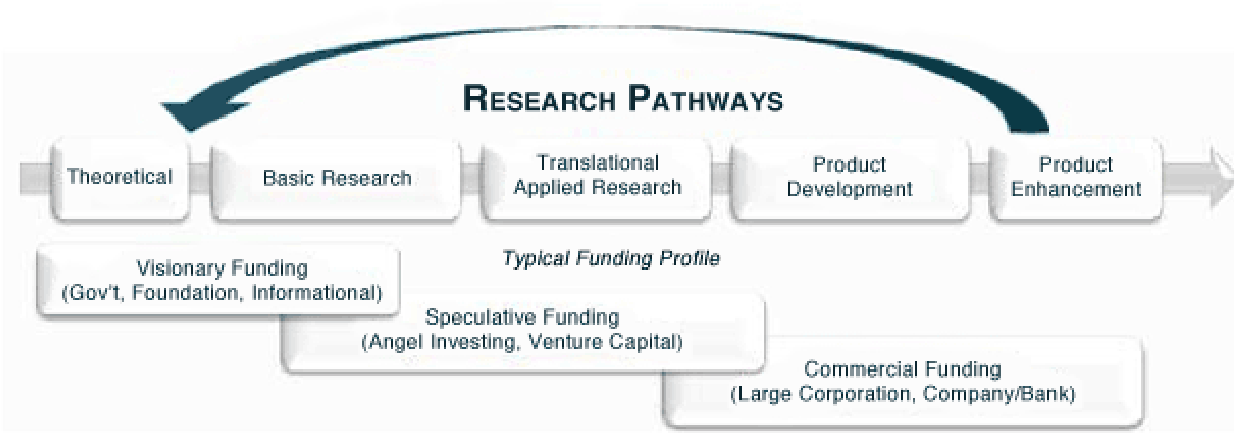

Figure 7: Source ProOrbis 2010

As an example of this pathway, basic research studying the reaction of the bacteria *Salmonella typhimurium* (a strain of bacteria responsible for the incidence of salmonella in humans) exposed to microgravity found increased virulence expressed by the bacteria in the space environment. Subsequent in-space experimentation identified the specific genes responsible for the virulence. Following this result, the private company Astogenetix, Inc. funded a series of experiments on the ISS focused on producing vaccine candidates—an example of preclinical, translational research. As of mid-2010, using results from the ISS experiments, the company is pursuing U.S. Food and Drug Administration approval of a *Salmonella typhimurium* vaccine as an investigational new drug. The company is also pursuing a similar investigation pathway for methicillin-resistant *Staphylococcus aureus*, better known as MRSA.

Research activities onboard the ISS can be classified into four research disciplines. These categories provide a framework for analyzing the types of applied research and development activities that might be conducted in LEO. These categories are:

1. **Biology and Biotechnology:** The space environment (e.g. microgravity) is unique for biological systems, and can offer distinct insights into molecular, cellular, and organismic functions. As a novel environment, space provokes biological processes and responses that cannot be evoked on Earth and, as a result, biology and biotechnology research in the microgravity environment could lead to medical and commercially relevant applications. More than 70 percent of the research performed on the ISS has been in this category.
2. **Earth Observation:** The ISS offers a stage for observation of the Earth, with the added capacity for servicing of onboard instruments should it be necessary. In some cases this may offer operational advantages for the collection of Earth observation data over the use of satellites for the same purpose.
3. **Physical and Materials Science:** The microgravity environment allows scientists to study physical properties, systems, and effects without the complicating factors provided by gravity. Long-term microgravity exposure permits scientific investigations to be conducted in a manner that allows the physical properties of the phenomena being studied to dominate the experiment, rather than the effects of gravity.
4. **Technology Development:** The ISS provides a unique test bed for new technologies for use both in space and on Earth. Technology testing in space allows developers to characterize, optimize, and space qualify hardware performance in space and expands the suite of space-qualified equipment that can then be used to enable other applications.

Historical Experience (Lower End of Range)

To date, virtually all of the funding for experiment development, transportation, accommodation and resources has been provided by government sponsors with few notable exceptions of commercial investment. Commercial investments have been limited to covering the costs of their investigators and incidental expenses. The share of experiments with a commercial interest, as a percent of total experiments performed, has been approximately nine percent.

Figure 8 shows the full breakdown of experiment sponsors, based on the number of experiments conducted onboard the ISS in each of the research disciplines, by all ISS Partners, from December 1998 through September 2010 (Expeditions 0 though 24), a period of time representing the assembly phase of station operations.

ISS Utilization Sponsor	Estimated Distribution of Interests
ISS International Partnership (non-United States)	64%
United States	36%
Commercial	9%
Department of Defense	10%
National Lab – Other Government Agencies	0%
National Lab – Academia	0%
National Lab – Education *(with significant NASA funding)*	17%
NASA Grants	64%
Subtotal (United States)	**100%**
Total	**100%**

Figure 8: ISS Experiment Sponsors, December 1998 to September 2010

In some cases, an experiment conducted on board the ISS by a private, non-U.S. Government entity had its investigator costs paid for by that private entity, but costs of transport and use of the station were covered by NASA. Thus, none of the research included in the "United States – Commercial" category was completely funded by private entities, and it is unclear if any of this research would have been conducted had the government financial contribution not existed. Accordingly, the low end of the range for this market is zero pounds of cargo, even though private entities have contributed financially, in some cases quite substantially, to this research.

Market Potential (Upper End of Range)

NASA planning for ISS utilization requirements breaks cargo upmass and downmass requirements into three categories: mass required to support ISS Systems and Operations, mass required for research on the United States On-orbit Segment (USOS) of the ISS, and mass required for National Lab Utilization. The USOS includes NASA utilization requirements and those of all International Partners except Russia. The National Lab Utilization category includes all U.S. research on the station pursued by entities other than NASA, including research by private firms. In August 2009, NASA developed a *Plan to Support Operations and Utilization of the International Space Station Beyond FY 2015*. This report contained projected cargo upmass (and downmass) requirements for ISS Utilization through 2020, as shown in Figure 9.

Category	Total Projected Cargo Upmass Requirements
Systems/Operations	194,820 lbs
USOS Research (funded)	80,067 lbs
National Lab Utilization (unfunded)	43,266 lbs

Figure 9: ISS Upmass and Downmass Requirements 2011-2020

As mentioned, approximately nine percent of ISS utilization interest has originated from commercial sources. This figure provides an estimate of the level of commercial market interest in Applied Research and Technology Development activities, when the research costs are largely covered by NASA. Accordingly, it can be used to provide the ISS-related portion of the upper end of the range of the Applied Research and Technology Development market. Applying the nine percent to the total projected National Lab Utilization gives an estimate for commercial ISS cargo of approximately 3,900 pounds.

In addition to ISS-related utilization, there will be research and technology related cargo flown to other destinations, such as the Bigelow station or simply to LEO in a DragonLab or other free-flying carrier. For the contribution of this portion to the upper end of the range, the Bigelow flight projection was used: 30 flights during the assessment period for Bigelow Station #1; and 45 - 60 flights for Bigelow Station #2. Bigelow plans to launch major payloads "with the module"; hence, the amount of utilization-related hardware will be relatively small. For the purposes of this assessment, NASA assumed 75 pounds of cargo would be flown on each flight, for a total of 5,600 - 6,750 pounds of commercial non-ISS cargo over the assessment period.

Adding together the ISS and non-ISS related portions provides a grand total of 9,500 - 13,400 pounds for commercial cargo. Figure 10 shows a summary of the projection for the Applied Research and Technology Development market.

Applied Research and Development Market	Number of Seats	Amount of Cargo (lbs)
Lower End of Range	-	0
Upper End of Range	-	9,500 - 13,400

Figure 10: Summary of Applied Research and Technology Development Market (Cumulative Over 10-Year Assessment)

Constraints on Market Growth

The estimates in Figure 11 are constrained by several factors. The historical data used for the range represents a period when ISS activities were conducted under a different concept of the operations than what is in place today: assembly versus utilization. During the period of ISS assembly, resources for completing experiments were relatively limited. Today, the largest modules and research racks have been delivered to ISS, so more launch payload volume and mass is allocated to ISS utilization. Furthermore, more crew time is available for research because there are fewer ISS components to install and assemble. Secondly, the ISS Program notes that "over the past decade funding for research (either from NASA or from private entities) and flight resources have never been available at the same time, and have fluctuated almost independently." Accordingly, the history-based statistics represented in Figure 11 should not be considered an absolute upper limit.

The American Society for Gravitational and Space Biology, an organization with an interest in expanding research conducted in microgravity, suggests that the following factors limit research activities on ISS:

- Inadequate hardware and instrumentation to support biological and physical sciences experimentation in reduced gravity, including biocontainment work stations and variable speed centrifugation for in-flight gravity controls;
- A lack of frequent and affordable upmass and downmass to and from ISS;
- Absence of designated ground and facilities support for fundamental life and physical sciences flight experiments; and
- Insufficient commercial and basic research entities participating jointly on missions.

Flight rate—*both* upmass and downmass—is a major constraint to development of the market. In the report, "Life and Physical Sciences Research for a New Era of Space Exploration", the National Research Council noted that, "conditioned down mass is of particular importance…" because without it, only basic analyses that do not require experiment or sample return to the Earth's surface can be conducted. Related to flight opportunities are flight costs. The U.S. Government Accountability Office noted in 2009 that launch costs are "prohibitive" to researchers seeking to fund their own way to orbit. An additional significant constraint is that availability of private (non-Government) funding for basic research activities is low, so reaching maturity in absence of government funds will be a challenge. In addition, space-based research techniques remain at risk of being supplanted by ground-based methodologies that offer similar results under more cost-effective conditions.

Most research activities conduced in LEO or onboard ISS to date have been basic research in character. Over the forecast period a gradual shift from basic to translational research could occur if the Government invests in proof-of-concept experiments that stimulate private interest. If the Government does not invest in this early stage research, it will impede the development of commercial applications.

As an example of proof-of-concept activities that might be enabled by in-space technology demonstration activities, Bigelow Aerospace and NASA have discussed connecting a Bigelow Expandable Activity Module (BEAM) to the ISS. Connecting a BEAM to the ISS would provide a demonstration of Bigelow's technology. The demonstration would also provide both NASA and Bigelow with data on the performance of inflatable space habitation modules in orbit. With a successful demonstration of the ISS's technology development capabilities, other users may follow.

Section 5.3: Other Markets

Other markets may be enabled by development of commercial crew and cargo transportation systems. These other markets include: satellite servicing, media and entertainment, and education. Historically, for example:

- Two commercial satellites have benefited from human-tended rescue performed by the Space Shuttle during a single mission in 1984: Palapa B2 and Westar 6.
- A number of companies have used spacecraft, particularly the Russian space station Mir and the Russian segment of the ISS, for advertising and other media projects (the first non-Government funded spaceflight participant was funded by a television broadcasting company).

- A commercial firm is preparing the first Science, Technology, Engineering, and Mathematics (STEM) mission that does not require NASA funding, for 16 school districts.

Satellite Servicing

Rescue of satellites stranded in an incorrect orbit is a relatively advanced capability that could be supported by commercial crew transportation spacecraft. To date, all human-tended servicing missions to date have been conducted by Government-funded missions performed by either the United States or Russian Governments. In addition, most commercially operated satellites in LEO are not valuable enough to justify a human-tended rescue mission. Thus, this market has not seen much historical activity.

However, there are two historical examples cited above, the Palapa B2 and Westar 6. In addition, between 1997 and 2009, approximately seven satellites lost greater than 50 percent of their lifespan due to being stranded in an incorrect orbit and could potentially have been candidates for servicing had the transportation capability been available.

Media and Entertainment

Mir, along with its cosmonauts, was a platform for companies such as Pepsi and MTV to launch promotional activities. This included an ad filmed on Mir that aired in September of 1997 during the MTV Music Awards. In 1999, Pizza Hut spent $1 million for the rights to plant a large logo on the side of a Proton launcher headed for the ISS. The following year, Pizza Hut worked with Russian food scientists to deliver oven-ready pizzas to ISS incumbents. Shortly after, Kodak paid to have their logo and a slogan placed onto a material that was to be tested for durability in space on the outside of the ISS. In 2001, Radio Shack & Popular Mechanics also worked out deals with the Russians for advertising on the ISS.

More recently, Bigelow Aerospace carried out a “Fly Your Stuff” promotion through their Genesis I and Genesis II. Photos taken within the Genesis I reveal banners and logos from different companies lined against the module’s interior walls. In addition to images and logos, Bigelow Aerospace allowed the public to send small items to space. Once in space, the items were photographed floating in Genesis II and those images were made visible on the Bigelow website.

Also, IMAX Corporation and NASA have developed a long-standing partnership which has enabled millions of people to virtually travel into space through a series of award-winning films. A list of those IMAX films is provided in Figure 11.

Title	Production Year
Hail Columbia	1981
The Dream is Alive	1985
Blue Planet	1990
Destiny in Space	1994
Cosmic Voyage	1996
L5: First City in Space	1996
Mission to MIR	1997
Space Station 3D	2002
Magnificent Desolation	2005
Hubble 3D	2009

Figure 11: NASA IMAX Movies

While past media and entertainment efforts have largely involved the use of government crew members on vehicles, one private spaceflight participant has flown as part of a media project. In 1989, Tokyo Broadcasting System (TBS) paid the Soviet Government to fly one of its journalists, Toyohiro Akiyama, to the Mir space station. Akiyama flew on Mir for one week in December 1990, providing reports for TBS. Since then, there have been several proposals to fly journalists, actors, or other media and entertainment professionals into space.

Education

As most people are aware, almost all shuttle missions and ISS expeditions have an education outreach component, whether that being astronauts talking with school children or filmed activity on Shuttle/ISS for educational purposes. Although the shuttle program will be ending, NASA's education efforts will continue to utilize the inspirational people, resources and facilities at its disposal, including the Astronaut Corps and the International Space Station, to assist the Nation to inspire a new generation of scientists and engineers.

An education-related market may develop in the future, thanks to lower cost research opportunities enabled by concepts such as NanoRacks. The approach of NanoRacks is to use increasingly sophisticated and powerful small space systems, along with a no-frills business model that drives down user cost. In 2010, the National Center for Earth and Space Science Education partnered with NanoRacks to perform the Student Spaceflight Experiments Program (SSEP). This program allows 16 microgravity science experiments, developed by grade 5-12 students, to be sent into space onboard the space shuttle. The 16 experiments were chosen from 447 proposals. SSEP is the first pre-college STEM education program to be both a national initiative and implemented as a commercial venture. Future SSEP missions will leverage the National Laboratory capability of the ISS in which NASA would provide the transportation and host the NanoRacks experiment platform.

Size of Other Markets

During our analysis for this report, we found no detailed studies of the demand for satellite servicing, media and entertainment, and educational activities on the ISS or elsewhere in LEO that can be enabled by commercial cargo and crew vehicles, beyond the anecdotal evidence cited above. This suggests that these other markets will not be drivers for the initial commercial demand for cargo and crew transportation systems. Hence, lower and upper ranges are not provided. However, given that there has been some historical activity shown to exist and the fact that, over time, activity in these markets may expand, they have been included in this report.

Section 5.4: Market Aggregation

Figure 12 combines the estimated projected sizes of the markets addressed in the previous section, for both the lower and upper ends. At the lower end, the overall market is dominated by national interests, a market with a decades-long track record of interest from nations seeking human access to space. The remainder of the market at the lower bound comes from tourism, another market with a lengthy record of interest that is expected to continue. Tourism becomes more of a driver at the upper end of the range, given the surge in demand expected by industry sources in the coming decade.

Market Segment	Cargo (lbs)		Crew	
	Lower End	Upper End	Lower End	Upper End
National Interests	6,180	24,720 - 28,430	36	186 - 216
Tourism	990	17,700	8	143
Applied Research and Technology Development	0	9,500 - 13,400	-	-
Other Enabled Markets	-	-	-	-
Total	**7,170**	**51,920 - 59,530**	**44**	**329 - 359**

Figure 12: Aggregated Non-Government Markets – 10-Year Total

A key factor in this analysis is that the market for crew transportation drives the overall market. That is, in the case of the lower end of the cargo market, 100 percent comes from supplies needed to support the crew during missions. For the upper end of the assessment, cargo to support the crew is still by far the biggest component to the overall projection, with the Applied Research and Technology Development market the only cargo market (i.e. experiments and support equipment) which does not also have a crew component. This suggests that the development of commercial crew transportation systems is essential to enabling the overall market growth for commercial space transportation capabilities in LEO.

Section 6.0: Other Relevant Considerations

Any discussion of commercial crew markets would not be complete without mention of U.S. Government needs. The U.S. Government provides the foundational market from which the commercial markets can grow and expand. Also, components of the systems, such as the launch vehicle and spacecraft, have commercial potential beyond just transporting crew and cargo to LEO. This section provides a top-level overview of the commercial potential for components of crew and cargo systems. In addition, the outlook for commercial crew and cargo systems beyond 10 years is also relevant to this report and is included in this section.

Section 6.1: U.S. Government Market for Commercial Crew and Cargo Capabilities

While the commercial markets described above are real and potentially large, NASA's need for commercial crew and cargo services is clearly the foundational market from which additional non-Government markets can be established. With the decision to extend the life of the ISS to 2020 or beyond, there is now a long-term, sustainable market for commercial human space transportation services.

Some potential commercial crew providers have indicated that the U.S. Government/NASA market is sufficient *in and of itself*. Per Boeing's voluntary, non-proprietary input to NASA for this report: "Although we can close our business case on NASA services alone, it is the potential upside generated by a commercial market that offsets the investment and risk inherent with a commercial crew LEO transportation development effort."

The most significant, and currently the only planned and funded, U.S. government mission for commercial crew and cargo services is ISS crew transportation and cargo resupply. The other missions listed in this section are entirely notional and are not currently planned or funded. They are potential U.S. Government missions that may arise in the future.

NASA ISS Mission

For the ISS mission, NASA requires safe and reliable crew rotation capability for up to four U.S. or U.S.-sponsored crewmembers per flight, two flights per year. This also includes providing an assured crew return/rescue capability for these crewmembers while the commercial spacecraft is docked to the ISS. Assuming services begin in 2016 and go through to 2020, there will be a need for up to 40 astronaut flights during the assessment period.

Regarding cargo, NASA is already under contract to purchase 132,000 pounds (60 MT) of cargo resupply services for the first half of this decade. In addition, NASA anticipates requiring an additional 132,000 pounds of cargo delivery to the ISS from 2016 - 2020. The cargo complement is composed of oxygen, water, food, clothing, medicine, spare parts, new science technology developments, etc. Cargo usage is annually assessed and changes based on the latest information on key cargo requirement drivers. Figure 13 shows a summary of NASA's projected needs for commercial crew and cargo transportation for the ISS during the assessment period to meet total ISS crew and cargo needs.

NASA ISS Crew and Cargo Market	Number of Astronaut Flights	Amount of Cargo (lbs)
Estimated Amount	Up to 40	264,000

Figure 13: Summary of Applied NASA Market for ISS Crew and Cargo

It should be noted that any flights above NASA's needs for commercial crew and cargo transportation to the ISS (i.e., all the non-U.S. Government projections shown in Figure 13) could have a profound impact on the business case for commercial services. As the Augustine report noted, *"…if there were only one non-NASA flight of this system per year, it would reduce the NASA share of the fixed recurring cost by 33 percent."*

More importantly, Figure 13 only shows NASA's needs for commercial crew and cargo transportation during the assessment period. NASA has already purchased over 40 crew seats on the Russian Soyuz system for ISS crew transportation and rescue services at a cost of well over $1 billion. Had commercial crew transportation been available to NASA, those 40+ crew seats could have been purchased from U.S. aerospace companies. Additionally, every year that there is a delay in the availability of commercial crew transportation (either because of budget cuts or other delays), some of the seat opportunities shown in Figure 13 will be transferred to Russia for the purchase of even more Soyuz seats.

Commercial Space Station Mission

A commercial space station mission would entail providing NASA crew access and/or cargo transfer to a commercially sponsored space station in LEO, which is functioning as a science platform. NASA-sponsored crew could participate in science experiments onboard a commercial space station. Cargo could include NASA science experiments which would require access to unique scientific equipment aboard a commercial space station.

Rescue Mission

This would entail a rescue mission to an inhabited space station operating in LEO, to rescue and return to Earth a crew whose spacecraft is no longer safe for return. In this scenario, a major malfunction would have to occur to the crew return spacecraft while it was docked to an orbiting space station. The crew would then remain on the station awaiting launch of a rescue vehicle.

Exploration Crew Transportation Mission

For this mission, NASA would require safe and reliable crew access (and potentially cargo transfer) to a NASA-developed Exploration Spacecraft System (ESS) loitering in LEO. Upon transfer of crew members to the ESS, an uncrewed (or minimally crewed) crew transportation system spacecraft would separate from the ESS. The ESS would depart LEO without the crew transportation system and would perform a deep space mission, providing its own Earth return capability once the deep space mission was completed. The crew transportation system would de-orbit and land at an appropriately chosen landing site.

Satellite Servicing Mission

The objective for this mission would be to provide servicing of NASA satellites (or potentially satellites owned by other Government agencies and serviced by NASA crew) in LEO. In general, each satellite servicing mission would have a unique inclination and altitude and unique servicing needs. Cargo carrying capability for these servicing missions would have to include all hardware and tools necessary to perform the servicing and return any items required for post-flight analysis.

Repair missions of the Hubble Space Telescope (HST) in 1993, 1997, 1999, 2002 and 2009 are perhaps the most well-known examples of on-orbit servicing. In addition, the NASA Solar Maximum Mission (SMM), launched in 1980, operated until 1981 when the attitude control system failed. The Space Shuttle Challenger successfully serviced the SMM satellite in 1984 during mission STS-41C, fully restoring functionality.

Propellant Refueling Mission

One space architecture concept that has garnered interest is the propellant depot. Such depots would store propellants in Earth orbit or other locations, such as Earth-moon Lagrange points, for use by commercial or government spacecraft for various applications, from human exploration missions to refueling commercial satellites. Depots would allow spacecraft to be launched "dry", or without any propellant on board, increasing the amount of useful mass that can be launched on a single vehicle; the spacecraft would then obtain its necessary propellant at the depot.

Depots have the potential to significantly increase the market for commercial launch vehicles developed for or adapted to commercial crew and cargo technology systems by launching propellant to the depots. Crew and cargo vehicles could also be adapted to support these vehicles by serving as tugs to transport propellant modules or spacecraft to be refueled to and from the depots. Specific launch and spacecraft requirements for depots would depend on a number of factors, including the orbit the depot is in and the types of propellants it would host.

Market for Components of the Commercial Crew and Cargo Systems

Pursuant to the language in the NASA Authorization Act of 2010, this study assesses the markets for complete commercial crew and cargo systems. However, individual components of these systems, particularly the launch vehicles, can address markets beyond those analyzed in this report.

Launch of Commercial Spacecraft

A major, existing market for commercial space transportation is the launch of commercial satellites intended to serve markets such as communications and remote sensing. In addition, some non-U.S. Governments without indigenous launch capabilities procure launch services on the commercial market. Over the last 10 years there have been an average of approximately 21 commercial launches per year globally, primarily consisting of commercial communications satellites operating in geosynchronous orbit. The *2010 Commercial Space Transportation Forecasts* by the FAA's Office of Commercial Space Transportation and its Commercial Space Transportation Advisory Committee projects an average of over 27 commercial launches per year from 2010-2019, again dominated by commercial geosynchronous orbit communications satellites.

New launch vehicles developed for commercial crew and cargo systems, or existing vehicles adapted to for use in those systems, could be used for commercial satellite launches as well. SpaceX has already demonstrated some success in this area, selling a number of commercial satellite launches on its Falcon 9 vehicle developed as part of the COTS program. Commercial satellite launch demand, along with that from crew and cargo launch markets, can allow launch services providers to amortize fixed costs over a larger number of missions, reducing per-launch costs and making them more competitive on the global launch market.

Launch of U.S. Government Spacecraft

Launch vehicles developed for or adapted to commercial crew and cargo transportation systems can also be used for the launch of U.S. Government civil and national security spacecraft. This is already the case for the Atlas V and Delta IV vehicles, developed originally for those missions and more recently proposed by a number of companies as the launch vehicles for their commercial crew transportation systems. The additional demand for commercial crew and cargo launches for NASA and commercial applications can help support the industrial base by increasing production rates and thus lowering per-unit costs.

Outlook Beyond 10 Years

This assessment examined potential markets for commercial crew and cargo vehicles out to a ten-year horizon, primarily because of the long-term uncertainties inherent in any market assessment as well as the expected operational life of the ISS. However, it is possible to qualitatively assess the outlook for these and other markets associated with such vehicles beyond 2020.

One major factor in the long-term outlook for such services is the lifetime of the ISS. The Governments of Japan and the Russian Federation have approved continued ISS operations beyond 2016. The NASA

Authorization Act of 2010 extended ISS operations until at least 2020. In March 2011, the European Space Agency Council approved continued ISS operations to at least 2020. The Canadian Space Agency is working with its Government to reach consensus about the continuation of the ISS. However, ISS operations beyond 2020 are uncertain. Continued use of the ISS beyond 2020 will depend on both technical issues with the station, as some core elements of the station approach the end of their design life, and the perceived utility of the station by the ISS Partner nations. Should technical considerations permit and ISS Partners find that government and commercial uses of the ISS have sufficient merit, ISS operations may continue well into the 2020s, extending the market for commercial crew and cargo services.

Even after the ISS reaches the end of its life, there will likely be continued human spaceflight operations in LEO. NASA's mission of space exploration is written into law in the National Aeronautics and Space Act, and it has been repeatedly authorized by multiple Congresses over the years. Thus, NASA is expected to be in the business of human spaceflight for the foreseeable future. New spacecraft developed and/or operated by Government agencies either as a direct successor to the ISS or in preparation for human spaceflight activities beyond Earth orbit can be projected. Government agencies may also choose to buy or lease commercially-developed orbital facilities, while other such facilities are used by commercial entities for tourism, research, and other markets.

Many of the markets studied in this assessment have growth potential that is likely to continue beyond this study's 10-year horizon. Tourism, for example, is likely to grow provided there is sufficient supply of transport spacecraft and orbital facilities to host them. Commercial research and development activities may grow at a significant rate, particularly if there are success stories from research activities in the next 10 years that demonstrate the value of space research to commercial customers. Media and entertainment, which is not foreseen to be a leading market in the next 10 years, may be able to leverage the capabilities developed for other markets and grow considerably beyond the ten-year horizon of this forecast. As in all cases, though, disruptive developments, both positive and negative such as accidents, economic downturns, or the development of new technologies could affect the long-term outlook for commercial cargo and crew transportation systems.

Section 6.2: How Government Interest/Action Can Help Spur Markets

Another major factor, perhaps the largest, that will affect the development of commercial crew and cargo markets is U.S. Government action. If the Government takes no action, many of the markets described in this report will likely not emerge to any significant degree in the next decade. The Augustine Committee stated, "*…unless NASA creates significant incentives for the development of the [commercial crew] capsule, the service is unlikely to be developed on a purely commercial basis.*" This conclusion was largely echoed by the final report of the FAA Workshop on Commercial Human Spaceflight, which concluded, "*The workshop participants expressed a general confidence that a commercial human spaceflight market will develop over time. They had considerably less confidence in the near-term viability of human space flight as a purely commercial enterprise*."

NASA's Commercial Crew Program is specifically designed to reduce the risk for private industry by providing significant financial and technical assistance for the development of these systems. Once these systems are proven to be safe and mature, NASA plans to be a reliable, long-term customer for crew transportation services. NASA believes that by providing both assistance in the system development and demand for the service, the "business case" for commercial human spaceflight providers can close for one or more U.S. aerospace companies.

Historical Examples

There are several historical examples where the U.S. Government, through direct financial and technical assistance, deliberately contributed to the development of new or expanded commercial transportation markets. The enabling legislation for the funding of the other transport industries clearly referenced the U.S. Government's strategic interest in seeing such a market develop for reasons that include but were never limited to the development of commerce. In other words, a frequently cited reason was the U.S. Government's interest in the further development of national capabilities in new technical realms. A similar situation exists today where commercial spaceflight capabilities can contribute to building new or expanding existing industries, but also support a Government interest of access to LEO for crew and cargo.

- **Railroads**

  Transcontinental railroad construction in the United States was initially enabled by the Pacific Railroad Acts approved in the mid-1800s. These acts authorized the issuance of Government bonds and the grants of land to railroad companies. From 1850-1871, the railroad companies received more than 175 million acres of public land, an area more than one tenth of the whole United States and larger in area than the state of Texas.

  The first transcontinental railroad was completed on May 10, 1869, establishing the possibility of travel from New York to San Francisco in six days. The commitment of consistent investment in railway development by the Government also supported and attracted related investment by the private sector in the United States and abroad. With both Government and private funding sources available, railroad mileage grew strongly, expanding from 9,000 miles in 1850 to over 129,770 miles in 1890. Government support for railways continued well into the era of airline travel as well. By year-end 2007, U.S. railroads operated 160,627 miles of track with 167,000 employees and generated $54 billion in annual operating revenues.

- **Airmail**

  Similarly, in the mid-1920s, legislation sponsored by Congressman Clyde Kelly of Pennsylvania, Chairman of the House Post Office Committee, authorized the Postmaster General to contract for domestic airmail service with commercial air carriers. The bill, which became known as the Air Mail Act of 1925, or the Kelly Act, also set airmail rates and the level of cash subsidies to be paid to companies that carried the mail. By transferring airmail operations to private companies, the U.S. Government effectively created the commercial aviation industry.

  Harry S. New, Postmaster General under President Calvin Coolidge, awarded contracts to the largest commercial companies with the largest aircraft, which could accommodate more passengers as well as the mail. Mr. New anticipated that increasing revenues from passengers, who at the time numbered only a few hundred each year, would eventually lead to more profit for the airlines. Additional airline profits would, in turn, directly reduce the burden of subsidy for airmail paid by the Post Office.

  Over time, the domestic airlines have grown steadily. Today, the commercial airline industry, initially derided as a fad, is recognized as a fully mature and fundamental part of the nation's infrastructure generating over $106 billion in 2009 revenues by the U.S. commercial passenger airlines.

Section 6.3: Government Catalyst for Commercial Cargo and Crew

Initiated in 2005, the COTS program has been making steady progress in the development of commercial cargo systems to resupply the ISS. A notable milestone occurred in December 2010 when SpaceX successfully completed its first demonstration flight under the COTS program by launching the Falcon 9 launch vehicle to orbit, separating the Dragon space capsule, completing two full orbits of the Earth, safely landing in the Pacific Ocean, and recovering the Dragon capsule.

While COTS cannot yet be considered a full success since no cargo has been delivered to the ISS, the COTS cargo project has already made a significant difference to NASA and the U.S. space industry. The following situation existed as recently as 2008:

- With the pending retirement of the space shuttle, NASA was facing a shortfall in ISS cargo resupply capability of some 60 metric tons in the first part of the decade which would have significantly curtailed the productivity of this laboratory in space;
- With the pending phase-out of the Delta II, there would have essentially been no mid-sized satellite launch capability for NASA science missions forcing those missions to either squeeze into a small launch vehicle or grow the size and cost of the payload to fit an Evolved Expendable Vehicle class launch vehicle; and
- The U.S. market share of commercial launch contracts was averaging less than 15 percent.

Today, NASA has contracts with two U.S. commercial providers for ISS cargo delivery services which, along with our International Partners, provide a robust portfolio of ISS resupply capabilities. Mid-sized NASA science missions can again be planned with the addition of the Falcon 9 launch vehicle into NASA's stable of vehicle options and potentially the addition of the Taurus II. In addition, SpaceX was recently awarded the largest commercial launch vehicle contract in history to launch a new constellation of Iridium satellites. All this, for a very modest U.S. Government investment and within a very short period of time compared to historical spaceflight development efforts. Thus, COTS has already proved successful in meeting one of its primary objectives which was to "create a market environment where commercial space transportation services are available to U.S. Government and private sector customers."

NASA's pending Commercial Crew Program, as proposed in the President's FY 2012 budget request, would significantly reduce the technical, programmatic, and financial risk associated with the development of crew transportation systems. FAA's report of the Commercial Human Spaceflight workshop which summarizes additional roles the U.S. Government could take in supporting commercial spaceflight:

> *"…industry and the panel agree that if policy makers decide that a transition to commercial launch services is in the national interest, the government must take more aggressive measures to support the development of the industry, such as the following:*
>
> *a. Act as the anchor tenant customer for the foreseeable future, including guaranteeing a market greater than five years of ISS support.*
>
> *b. Invest in system and/or infrastructure development to limit capital requirements and shorten payback periods. Several companies required that the government fund at least part of the development of the human system as a condition of their participation.*
>
> *c. Offer or facilitate limitations on liability.*
>
> *d. Provide mature, stable requirements, including human rating requirements, as soon as possible.*

e. *Ensure that NASA and the FAA agree on a coherent set of requirements and regulations that enable fielded systems to serve both government and non-government customers.*

f. *Insulate commercial providers from financial penalties associated with schedule impacts that may arise from conservative decisions required to operate safely*."

Section 7.0: Conclusion

This report assessed the market for commercial crew and cargo services, ranging from space tourism to research and development to national interests. Over time, the commercial markets identified in this report hold the strong promise of significantly more customers, more flights, and potentially lower prices to the U.S. Government. Even at the lower end of the range, which assumes absolutely no growth in the markets above what has already been experienced historically, the non-U.S. government market for crew transportation matches the U.S. Government market projection. At the upper end of the range, commercial markets drive the overall market and, in some cases, dwarf the U.S. Government projections for crew transportation.

From the Augustine Committee report:

> "*Given the appropriate incentives, this [commercial space] industry might help overcome a long-standing problem. The cost of admission to a variety of space activities strongly depends on the cost of reaching LEO. These costs become even greater when, as is the circumstance today, large sums are paid to develop new launch systems but those systems are used only infrequently. It seems improbable that order-of magnitude reductions in launch costs will be realized until launch rates increase substantially. But this is a 'chicken-and-egg' problem. The early airlines faced a similar barrier, which was finally resolved when the federal government awarded a series of guaranteed contracts for carrying the mail. A corresponding action may be required if space is ever to become broadly accessible. If we craft a space architecture to provide opportunities to industry, creating an assured initial market, there is the potential -- not without risk -- that the eventual costs to the government could be reduced substantially*."

The clearly identifiable market of the ISS for regular cargo delivery and return, and crew rotation provides the "corresponding action" referred to in the Augustine report and provides a foundation for private sector development efforts to succeed. With the fully operational ISS, there exists for the first time a strong, identifiable market for "routine" transportation services to and from LEO. This base market provides sufficient justification, in and of itself, for at least one established aerospace company to project that it can close its business case.

If successful, NASA's Commercial Crew Program will provide assured access to the ISS. It will end the gap in U.S.-provided human access to space and ensure we do not cede the U.S. leadership role in space. It will also allow NASA to concentrate its limited resources on exploration beyond LEO, enabling NASA to go further faster in the exploration of the solar system. It benefits U.S. private industry by strengthening the U.S. industrial base, enhancing our capabilities, and capturing market share of a new high technology industry. In addition, it benefits the Nation with more jobs, economic growth, and opportunities for human spaceflight for a variety of people (e.g., astronauts, international partner personnel, scientists, spaceflight participants) for a variety of reasons (e.g., science, research, ISS operations, tourism).

For these reasons, it is important that the Congress support NASA's commercial cargo and crew efforts. Delays in the availability of commercial spaceflight capabilities negatively affect the markets described in this report and degrade the business case for commercial providers. Catalyzed by a successful

Commercial Crew Program, a stable commercial non-Government market is likely to emerge. Without this catalyst, prospects for such a market emerging are considerably lessened. New potential suppliers are poised to try, and now is the time to open this new vista for American industry.

Bibliography

American Society for Gravitational and Space Biology (ASGSB), "The American Society for Gravitational and Space Biology Calls to Reestablish American Leadership in Space Sciences," Whitepaper submitted to the NRC Decadal Survey on Biological and Physical Sciences in Space, 2009.

Astrogenetix, Inc. "Astrogenetix Performs Drug Development In Microgravity," May 26, 2010, http://www.astrogenetix.com/news-and-events/news/astrogenetix-performs-drug-development-in-microgravity (accessed February 16, 2011).

BBC, "Mir actor remains grounded," March 16, 2000, http://news.bbc.co.uk/2/hi/entertainment/679935.stm (accessed February 15, 2011).

Blumberg, Baruch S., et al, "Report of the Workshop on Space Biology on the Early International Space Station" NASA Ames Research Center, Moffett Field, CA, March 14-15, 2002.

Boeing communication with NASA on space tourism demand, released January 2011.

Boyle, Alan, "NBC launching 2001 space odyssey," MSNBC.com, September 12, 2000, http://www.msnbc.msn.com/id/15424344/ns/technology_and_science-space/ (accessed February 15, 2011).

Cantwell, Betsy, "Life and Physical Sciences for a New Era of Space Exploration." (presentation at the American Astronautical Society National Conference: ISS - The Next Decade, Cape Canaveral, Florida, November 16-17, 2010)

Carreau, Mark, "$30 million buys Austin resident a ride of Soyuz mission," *Houston Chronicle*, October 10, 2008, http://www.chron.com/disp/story.mpl/front/6052360.html, (accessed February 11, 2011).

Clark, Stephen, "Boeing space capsule could be operational by 2015," Spaceflight Now, July 21, 2010, http://www.spaceflightnow.com/news/n1007/21boeing/ (accessed February 7, 2011).

Commercial Space Launch Amendments Act of 2004 (Public Law 208-492), December 23, 2004, http://www.faa.gov/about/office_org/headquarters_offices/ast/media/PL108-492.pdf (accessed February 7, 2011).

David, Leonard, "International Space Station Could Get Private Inflatable Room," SPACE.com, January 26, 2011, http://www.space.com/10686-nasa-bigelow-module-international-space-station.html (accessed February 16, 2011).

DeLucas, Larry, et al. "A Major Initial Market: Activity in Low Earth Orbit. Creating a Business Case for Protein Crystallization," (presentation at Space Investment Summit, April 17 ,2007).

de Selding , Peter B., "DLR Takes Step Toward In-orbit Servicing Demonstration," *Space News*, February 24, 2010, http://www.spacenews.com/civil/022410-dlr-takes-step-toward-in-orbit-servicing-demo.html (accessed February 4, 2011).

Eilertsen, Baard, "Market Interest in Fleet Management on Orbit Services – a Commercial Approach," Swedish Space Corporation, March 24, 2010, NASA On-Orbit Servicing Workshop Presentation.

FAA Office of Commercial Space Transportation, *2010 Commercial Space Transportation Forecasts*, May 2010, http://www.faa.gov/about/office_org/headquarters_offices/ast/media/2010_launch_forecast_report.pdf (accessed February 16, 2011)

FAA Office of Commercial Space Transportation, *Report of the Commercial Human Spaceflight Workshop, August 4-6, 2010,* report published April 2011.

Futron Corporation, *Space Tourism Market Study: Orbital Space Travel & Destinations with Suborbital Space Travel*, October 2002, http://www.futron.com/upload/wysiwyg/Resources/Reports/Space_Tourism_Market_Study_2002.pdf (accessed February 16, 2011).

Goldstein, Jeff, "STS-134 Experiments Selected, STS-135 Opportunity Announced," Student Spaceflight Experiments Program Press Release, December 22, 2010, http://ssep.ncesse.org/2010/12/ssep-national-press-release-sts-134-experiments-selected-sts-135-opportunity-announced/ (accessed February 22, 2011).

Government Accountability Office (GAO), "International Space Station: Significant Challenges May Limit Onboard Research," November 2009.

Griffin, Michael, "Remarks to the Space Transportation Association," June 21, 2005, http://www.nasa.gov/pdf/119275main_Griffin_STA_21_June_2005.pdf (accessed February 11, 2011).

Halvorson, Todd, "Space, Inc. Part 1: Robert Bigelow, a hotel mogul working to build private space stations." *Florida Today*, November 15, 2010, http://www.floridatoday.com/article/20101114/NEWS0204/101115027/Space-Inc-Part-1-Robert-Bigelow-hotel-mogul-working-build-private-space-stations (accessed February 16, 2011).

Halvorson, Todd, "Space station production plant could bring 2K jobs to Brevard," *Florida Today*, February 3, 2011, http://www.floridatoday.com/article/20110203/BUSINESS/102030309/1007/news02/CEO++Space+station+plant+could+bring+2K+jobs+to+Brevard (accessed February 7, 2011).

Harper, Lynn, et al, "The Biotech Revolution in Space." (paper presented at the AIAA Space 2006 Conference, San Jose, California, September 19 – 21, 2006).

Kundrot, Craig E., et al., "Microgravity and Macromolecular Crystallography," *Crystal Growth & Design* Vol, 1, No. 1: 87-99.

Miller, Barry, "On-Orbit Satellite Servicing – Is There A Business Case That Makes Sense," Lockheed Martin, March 24, 2010, NASA On-Orbit Servicing Workshop Presentation.

Morring Jr., Frank, "NASA, Roscosmos Seeking More Soyuz Seats," *AviationWeek.com*, February 10, 2011, http://www.aviationweek.com/aw/generic/story_channel.jsp?channel=space&id=news/asd/2011/02/10/07.xml&headline=NASA,%20Roscosmos%20Seeking%20More%20Soyuz%20Seats, (accessed February 11, 2011).

NASA Authorization Act of 2005 (Public Law 109-155), December 30, 2005, http://legislative.nasa.gov/PL109-155.pdf (accessed February 21, 2011).

NASA Authorization Act of 2008 (Public Law 110-422), October 15, 2008, http://legislative.nasa.gov/PL%20110-422.pdf (accessed February 21, 2011).

NASA Authorization Act of 2010 (Public Law 111-267), October 11, 2010, http://legislative.nasa.gov/PL%20111-267.pdf (accessed February 7, 2011).

NASA, "NASA Deputy Administrator Visits Nevada Innovation Sites", February 4, 2011, http://www.nasa.gov/home/hqnews/2011/feb/HQ_11-033_GarverNevada.html (accessed February 15, 2011).

NASA, International Space Station Program-provided data, February 2010.

NASA, "Plan to Support Operations and Utilization of the International Space Station Beyond FY 2015, pursuant to The NASA Authorization Act of 2008," August 6, 2009, http://www.nasa.gov/pdf/472057main_CORRECTED_ISS_Beyond_2015_Report_sec_601_FINAL_8_14_09.pdf (accessed February 22, 2011).

NASA Marshall Space Flight Center, "Orbital Space Plane Fact Sheet", May 2003, http://www.nasa.gov/centers/marshall/news/background/facts/ospfacts.html (accessed February 11, 2011).

NASA, CSA, ESA, JAXA, and Roscosmos, "The Era of International Space Station Utilization, Perspectives on Strategy from International Research Leaders" 2010.

National Research Council, "Life and Physical Sciences Research for a New Era of Space Exploration: An Interim Report." 2010.

National Space Policy of the United States of America, June 28, 2010, http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf (accessed February 21, 2011).

Orbital Sciences Corporation, "Cygnus™ Advanced Maneuvering Spacecraft," http://www.orbital.com/NewsInfo/Publications/Cygnus_fact.pdf (accessed February 7, 2011).

Orbital Sciences Corporation, "Orbital Submits Proposal for NASA's Commercial Crew Development Program," December 14, 2010, http://www.orbital.com/NewsInfo/release.asp?prid=756 (accessed February 7, 2011).

President's Commission on Implementation of United States Space Exploration Policy, *A Journey to Inspire, Innovate, and Discover*, June 2004, http://govinfo.library.unt.edu/moontomars/docs/M2MReportScreenFinal.pdf (accessed February 11, 2011).

ProOrbis, LLC, "Reference Model for the International Space Station U.S. National Laboratory." 2010.

Review of U.S. Human Spaceflight Plans Committee, *Seeking a Human Spaceflight Program Worthy of a Great Nation*, October 2010, http://www.nasa.gov/pdf/396093main_HSF_Cmte_FinalReport.pdf (accessed February 11, 2011).

Robinson, Julie A. "International Space Station: Research Capabilities in Life and Physical Sciences Early Utilization Results" (presentation to the NRC Decadal Survey, May 7, 2009).

Rogers, Everett M. *Diffusion of Innovations,* 5th Edition, Free Press, 2003.

Shiryaevskaya, Anna, “Space Adventures, Russia Agree to Expand Tourist Trips in 2013,” Bloomberg Businessweek, January 12, 2011, http://www.businessweek.com/news/2011-01-12/space-adventures-russia-agree-to-expand-tourist-trips-in-2013.html, (accessed February 11, 2011).

Sierra Nevada Corporation, “Virgin Galactic Joins in Sierra Nevada Space Systems Dream Chaser Orbital Space Vehicle Program,” December 15, 2010, http://www.sncorp.com/news/press/pr10/snc_vg.shtml (accessed February 7, 2011).

Space Adventures, “Space Adventures Concludes Agreement to Offer Commercial Spaceflight Opportunities to the International Space Station,” January 12, 2011, http://www.spaceadventures.com/index.cfm?fuseaction=news.viewnews&newsid=817 (accessed February 11, 2011).

Space Commercial Laboratory Applications Working Group. 2010. https://sites.google.com/site/spacecommerciallabworkinggroup/ (accessed February 3, 2011).

SPACEHAB, “Enterprise Module and Space Station Internet Media Company Will Take Space Commerce to New Heights,” December 10, 1999, http://www.spaceref.com/news/viewpr.html?pid=269 (accessed February 15, 2011).

SpaceX, “Dragon Overview”, http://www.spacex.com/dragon.php (accessed February 7, 2011).

SpaceX, “DragonLab,” http://www.spacex.com/downloads/dragonlab-datasheet.pdf (accessed February 7, 2011).

SpaceX, “Iridium and SpaceX Sign Major Commercial Launch Contract”, June 16, 2010, http://www.spacex.com/press.php?page=20100616 (accessed February 16, 2011).

SpaceX, “Taking the Next Step | Commercial Crew Development Round 2”, January 17, 2011, http://www.spacex.com/updates.php (accessed February 7, 2011).

Stodieck, Louis S., “ISS National Laboratory: Commercial and Educational Research.” (presentation at the American Astronautical Society National Conference: ISS - The Next Decade, Cape Canaveral, Florida, November 16 – 17, 2010).

Thumm, Tracy, et al, “The Era of International Space Station Utilization Begins: Research Strategy, International Collaboration, and Realized Potential” (paper presented at 61st International Astronautical Congress, Prague, Czech Republic, September 27 - October 1, 2010).

Uhran, Mark, “Positioning the International Space Station for the Utilization Era,” (presentation at the 49th AIAA Aerospace Sciences Meeting, January 4-7, 2011).

ViviSat, “ViviSat Launched: New Venture Will Provide Satellite Life Extension Services”, January 13, 2011, http://www.vivisat.com/?page_id=70 (accessed February 16, 2011).

Wilford, J.N., “Space Salvage: Lost Satellites are the Prize,” *New York Times*, November 6, 1984.

Webber, D. and Reifert, J. “Filling in Some Gaps”, Executive Summary of the Adventurers’ Survey of Public Space Travel, September 2006.

Appendix A – Historical Astronaut Flights by National Interests

Astronaut	Nation	Launch Date	Flight Up	Flight Back	Flight Time (days)
Remek, Vladimir	Czechoslovakia, now Czech Republic	3/2/1978	Soyuz 28	Soyuz 28	7.93
Hermaszewski, M	Poland	6/27/1978	Soyuz 30	Soyuz 30	7.92
Jaehn, Sigmund	Germany	8/26/1978	Soyuz 31	Soyuz 29	7.87
Ivanov, Georgy	Bulgaria	4/10/1979	Soyuz 33	Soyuz 33	1.96
Farkas, Bertalan	Hungary	5/26/1980	Soyuz 36	Soyuz 35	7.86
Tuan, Pham	Vietnam	7/23/1980	Soyuz 37	Soyuz 36	7.86
Mendez, Arnaldo	Cuba	9/18/1980	Soyuz 38	Soyuz 38	7.86
Gurragcha, J	Mongolia	3/22/1981	Soyuz 39	Soyuz 39	7.86
Prunariu, D	Romania	5/14/1981	Soyuz 40	Soyuz 40	7.86
Chretien, Jean-Loup	France	6/24/1982	Soyuz T-6	Soyuz T-6	7.91
Merbold, Ulf	Germany	11/28/1983	STS-9	STS-9	10.32
Sharma, Rakesh	India	4/3/1984	Soyuz T-11	Soyuz T-10	7.90
Garneau, Marc	Canada	10/5/1984	STS-41-G	STS-41-G	8.22
Baudry, Patrick	France	6/17/1985	STS-51-G	STS-51-G	7.07
AlSaud, Sultan	Saudi Arabia	6/17/1985	STS-51-G	STS-51-G	7.07
Furrer, Reinhard	Germany	10/30/1985	STS-61-A	STS-61-A	7.03
Messerschmid, Ernst	Germany	10/30/1985	STS-61-A	STS-61-A	7.03
Ockels, Wubbo	Netherlands	10/30/1985	STS-61-A	STS-61-A	7.03
Neri Vela, Rodolfo	Mexico	11/27/1985	STS-61-B	STS-61-B	6.88
Faris, MA	Syria	7/22/1987	Soyuz TM-3	Soyuz TM-2	7.96
Alexandrov, Alexander	Bulgaria	6/7/1988	Soyuz TM-5	Soyuz TM-4	9.84
Mohmand, A	Afghanistan	8/29/1988	Soyuz TM-6	Soyuz TM-5	8.85
Chretien, Jean-Loup	France	11/26/1988	Soyuz TM-7	Soyuz TM-6	24.76
Sharman, Helen	Britain	5/18/1991	Soyuz TM-12	Soyuz TM-11	7.88
Viehboeck, Franz	Austria	10/2/1991	Soyuz TM-13	Soyuz TM-12	7.93
Bondar, Roberta	Canada	1/22/1992	STS-42	STS-42	8.05
Merbold, Ulf	Germany	1/22/1992	STS-42	STS-42	8.05
Flade, Klaus-Dietrich	Germany	3/17/1992	Soyuz TM-14	Soyuz TM-13	7.91
Frimout, Dirk	Belgium	3/24/1992	STS-45	STS-45	8.92
Tognini, Michel	France	7/27/1992	Soyuz TM-15	Soyuz TM-14	13.79
Malerba, Franco	Italy	7/31/1992	STS-46	STS-46	7.97
Nicollier, Claude	Switzerland	7/31/1992	STS-46	STS-46	7.97
Mohri, Mamoru	Japan	9/12/1992	STS-47	STS-47	7.94
MacLean, Steve	Canada	10/22/1992	STS-52	STS-52	9.87

Astronaut	Nation	Launch Date	Flight Up	Flight Back	Flight Time (days)
Schlegel, Hans	Germany	4/25/1993	STS-55	STS-55	9.99
Walter, Ulrich	Germany	4/25/1993	STS-55	STS-55	9.99
Haigere, Jean-Pierre	France	7/1/1993	Soyuz TM-17	Soyuz TM-16	20.67
Nicollier, Claude	Switzerland	12/2/1993	STS-61	STS-61	10.83
Mukai, Chiaki	Japan	7/8/1994	STS-65	STS-65	14.75
Merbold, Ulf	Germany	10/3/1994	Soyuz TM-20	Soyuz TM-19	31.52
Clervoy, Jean-Francois	France	11/3/1994	STS-66	STS-66	10.94
Reiter, Thomas	Germany	9/3/1995	Soyuz TM-22	Soyuz TM-22	179.07
Hadfield, Chris	Canada	11/12/1995	STS-74	STS-74	8.19
Wakata, Koichi	Japan	1/11/1996	STS-72	STS-72	8.92
Cheli, Maurizio	Italy	2/22/1996	STS-75	STS-75	15.74
Guidoni, Umberto	Italy	2/22/1996	STS-75	STS-75	15.74
Nicollier, Claude	Switzerland	2/22/1996	STS-75	STS-75	15.74
Garneau, Marc	Canada	5/19/1996	STS-77	STS-77	10.03
Thirsk, Robert	Canada	6/20/1996	STS-78	STS-78	16.91
Favier, Jean-Jacques	France	6/20/1996	STS-78	STS-78	16.91
Haignere, Claudie	France	8/17/1996	Soyuz TM-24	Soyuz TM-23	15.77
Ewald, Reinhold	Germany	2/10/1997	Soyuz TM-25	Soyuz TM-24	19.69
Clervoy, Jean-Francois	France	5/15/1997	STS-84	STS-84	9.22
Tryggvason, Bjarni	Canada	8/7/1997	STS-85	STS-85	11.85
Chretien, Jean-Loup	France	9/26/1997	STS-86	STS-86	10.81
Doi, Takao	Japan	11/19/1997	STS-87	STS-87	15.69
Kadenyuk, Leonid	Ukraine	11/19/1997	STS-87	STS-87	15.69
Eyharts, Leopold	France	1/29/1998	Soyuz TM-27	Soyuz TM-26	20.69
Williams, Dafydd	Canada	4/17/1998	STS-90	STS-90	15.91
Mukai, Chiaki	Japan	10/29/1998	STS-95	STS-95	8.91
Duque, Pedro	Spain	10/29/1998	STS-95	STS-95	8.91
Haigere, Jean-Pierre	France	2/20/1999	Soyuz TM-29	Soyuz TM-29	188.85
Bella, Ivan	Slovakia	2/20/1999	Soyuz TM-29	Soyuz TM-28	7.91
Payette, Julie	Canada	5/27/1999	STS-96	STS-96	9.80
Tognini, Michel	France	7/23/1999	STS-93	STS-93	4.95
Clervoy, Jean-Francois	France	12/20/1999	STS-103	STS-103	7.97
Nicollier, Claude	Switzerland	12/20/1999	STS-103	STS-103	7.97
Thiele, Gerhard	Germany	2/11/2000	STS-99	STS-99	11.24
Mohri, Mamoru	Japan	2/11/2000	STS-99	STS-99	11.24

Astronaut	Nation	Launch Date	Flight Up	Flight Back	Flight Time (days)
Wakata, Koichi	Japan	10/11/2000	STS-92	STS-92	12.90
Garneau, Marc	Canada	12/1/2000	STS-97	STS-97	10.83
Hadfield, Chris	Canada	4/19/2001	STS-100	STS-100	11.90
Guidoni, Umberto	Italy	4/19/2001	STS-100	STS-100	11.90
Haignere, Claudie	France	10/21/2001	Soyuz TM-33	Soyuz TM-32	9.83
Vittori, Roberto	Italy	4/25/2002	Soyuz TM-34	Soyuz TM-33	9.89
Perrin, Philippe	France	6/5/2002	STS-111	STS-111	13.86
DeWinne, Frank	Belgium	10/30/2002	Soyuz TMA-1	Soyuz TM-34	10.87
Ramon, Ilan	Israel	1/16/2003	STS-107	STS-107	15.94
Duque, Pedro	Spain	10/18/2003	Soyuz TMA-3	Soyuz TMA-2	9.86
Kuipers, Andre	Netherlands	4/19/2004	Soyuz TMA-4	Soyuz TMA-3	10.87
Vittori, Roberto	Italy	4/15/2005	Soyuz TMA-6	Soyuz TMA-5	9.89
Noguchi, Soichi	Japan	7/26/2005	STS-114	STS-114	13.90
Pontes, Marcos	Brazil	3/30/2006	Soyuz TMA-8	Soyuz TMA-7	9.89
Reiter, Thomas*	Germany	7/4/2006	STS-121	STS-116	171
MacLean, Steve	Canada	9/9/2006	STS-115	STS-115	11.80
Fuglesang, Christer	Sweden	12/9/2006	STS-116	STS-116	12.86
Williams, Dafydd	Canada	8/8/2007	STS-118	STS-118	12.75
Shukor, Sheikh Muszaphar	Malaysia	10/10/2007	Soyuz TMA-11	Soyuz TMA-10	11.00
Nespoli, Paolo	Italy	10/23/2007	STS-120	STS-120	15.06
Eyharts, Leopold*	France	2/7/2008	STS-122	STS-123	48.25
Schlegel, Hans	Germany	2/7/2008	STS-122	STS-122	12.77
Doi, Takao	Japan	3/11/2008	STS-123	STS-123	15.76
Yi, So-Yeon	South Korea	4/8/2008	Soyuz TMA-12	Soyuz TMA-11	10.00
Hoshide, Akihiko	Japan	5/31/2008	STS-124	STS-124	13.76
Wakata, Koichi*	Japan	3/15/2009	STS-119	STS-127	137.63
DeWinne, Frank*	Belgium	5/27/2009	Soyuz TMA-15	Soyuz TMA-15	187.86
Thirsk, Robert*	Canada	5/27/2009	Soyuz TMA-15	Soyuz TMA-15	187.86
Payette, Julie	Canada	7/15/2009	STS-127	STS-127	15.70
Fuglesang, Christer	Sweden	8/28/2009	STS-128	STS-128	13.87
Noguchi, Soichi*	Japan	12/20/2009	Soyuz TMA-17	Soyuz TMA-16	167.00
Yamazaki, Naoko	Japan	4/5/2010	STS-131	STS-131	15
Nespoli, Paolo*	Italy	12/15/2010	Soyuz TMA-20	In progress	In progress

* These flights were covered by the ISS Partner agreements. For the purposes of this report, these flights are not part of the National Interest market.

Appendix B – Discussion of Cost Effectiveness of Commercial Cargo Effort

NASA recently conducted a predicted cost estimate of the Falcon 9 launch vehicle using the NASA-Air Force Cost Model (NAFCOM). NAFCOM is the primary cost estimating tool NASA uses to predict the costs for launch vehicles, crewed vehicles, planetary landers, rovers, and other flight hardware elements prior to the development of these systems.

NAFCOM is a parametric cost estimating tool with a historical database of over 130 NASA and Air Force space flight hardware projects. It has been developed and refined over the past 13 years with 10 releases providing increased accuracy, data content, and functionality. NAFCOM uses a number of technical inputs in the estimating process. These include mass of components, manufacturing methods, engineering management, test approach, integration complexity, and pre-development studies.

Another variable is the relationship between the Government and the contractor during development. At one end, NAFCOM can model an approach that incorporates a heavy involvement on the part of the Government, which is a more traditional approach for unique development efforts with advanced technology. At the other end, more commercial-like practices can be assumed for the cost estimate where the contractor has more responsibility during the development effort.

For the Falcon 9 analysis, NASA used NAFCOM to predict the development cost for the Falcon 9 launch vehicle using two methodologies:

1) Cost to develop Falcon 9 using traditional NASA approach, and
2) Cost using a more commercial development approach.

Under methodology #1, the cost model predicted that the Falcon 9 would cost $4.0 billion based on a traditional approach. Under methodology #2, NAFCOM predicted $1.7 billion when the inputs were adjusted to a more commercial development approach. Thus, the predicted the cost to develop the Falcon 9 if done by NASA would have been between $1.7 billion and $4.0 billion.

SpaceX has publicly indicated that the development cost for Falcon 9 launch vehicle was approximately $300 million. Additionally, approximately $90 million was spent developing the Falcon 1 launch vehicle which did contribute to some extent to the Falcon 9, for a total of $390 million. NASA has verified these costs.

It is difficult to determine exactly why the actual cost was so dramatically lower than the NAFCOM predictions. It could be any number of factors associated with the non-traditional public-private partnership under which the Falcon 9 was developed (e.g., fewer NASA processes, reduced oversight, and less overhead), or other factors not directly tied to the development approach. NASA is continuing to refine this analysis to better understand the differences.

Regardless of the specific factors, this analysis does indicate the potential for reducing space hardware development costs, given the appropriate conditions. It is these conditions that NASA hopes to replicate, to the extent appropriate and feasible, in the development of commercial crew transportation systems.

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 217

[Docket No. 100806326–1088–02]

RIN 0648–AY99

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Space Vehicle and Missile Launch Operations at Kodiak Launch Complex, AK

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule.

SUMMARY: NMFS, upon application from the Alaska Aerospace Corporation (AAC), is issuing regulations to govern the unintentional taking of small numbers of marine mammals incidental to rocket launches from the Kodiak Launch Complex (KLC) on Kodiak Island, AK. Issuance of regulations is required by the Marine Mammal Protection Act (MMPA) when the Secretary of Commerce (Secretary), after notice and opportunity for comment, finds, as here, that such takes will have a negligible impact on the species and stocks of marine mammals and will not have an unmitigable adverse impact on their availability for subsistence uses. These regulations do not authorize the AAC's rocket launch activities; such authorization is not within the jurisdiction of the Secretary. Rather, these regulations govern the issuance of Letters of Authorization (LOAs) for the unintentional and incidental take of marine mammals in connection with this activity and prescribe methods of taking and other means of effecting the least practicable adverse impact on marine mammal species and their habitat, and on the availability of the species for subsistence uses. In addition, NMFS incorporates reporting and monitoring requirements on these activities.

DATES: Effective March 22, 2011 to March 22, 2016.

ADDRESSES: A copy of the AAC's application and other related documents may be obtained by writing to P. Michael Payne, Chief, Permits, Conservation and Education Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910–3225, by telephoning the contact listed under **FOR FURTHER INFORMATION CONTACT**, or on the Internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications*. Documents cited in this final rule may also be viewed, by appointment, during regular business hours at the above address.

FOR FURTHER INFORMATION CONTACT: Michelle Magliocca, Office of Protected Resources, NMFS, 301–713–2289, ext 123.

SUPPLEMENTARY INFORMATION:

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the identified species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth in the regulations. NMFS has defined "negligible impact" in 50 CFR 216.103 as "* * * an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

Except with respect to certain activities not pertinent here, the MMPA (16 U.S.C. 1362(18)(A)) defines "harassment" as:

> Any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Summary of Request

On June 4, 2010, NMFS received a complete application for regulations from AAC for the taking of small numbers of marine mammals incidental to launching space launch vehicles, long-range ballistic target missiles, and other smaller missile systems at the KLC. A proposed rule was published on December 23, 2010 (75 FR 80773). NMFS received 12 comments on the proposed rule from eight private citizens, the Kodiak Chamber of Commerce, the Kodiak Island Borough Mayor, the City of Kodiak Mayor, and the Marine Mammal Commission (Commission). The majority of the comments supported the proposed rule. These regulations will allow NMFS to issue Letters of Authorization (LOAs) to the AAC over a 5-year period. A full description of the operations is contained in the AAC's application which is available upon request (*see* **ADDRESSES**) or at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications.*

The AAC conducts space vehicle and missile launches from the KLC, a commercial spaceport that supports civilian and Federal launch customers. The facility occupies 3,717 acres of State-owned lands on the Narrow Cape Peninsula on the eastern side of Kodiak Island, Alaska. The KLC primarily supports launches of small to medium space launch vehicles—which are those used to boost satellites to orbit—ranging in size from the small space-launch Castor 120 motor (used in the Athena, Minotaur IV, Minotaur V, and Taurus I systems) to the under-development medium-lift Taurus II. The KLC is also configured to support launch of the Minuteman I-derived Minotaur I Space Launch System, and to support the launch of long-range ballistic systems such as the Polaris derived A–3 STARS, the Minuteman-derived Minotaur II and III, and the C–4. Launch operations are authorized under license from the Federal Aviation Administration (FAA), Office of the Associate Administrator for Space Transportation, in accordance with the facility's Environmental Assessment (EA), stipulations in the EA's Finding of No Significant Impact, and in subsequent licenses.

Description of the Specified Activity

The AAC anticipates that the KLC can accommodate up to 45 launches, in total, for the effective period of the regulations. Annually, an average of nine but maximum of 12 launches may occur. Most of these vehicles are expected to be of the Minotaur I through V class, including civil versions of the Castor 120 known as the Athena and Taurus I, or smaller target vehicles. The AAC estimates that of the 45 estimated launches from KLC over the 5-year period in consideration, 32 will be of small space-launch and target vehicles of the Castor 120 or smaller size, 10 will be of THAAD or smaller size, and three will be of the medium-lift Taurus II. A summarized description of each class of space launch and smaller launch vehicles was published in the **Federal Register** (75 FR 80774, December 23, 2010) and a full description can be found online (*http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications*) within the AAC's application.

Launch Noise

Launch operations are a major source of noise on Kodiak Island, as the operation of launch vehicle engines produce substantial sound pressures. In air, all pressures are referenced to 20 micoPascals; therefore all dB levels in this notice are provided re: 20 MicroPa, unless otherwise noted. Generally, four types of noise occur during a launch: (1) Combustion noise; (2) jet noise from interaction of combustion exhaust gases with the atmosphere; (3) combustion noise proper; and (4) sonic booms. Sonic booms are not a concern for pinnipeds on Ugak Island, as sonic booms created by ascending rockets launched from KLC reach the Earth's surface over deep ocean, well past the edge of the Outer Continental Shelf (OCS) (FAA 1996). Spent first-stage motors from space lift missions (*i.e.,* those going to orbit) fall to Earth at least 11, and possibly more than 300, miles down range (well past the edge of the OCS), depending on launch vehicle (U.S. FAA 1996). A complete description of launch noise measured from Ugak Island, including previously launched and recorded space vehicles, can be found in the proposed rule (75 FR 80775, December 23, 2010).

Another component of the AAC's launches includes security overflights. In the days preceding the launch, these occur approximately 3 times per day based on the long-term average. Flights associated with the launch will not approach occupied pinniped haulouts on Ugak Island by closer than 0.25 mile (0.4 km), and will maintain a vertical distance of 1,000 ft (305 m) from the haulouts when within 0.5 miles (0.8 km), unless indications of human presence or activity warrant closer inspection of the area to assure that national security interests are protected in accordance with law. Over the operational history of these flights, aircraft have been operated within the 0.25-mile limit on two occasions; both involved direct overflight of the Steller sea lion haulout spit, which was unoccupied each time the incursions occurred.

Description of Marine Mammals in the Area of the Specified Activity

The AAC's current MMPA regulations (71 FR 4297, January 26, 2006), which are set to expire February 28, 2011, require aerial surveys be conducted before and after each launch to monitor for presence and abundance of marine mammals within the designated 6-mile action area. In compliance with these conditions, the AAC has completed these surveys since 2006. Aerial survey data indicate that Steller sea lions, harbor seals, gray whales (*Eschrichtius robustus*), humpback whales (*Megaptera novaeangliae*), and sea otters (*Enhydra lutris*) occur within the action area. Although potentially present, cetaceans within the action area are not expected to be taken during the specified activities. Airborne noise is generally reflected at the sea surface outside of a 26° cone extending downward from the ascending rocket (Richardson *et al.,* 1995); therefore, little sound energy passes into the sea across the air-water boundary. Submerged animals would have to be directly underneath the rocket to hear it, and given the hypersonic velocity of launch vehicles in the atmosphere, the duration of sounds reaching any cetacean would be discountable. In addition, all spent rocket motors will fall into the open ocean over deep water. Given the very short time a cetacean is at the surface, direct impact from spent motors can be discounted as can any noise related impacts. Based on these reasons, NMFS does not anticipate take of cetaceans incidental to the specified activity; hence, they will not be discussed further. Sea otters are managed by the U.S. Fish and Wildlife Service; therefore no take of sea otters is included in the proposed regulations. As such, this species is not discussed further in this final rule.

Steller Sea Lions

Steller sea lions are designated into two stocks by NMFS. Those west of 144° longitude, which includes the KLC area, are listed as endangered under the ESA. Historically, mature and sub-adult males have used a spit on the northwestern side of Ugak Island as a post-breeding haulout. This spit is located 3.5 miles from the launch pad complex (*see* figure 4 and 5 in the application). The historic occupancy period ranges from June to September (post breeding), with peak reported numbers in the hundreds (Sease 1997; ENRI 1995–1998). However, use has declined in recent times in keeping with general declines seen in the species as a whole. The spit is designated a long-term trend count site by NMFS and has been surveyed once yearly, with June as the target, since the 1990s. Counts since 2000 have generally been zero (*e.g.,* NMFS, 2009; Fritz and Stinchcomb, 2005), which is in line with the counts from all other long-term trend count sites in the Kodiak Archipelago over the same time period. All of these other long-term trend sites are far removed from the 6-mile radius anticipated impact area up range from KLC (*i.e.,* areas opposite to the flight path), in areas not exposed to launch noise. Hence, Steller sea lion abundance has declined throughout the region, not just the area affected by launches, and the losses are likely not a result of or connected with the launches or use of KLC.

Data from AAC's aerial surveys over the past four years also support low use of the haulout. Since 1999, five launches have occurred during the Steller sea lion season. The spit haulout has not been used by Steller sea lions during launch-monitoring surveys since 1999 (ENRI, 2000, R&M, 2007a,b, 2008); however, during recent launch surveys one to several Stellar sea lions have been observed from time-to-time utilizing a supratidal rock on eastern Ugak Island (termed East Ugak Rock) as a haulout. Tables 2 and 4 in the application provide a breakdown of survey results per day. In summary, two to eight sea lions were observed per day on East Ugak Rock during surveys for the FTG–02 launch (R&M, 2006b), and one to five (per day) were observed during the FTX–03 launch (R&M, 2008). In addition, during one aerial survey that was completed outside the June to September timeframe (during the FTG–05 campaign in December 2008), a single Stellar sea lion was observed on East Ugak Rock. East Ugak Rock is located farther east and to the south of the KLC than Ugak Island; therefore, one can assume launch generated sound levels here are less than those at Ugak Island.

Harbor Seals

Harbor seals are the most abundant marine mammal species found within the action area. Harbor seals are not listed as threatened or endangered under the ESA or as depleted under the MMPA. Based on the AAC's aerial survey counts from launch monitoring reports conducted since January 2006, approximately 97% of all observed harbor seals are found on the eastern shore of Ugak Island, approximately 5 miles from the launch pad complex. The eastern shore is backed by high steep cliffs that reach up to 1,000 feet above sea level. These cliffs form a visual and acoustic barrier to rocket operations, and alleviate effects on the species. This conclusion is based on review of sound pressure recordings made at the haulout spit found on the island's northwestern shore, which showed surf and wind-generated sound pressures at sea level were generally in the >70 dBA (SEL) range on the clearest days (Cuccarese *et al.,* 1999, 2000). During inclement weather periods ambient sound pressures at sea level can exceed 100 dBA (SEL). The island's eastern shore is windward to prevailing winds and surf noise is routinely high. Harbor seals located on Ugak Island's northern shore are not as protected from launch noise, and therefore may be harassed incidental to the AAC's specified activity. However, harbor seal abundance on the northern shores is limited due to the lack of suitable habitat (*i.e.,* few beaches). During 30 aerial surveys conducted by the AAC during six rocket launches from 2006 to 2008, no seals were observed on North Ugak Island on 19 occasions. During surveys when seals were present, average abundance was 25 with a single day count of 125 individuals.

Because physical access to Ugak Island harbor seal haulouts is difficult and dangerous, the only abundance and behavior data of these seals have been derived from aerial surveys conducted by the AAC. Harbor seals generally breed and molt where they haul out, so it is assumed that both of these activities take place on Ugak Island, and young seals have routinely been seen there during launch-related aerial surveys. Pupping in Alaska takes place generally in the May to June time frame; molting occurs generally from June to October. Both periods contain peaks in haulout attendance. Total counts on Ugak Island have increased steadily since the 1990s from several hundred (ENRI 1995–1998) up to a peak of about 1,500 today (R&M 2007a, 2007b, 2008, 2009).

Potential Effects on Marine Mammals

As discussed above, launch operations are a major source of noise on Kodiak Island and can reach Steller sea lion and harbor seal haulouts and rookeries on Ugak Island. Marine mammals produce sounds in various contexts and use sound for various biological functions including, but not limited to: (1) Social interactions; (2) foraging; (3) orientation; and (4) predator detection. Interference with producing or receiving these sounds may result in adverse impacts. Audible distance, or received levels (RLs), will depend on the nature of the sound source, ambient noise conditions, and the sensitivity of the receptor to the sound (Richardson *et al.,* 1995). Type and significance of marine mammal reactions to noise are likely to be dependent on a variety of factors including, but not limited to, the behavioral state (*e.g.,* resting, socializing, *etc.*) of the animal at the time it receives the stimulus, frequency of the sound, distance from the source, and the level of the sound relative to ambient conditions (Southall *et al.,* 2007). In general, marine mammal impacts from loud noise can be characterized as auditory and non-auditory.

Potential Auditory Impacts

Auditory impacts consist of injurious (*e.g.,* ruptured ear drums, permanent threshold shift [PTS]) or non-injurious (*e.g.,* temporary threshold shift [TTS]) effects. There are no empirical data for onset of PTS in any marine mammal; therefore, PTS-onset must be estimated from TTS-onset measurements and from the rate of TTS growth with increasing exposure levels above the level eliciting TTS-onset. PTS is presumed to be likely if the hearing threshold is reduced by ≥ 40 dB (*i.e.,* 40 dB of TTS).

Given the distance from the pad area to Ugak Island and the measured sound levels from the Castor 120 (101.4 dB), for the loudest space vehicle used at the KLC, pinniped auditory injury is not anticipated. Further explanation was provided in the proposed rule **Federal Register** notice (75 FR 80777, December 23, 2010). Regarding TTS, although hearing sensitivity was not apparently affected during the ABR testing, that is not to say that TTS did not occur, as seals were tested approximately 2 hours after launch, not immediately following the launch. However, if TTS did occur, hearing was fully recovered within 2 hours. In conclusion, NMFS has preliminarily determined PTS would not occur in pinnipeds on Ugak Island and TTS, although unlikely, may occur. However, if pinnipeds on Ugak Island experience TTS, full-hearing recovery is expected shortly after exposure.

Potential Behavioral Impacts

To comply with their current regulations, the AAC attempted to collect video footage of pinnipeds during launches; however, weather, technical, and accessibility issues prevented video coverage from being obtained. Therefore, no immediate responses of pinnipeds to the AAC's launch noise have been documented. However, as discussed above, VAFB researchers have been investigating the short- and long-term effects of space vehicle launch noise and sonic booms on pinnipeds. As described in NMFS' 2009 EA, the percentage of seals that left the haulout increased as noise level increased up to approximately 100 decibels (dB) A-weighted SEL, after which almost all seals left, although recent data have shown that an increasing percentage of seals may remain on shore. Using time-lapse video photography, VAFB discovered that during four launch events, the seals that reacted but remained on the haulout were all adults. VAFB theorized that adult seals may have habituated to launch stimuli more so than less-experienced younger seals; hence the less-severe reactions. Further information on this research can be found within the proposed rule (75 FR 80777, December 23, 2010).

The behavioral data record for Steller sea lions is small throughout the North Pacific range and typically is focused on reproductive behaviors. In general, studies have shown that responses of pinnipeds on beaches to acoustic disturbance arising from rocket and target missile launches are highly variable. This variability may be due to many factors, including species, age class, and time of year.

The infrequent (approximately nine times per year) and brief (no more than 1 minute as heard from Ugak Island) nature of these sounds that would result from a rocket launch is not expected to alter the population dynamics of Steller sea lions or harbor seals which utilize Ugak Island as a haulout site. If launches occur during the harbor seal pupping period and harbor seals have also chosen to pup on the north beach, it is possible that harbor seal pups could be injured or killed as a result of the adults flushing in response to the rocket noise, or the mother/pup bond could be permanently broken. However, NMFS does not expect harbor seal pup injury and mortality to occur to a great degree, due to previous research studies that are summarized in the proposed rule (75 FR 80778, December 23, 2010).

Finally, the KLC conducts approximately three security overflights per day in the days preceding a launch. Several studies of both harbor seals and Steller sea lions cited in Richardson *et al.* (2005) suggest that these animals respond significantly less to overflights of both planes and helicopters that occur above 305 m (0.2 mi). NMFS does not anticipate harassment from overflights to occur as they generally remain at least 0.25 miles from a haulout; however, if the pilot or crew notice overt responses from pinnipeds (*e.g.,* flushing) to aircraft, this response will be noted and reported to NMFS in the flight report. Observations made of any animals displaced by a security overflight are reported to the environmental monitoring team for inclusion in their report of monitoring results.

Anticipated Effects on Habitat

Solid-fuel rocket boosters will fall into the ocean away from any known or potential haulouts. All sonic booms that reach the earth's surface are expected to occur over open ocean, beyond the OCS. Airborne launch sounds will mostly reflect or refract from the water surface and, except for sounds within a cone of approximately 26 degrees directly below the launch vehicle, will not penetrate into the water column. The sounds that do penetrate will not persist in the water for more than a few seconds. Overall, rocket launch activities from the KLC are not expected to cause any impacts to habitats used by marine mammals, including pinniped haulouts, or to their food sources.

Comments and Responses

On December 23, 2010 (75 FR 80773), NMFS published a notice of proposed rulemaking on the AAC's request to take marine mammals incidental to rocket launches at KLC and requested comments, information, and suggestions concerning the request. During the 30-day public comment period, NMFS received comments from eight private citizens, the Kodiak Chamber of Commerce, the Kodiak Island Borough Mayor, the City of Kodiak Mayor, and the Commission. Six of the private citizens—four of them residents of Kodiak, Alaska—and all of the city/borough officials wrote in support of the proposed rule. One private citizen expressed general opposition to anything related to the military. The remaining comments and NMFS' responses are detailed below.

Comment 1: The AAC should be required to obtain video footage of the harbor seal reactions to launches from the KLC. Furthermore, NMFS does not provide specific indications of what will be reviewed or potentially modified should the distribution, size, or productivity of either pinniped population be affected from the launches.

Response: As explained in the proposed rule, the AAC will be purchasing and placing one remote live-streaming video system to overlook a harbor seal haulout on the eastern side of Ugak Island. The purpose is to monitor for any behavioral reactions of harbor seals to the launches. The language about reviewing monitoring data and potentially modifying mitigation and monitoring requirements is put in place as an adaptive management measure. Data from aerial surveys and camera footage will be reviewed for unusual behavior, injury, or death. Any modifications to the mitigation or monitoring requirements will be determined on a case-by-case basis.

Comment 2: The Commission recommends that NMFS include in its final rule all of the applicant's proposed mitigation and monitoring measures, including those described in the preamble of the proposed rule.

Response: NMFS has included all of the required mitigation and monitoring measures in the final rule, including those described in the preamble.

Comment 3: The Commission recommends that NMFS require the AAC to use a remote video-camera system to monitor harbor seals on the eastern side of Ugak Island during at least five launches. If the cameras detect any disturbance, then the Commission recommends that the applicant and NMFS consult to determine what monitoring adjustments are needed and, if the authorized harbor seal takes are exceeded due to disturbance on the eastern side of the island, the applicant should consult with NMFS to determine if amendments to the regulations or letters of authorization are needed.

Response: The use of a remote video-camera system to monitor harbor seals on the eastern side of Ugak Island during at least five launches is a required monitoring measure for the AAC under this rulemaking. If any disturbance to the animals' behavior is detected, the regulations require that the AAC consult with NMFS to determine if any mitigation or monitoring modifications are necessary. Furthermore, if the authorized harbor seal takes are exceeded, the regulations require that the AAC consult with NMFS to determine if amendments to the regulations or letters of authorization are needed.

Comment 4: The Commission recommends that NMFS require appropriate monitoring of Steller sea lions before, during, and after launches to determine if the launches are disturbing the sea lions' use of Ugak Island and possibly discouraging more sea lions from hauling out there.

Response: After the first five launches, cameras may be repositioned to monitor Steller sea lions on Ugak Island. Monitoring of Stellers under the previous rule (2006 to 2011) showed one of the following: (1) No sea lions present during a launch; (2) all sea lions present became alert but did not move immediately following a launch; or (3) some sea lions present were flushed into the water temporarily. Attempts will be made by the AAC to capture further sea lion behavioral responses at the time of launch.

Comment 5: The Commission recommends that NMFS advise the applicant of the need to consult with the Fish and Wildlife Service regarding the potential incidental take of sea otters.

Response: The AAC is aware of the Fish and Wildlife Service's jurisdiction over the incidental take of sea otters.

Mitigation

In order to issue an Incidental Take Authorization (ITA) under section 101(a)(5)(A) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable adverse impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses.

To minimize impacts on pinnipeds at haulout sites, NMFS is requiring the following mitigation measures: (1) Security overflights associated with the launch will not approach occupied pinniped haulouts on Ugak Island by closer than 0.25 mile (0.4 km), and will maintain a vertical distance of 1,000 ft (305 m) from the haulouts when within 0.5 miles (0.8 km), unless indications of human presence or activity warrant closer inspection of the area to assure that national security interests are protected in accordance with law; (2) the AAC will avoid launches during the harbor seal pupping season (May 15 to June 30), unless constrained by factors including, but not limited to, human safety and national security; and (3) if launch monitoring detects pinniped injury or death, or if long-term trend counts from quarterly aerial surveys indicate that the distribution, size, or productivity of the potentially affected pinniped populations has been affected due to the specified activity, the launch procedures and the monitoring methods will be reviewed, in cooperation with NMFS, and, if necessary, appropriate changes may be made through modifications to a given LOA, prior to conducting the next launch of the same vehicle under that LOA.

NMFS carefully evaluated the applicant's proposed mitigation measures and considered a range of other measures in the context of ensuring that NMFS prescribes the means of effecting the least practicable adverse impact on the affected marine mammal species and stocks and their habitat. Our evaluation of potential measures included consideration of the following factors in relation to one another: (1) The manner and the degree to which the successful implementation of the measure is expected to minimize adverse impacts to marine mammals; (2) the proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and (3) the practicability of the measure for applicant implementation, including consideration of personnel safety, and practicality of implementation. The required mitigation measures take scientific studies (Richardson *et al.,* 2005) of overflight effects on pinnipeds into consideration. By avoiding launches during the harbor seal pupping season, the AAC will avoid all Level A harassment and mortality, which is only anticipated to occur as a result of pups being trampled or separated from their mothers. Lastly, the adaptive nature of the proposed mitigation measures allow for adjustments to be made if launch monitoring or quarterly aerial surveys indicate that impacts to the distribution, size, or productivity of pinniped populations are occurring.

Based on our evaluation of the applicant's proposed measures, as well as other measures considered by NMFS or recommended by the public during the 30-day comment period, NMFS has determined that the aforementioned mitigation measures provide the means of effecting the least practicable adverse impacts on marine mammals species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Monitoring and Reporting

In order to issue an ITA for an activity, section 101(a)(5)(A) of the MMPA states that NMFS must set forth "requirements pertaining to the monitoring and reporting of such taking." The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for ITAs must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present.

The AAC plans to purchase and place one remote live-streaming video system overlooking one of the harbor seal haulouts on the eastern side of Ugak Island for the first five launches conducted under these regulations to verify the assumption that seals on the eastern side of the island are not affected by launches. Although animals on the northern shore are more likely to be affected by the action, this area is predominantly a rocky reef tidal area where seals haul out opportunistically, either singly or in small numbers on exposed rocks. There is more confidence seals will be visible and able to be monitored on the eastern side of the island. After five launches, AAC and NMFS will reassess the efficiency of the camera system and possibly move it to another location (*e.g.,* the traditional Steller sea lion haulout).

The selected haulout will be viewed either in real time or via "tape" delay for six days using the following schedule where day length permits. The six-day schedule will be roughly centered on the day of launch, with launch day being day three of the monitoring schedule. The video stream will be viewed by professional biologists for 4 hours each day with monitoring centered on the time of launch on launch day, and on low tide on the other days. Detailed information on when monitoring will occur around a launch is provided in the AAC's application. Data collected from the live stream video will include number of animals observed, by age and sex class when possible, behavior (*e.g.,* resting), animal response to launches, and re-occupation time if disturbed.

The video system was developed, tested, and first put into service in Alaska, and has proven itself over many years of operation both in Alaska and around the world. The video system is all weather proven and autonomous, drawing energy from a combination of wind and solar generators. It features a camera that includes a lens that can be focused (zoom and pan) on command and provides live-streaming video that can be made available through Internet access to interested researchers in real time.

The AAC will also carry out quarterly aerial surveys to determine long-term trend counts of Steller sea lions and harbor seals within the action area. Surveys will be flown midday and centered around low tide for optimal seal counts. The aircraft will survey from a distance appropriate to count seals or sea lions, but far enough away to minimize harassment. Data collected will include number of seals or sea lions per haulout, by age class when possible, and if any disturbance behavior is noted from aircraft presence.

In addition to visual monitoring, whenever a new class of rocket is flown from the KLC, a real time sound pressure record will be obtained for documentation purposes and correlated with the behavioral response record. Two sound pressure monitors will be used: one will be placed at the established sound pressure recording location known as Narrow Cape and the other as close as practical to the remote video system.

Estimated Take by Incidental Harassment

Except with respect to certain activities not pertinent here, the MMPA (16 U.S.C. 1362(18)(A) defines "harassment" as:

> any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

As described above, Steller sea lions hauled out on Ugak Island may become alert or flush into the water in response to launch noise. Sound exposure levels from the loudest launch may reach approximately 101.4 dBA at the traditional Steller sea lion haulout. Based on this recorded level and the fact that audible launch noise will be very short in duration, sea lions are not expected to incur PTS, and the chance of TTS is unlikely. No injury or mortality of Stellar sea lions is anticipated, nor is any authorized. Therefore, NMFS authorizes Steller sea lion take, by Level B harassment only, incidental to launches from KLC.

Harbor seals of all age classes hauled out on the northern side of Ugak Island will likely react in a similar manner as Steller sea lions (and may become alert or flush into the water) to launches from KLC. Therefore, harbor seals may be taken by Level B harassment incidental to rocket launch noise. However, during the pupping season (May 15 to June 30), pups may also be injured, killed, or separated from their mother during a flushing event. Therefore, NMFS authorizes Level A harassment and mortality of harbor seal pups, should launches during the harbor seal pupping season be unavoidable.

As discussed above, security overflights associated with a launch will not closely approach or circle any sea lion or seal haulout site. Therefore, incidental take from this activity is not anticipated. Should the pilot or crew on the plane observe pinnipeds reacting to their presence, the plane will increase altitude and note the number of animals reacting to the plane. This data will be included in the AAC's final marine mammal report.

The AAC estimates that up to 45 launches may occur from the KLC over the course of the 5-year period covered by the proposed rulemaking. Annually, the AAC estimates an average of nine launches will occur. Most of these vehicles are expected to be of the Minotaur I through V class, including civil versions of the Castor 120 known as the Athena and Taurus I or smaller target vehicles. The AAC estimates that no more than one launch will occur over a 4-week period, and it is likely the frequency of launches will be less than this estimate.

Based on aerial survey data, the AAC estimates a maximum of ten Steller sea lions could be present during launches occurring during the Steller sea lion season (the maximum number of animals sighted during a survey of this season has been eight). Any sea lions present during the launches will be adult or juvenile males; therefore, no reproductive processes or pupping will be affected by the specified activities. Assuming that all nine launches (the average number of launches predicted by the AAC) occur during the Steller sea lion season, that all nine launches involve the Castor 120 (the loudest vehicle expected to be flown from KLC over the period to be covered by the proposed regulations), and that there is no habituation to rocket motor effects with experience, then up to 90 takes by harassment could occur per year (ten animals/launch × nine launches). However, it is more reasonable to assume that a maximum of four launches per year could occur during the 2-month Steller sea lion season, and that no more than eight Stellers would be present at any given time (the maximum number recorded). Therefore, NMFS authorizes the take, by Level B harassment, of 32 Steller sea lions per year (eight animals × four launches).

The total number of harbor seals present on Ugak Island ranges up to about 1,500, most of which are found on the island's eastern shore where they are sheltered from launch effects by the 1,000-foot tall cliffs that stand between their haulouts and the KLC. Relatively few harbor seals use haulouts on the northern side of the island across from the KLC due to the lack of suitable beaches. No seals were observed on northern haulouts, which consist primarily of isolated rocks, during 19 of 30 marine mammal surveys flown by the AAC from 2006 to 2008. When present, the majority of counts on northern haulouts showed fewer than 25 individuals; however, a one-time high count of about 125 animals on these rocks has been made. Using the conservative and rare high number of 125 as being a representative figure, the AAC estimates that up to 125 individuals might be taken per launch operation. Therefore, NMFS authorizes 1,125 harbor seal (125 seals/launch × nine launches/year) takes during launch operations.

The actual number of pups taken by Level A harassment or mortality is difficult to quantify, as age class was not identified during the AAC's previous monitoring efforts (age class distinction will occur under the current monitoring and reporting requirements). Given that seals do not use the northern haulouts in large numbers (as compared to the protected eastern haulouts), the number of pups on the area of the island exposed to launch noise is likely low. Actual numbers will likely be smaller given the low and variable use of the area by harbor seals.

To better determine the potential number of pups on Ugak Island during launches, NMFS consulted with Ms. Kate Wynne, a marine mammal specialist with the Alaska Sea Grant Marine Advisory Program, who has previously flown aerial surveys within the action area. Her data, from the early 1990s, indicates that pup counts on the northern side of Ugak Island averaged approximately 17. Although this data is not recent, it is the best available. NMFS does not anticipate that all pups on a haulout would be injured or killed during a launch and, in fact, many may not be taken by Level A harassment or mortality. However, in the unlikely event injury or mortality occurs, NMFS authorizes 17 harbor seal pup takes by Level A harassment or mortality, annually, incidental to AAC's activities.

Previous Activities and Monitoring

As previously discussed, under AAC's current regulations (valid February 27, 2006 through February 28, 2011) and annual LOAs, AAC has been conducting marine mammal monitoring within the action area before and after launch events to satisfy the monitoring requirements set forth in MMPA authorizations. The objective of monitoring Steller sea lions and Pacific harbor seals is to detect any indications of pinniped disturbance, injury, or mortality resulting from KLC rocket launches at the Ugak Island haulout site. Monitoring requirements included: (1) Conducting fixed-wing aerial surveys at least one day prior to, immediately after, and three days following any launches taking place from June 15 through September 30, weather permitting; (2) installing a remote custom-designed, closed-circuit, weatherproof, time-lapse video camera system at the base of the traditional Steller sea lion haulout before any launch occurring from June 15 through September 30; and (3) making an attempt to place a video camera with zoom lens on the accessible western end of the north-facing shore to record harbor seal behavior on the middle or eastern end of the shore, or on the rocks offshore (recall that the eastern side of Ugak Island—where the majority of seals are—is completely inaccessible to pedestrian or boat traffic due to the high cliffs and violent surf).

The regulations also contained noise monitoring requirements; these data are discussed in the *Description of the Specified Activity* section above. The AAC complied with the noise monitoring conditions contained within the regulations and annual LOAs. Further information on the AAC's previous activities and monitoring results can be found within the proposed rule (75 FR 80780, December 23, 2010).

NMFS has shifted its focus from direct Steller sea lion to harbor seal monitoring under these regulations. The AAC will monitor harbor seal reactions to rocket launches during the launch itself via a type of camera system currently used by the Alaska Sea Life Center to monitor haulouts and rookeries. The camera will be placed at a harbor seal pupping location on Ugak Island to better assess the likelihood that harbor seal pups may be abandoned, injured, or killed as a direct result of a rocket launch disturbance. The camera system will be installed and operating if the AAC conducts a launch during the harbor seal pupping season. Unlike the previous system, this camera system does not need to be retrieved to acquire data and battery power is not problematic. Therefore, the AAC can place it at a harbor seal haulout during good weather no matter the number of days before a launch and does not have to be concerned with retrieving it. These factors will likely eliminate the previous issues with video monitoring designed to detect pinniped reactions at the time of the launch. In addition, the camera system will have a zoom lens for better viewing quality.

Negligible Impact and Small Numbers Analysis and Determination

NMFS has defined "negligible impact" in 50 CFR 216.103 as "* * * an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival." In making a negligible impact determination, NMFS considers (and should explicitly address whenever possible) the following: (1) Number of anticipated mortalities; (2) number and nature of anticipated injuries; (3) number, nature, intensity, and duration of Level B harassment; (4) is the nature of the anticipated takes such that we would expect it to actually impact rates of recruitment or survival; (5) context in which the takes occur; and (6) species or stock status.

In the past few years, the AAC has conducted no more than two launches on an annual basis. Regardless, NMFS has analyzed the specified activity to include disturbance events of up to nine launches per year as they anticipate the capability to carry out more efficient mission turn-around time over the duration of the final regulations. Mortalities and injuries are only authorized for harbor seal pups, and these are not expected due to small and variable harbor seal populations using the northern haulout sites, as well as the nature of pups and the early bonds formed between pups and mothers. Level B harassment of Steller sea lions is possible due to rocket launch noise, but is considered unlikely based on projected sound levels and the short duration of the noise; therefore, rates of sea lion recruitment or survival are not expected to be impacted. Rates of harbor seal recruitment or survival are also not expected to be impacted due to the limited number of mortalities or injuries to harbor seal pups (less than one percent of population). Due to the fact that no sonic booms are audible from Ugak Island, NMFS does not anticipate the potential for PTS to occur and TTS is unlikely, but possible. These assumptions are justified from ABR data collected at and around VAFB from similar launch activities. Further, based on aerial survey data, the harbor seal population on this island is increasing. Given that harbor seals are considered a species that is easily disturbed, their resilience to launch effects suggest any impacts from launches are short-term and negligible. The amount of take the AAC has requested, and NMFS authorizes, is considered small (less than one percent of Stellers and less than three percent of harbor seals) relative to the estimated stock populations of 41,197 Steller sea lions in the Western U.S. and 44,453 harbor seals in the Gulf of Alaska.

Mitigation measures to reduce noise from launches once in the air are virtually impossible; however, the noise generated on the launch pad during ignition moves through a deep trench (called a flame trench or flame bucket) that diverts the noise/exhaust toward the northwest (away from Ugak Island). The primary method of minimizing impacts to pinnipeds from launch noise is to minimize the number of launches when possible during sensitive times.

In addition, improved monitoring will better enable the AAC and NMFS to determine if impacts from rocket launches are having short-term and long-term impacts on the present day pinniped populations on Ugak Island. The camera system will be able to detect immediate impacts from launch exposure, including the number of pinnipeds flushing at the haulout site, while quarterly aerial surveys will aid in determining long-term trends of pinniped abundance. NMFS conservatively anticipates a small number of pups may be injured or killed during a launch. However, there is no empirical data to prove or disprove this as no video monitoring of seals during the launch has been successful (the one time a video system was placed near the haulout, no seals were observed). As discussed previously, the population of harbor seals on Ugak Island has increased steadily from several hundred in the 1990s (ENRI 1995–1998) to a peak of about 1,500 today (R&M 2007a, 2007b, 2008, 2009). Therefore, NMFS does not believe there will be any long-term impact on the health of the population if pup mortality occurs from launches. The required monitoring measures contained within this notice are specifically designed to, among other things, determine if pup injury or mortality is occurring (*i.e.,* from flushing, separation of mothers and pups, *etc.*) due to rocket launches from the AAC.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the mitigation and monitoring measures, NMFS finds that space vehicle and missile launches at the KLC will result in the incidental take of small numbers of marine mammals, but that the total taking will have a negligible impact on the affected species or stocks.

Impact on Availability of Affected Species for Taking for Subsistence Uses

There are no relevant subsistence uses of marine mammals implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks will not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence uses.

Endangered Species Act (ESA)

The Steller sea lion is the only marine mammal species under NMFS' jurisdiction that is listed as endangered under the ESA with confirmed or possible occurrence in the action area. In the 2003 Biological Opinion, NMFS determined that the proposed actions would not result in jeopardy to the affected species or result in adverse modification of critical habitat. In 2005, the AAC, on behalf of the FAA, consulted with NMFS, under Section 7 of the ESA, on the impacts of space vehicle and rocket launches on Steller sea lions. NMFS consulted internally under the ESA on its proposed issuance of the AAC's 2006 MMPA regulations and subsequent LOAs. NMFS also consulted internally on the issuance of the final regulations (effective from March 2011, through February 2016) for this activity under section 101(a)(5)(A) of the MMPA. In a Biological Opinion (BiOp), NMFS Alaska Region concluded that the AAC's activities at the KLC and NMFS' issuance of these regulations are not likely to jeopardize the continued existence of Steller sea lions or destroy or adversely modify any designated critical habitat.

NMFS Alaska Region will also issue BiOps and associated incidental take statements (ITSs) to NMFS' Permits, Conservation, and Recreation Division to exempt the take (under the ESA) that NMFS authorizes in the LOAs under the MMPA. Because of the difference between the statutes, it is possible that ESA analysis of the applicant's action could produce a take estimate that is different than the takes requested by the applicant (and analyzed for authorization by NMFS under the MMPA process), despite the fact that the same proposed action (*i.e.,* number and type of launches) was being analyzed under each statute. When this occurs, NMFS staff coordinates to ensure that the most conservative (lowest) number of takes is authorized. For the AAC's activities at the KLC, coordination with the NMFS Alaska Region indicates that they will likely allow for the same amount of take of Steller sea lions that was requested by the applicant.

The ITS(s) issued for each LOA will contain implementing terms and conditions to minimize the effect of the marine mammal take authorized through the 2011 LOA (and subsequent LOAs in 2012, 2013, 2014, and 2015). With respect to listed marine mammals, the terms and conditions of the ITSs will be incorporated into the LOAs.

National Environmental Policy Act (NEPA)

In 1996, the FAA prepared an EA, and subsequently issued a Finding of No Significant Impact (FONSI), for the AAC's proposal to construct and operate a launch site at Narrow Cape on Kodiak Island, Alaska. Since 1998, the AAC has provided monitoring reports related to noise and marine mammal impacts associated with ongoing rocket launches from KLC. After reviewing the new information contained in the monitoring reports, and considering the Commission's comments that impacts to harbor seals should be more comprehensively addressed, NMFS decided that a more current environmental analysis was necessary. In 2005, NMFS prepared an EA and associated FONSI on the Promulgation of Regulations Authorizing Take of Marine Mammals Incidental to Rocket Launches at Kodiak Launch Complex, Alaska, and the Issuance of Subsequent Letters of Authorization. NMFS found that the promulgation of a 5-year rulemaking in 2006 and issuance of subsequent LOAs would not significantly impact the quality of the human environment, and therefore issued a FONSI. Accordingly, preparation of an Environmental Impact Statement or Supplemental Environmental Impact Statement for this action was not necessary. NMFS has determined that because neither the action nor the environmental baseline in the area has changed significantly from that analyzed in previous NEPA documents, further analysis under NEPA is not necessary for issuance of regulations and subsequent LOAs extending into 2016.

Classification

The Office of Management and Budget (OMB) has determined that this proposed rule is not significant for purposes of Executive Order 12866.

Good cause exists to waive the 30-day delay in effectiveness for this rule pursuant to 5 U.S.C. 553(d), because delaying the rule's effectiveness is contrary to the public interest and is unnecessary. While there are no launches specifically scheduled for March 2011, the U.S. Air Force has told the AAC to be prepared for a potential launch as early as March. Because these launches may be necessary for national security, it is in the public's interest to have these regulations take effect immediately, before the AAC's current regulations expire on February 28, 2011. The AAC has requested a waiver of the 30-day delay in effectiveness for this rule in order to ensure that the rule goes into effect March 1, 2011, the day after the current regulations expire. A launch delay would lead to increased risk for personnel if there is increased handling time for hazardous materials or ordnance that has to be deactivated or offloaded, depending on the stage of launch preparations at the time of delay. Delaying this initial launch could also delay other scheduled launches for the following months. Additionally, the measures contained in this final rule are substantially similar to the measures contained in the five-year rule that expires on February 28, 2011. Accordingly, delaying the effectiveness of these rules is not necessary to provide time to allow the affected entities to come into compliance with the rules. Moreover, this rule does not impose any requirements or obligations on the public. For these reasons, there is good cause to waive the 30-day delay in effectiveness of this rule.

Pursuant to section 605(b) of the Regulatory Flexibility Act (RFA), the Chief Counsel for Regulation of the Department of Commerce has certified to the Chief Counsel for Advocacy of the Small Business Administration that this final rule will not have a significant economic impact on a substantial number of small entities. A description of this final rule and its purpose are found in the preamble to this rule, and are not repeated here. NMFS received no comments or questions regarding this certification. For a copy of the certification, *see* **ADDRESSES.**

Notwithstanding any other provision of law, no person is required to respond to nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act (PRA) unless that collection of information displays a currently valid OMB control number. This rule contains a collection-of-information requirement subject to the provisions of the PRA. This collection has been approved previously by OMB under section 3504(b) of the PRA issued under OMB control number 0648–0151, which includes applications for LOAs and reports.

List of Subjects in 50 CFR Part 217

Exports, Fish, Imports, Indians, Labeling, Marine mammals, Penalties, Reporting and recordkeeping requirements, Seafood, Transportation.

Dated: February 16, 2011.

Eric C. Schwaab,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

For reasons set forth in the preamble, 50 CFR part 217 is amended as follows:

PART 217—REGULATIONS GOVERNING THE TAKING AND IMPORTING OF MARINE MAMMALS

■ 1. The authority citation for part 217 continues to read as follows:

Authority: 16 U.S.C. 1361 *et seq.*

■ 2. Subpart H is added to read as follows:

Subpart H—Taking of Marine Mammals Incidental to Space Vehicle and Missile Launches at Kodiak Launch Complex, Alaska

Sec.

Subpart H—Taking of Marine Mammals Incidental to Space Vehicle and Missile Launches at Kodiak Launch Complex, Alaska

§ 217.70 Specified activity and specified geographical region.

(a) Regulations in this subpart apply only to the incidental taking of marine mammals specified in paragraph (b) of this section by U.S. citizens engaged in space vehicle and missile launch activities at the Kodiak Launch Complex on Kodiak Island, Alaska.

(b) The incidental take of marine mammals under the activity identified in paragraph (a) of this section is limited to 32 juvenile and adult Steller sea lions (*Eumetopius jubatus*), 1,125 Pacific harbor seals (*Phoca vitulina*) of all ages, and 17 harbor seal pups.

§ 217.71 Effective dates.

Regulations in this subpart are effective from March 22, 2011 through March 22, 2016.

§ 217.72 Permissible methods of taking.

(a) Under a Letter of Authorization issued pursuant to § 216.106 of this chapter, the Alaska Aerospace Corporation and its contractors may incidentally, but not intentionally, take Steller sea lions and Pacific harbor seals by Level B harassment and harbor seal pups by Level A harassment or mortality in the course of conducting space vehicle and missile launch activities within the area described in § 217.70(a), provided all terms, conditions, and requirements of these regulations and such Letter of Authorization are complied with.

(b) The activities identified in § 217.70(a) must be conducted in a manner that minimizes, to the greatest extent practicable, adverse impacts on marine mammals and their habitat.

§ 217.73 Prohibitions.

The following activities are prohibited:

(a) The taking of a marine mammal that is other than unintentional.

(b) The violation of, or failure to comply with, the terms, conditions, and requirements of this subpart or a Letter of Authorization issued under § 216.106 of this chapter.

(c) The incidental taking of any marine mammal of a species not specified, or in a manner not authorized, in this subpart.

§ 217.74 Mitigation.

(a) The activity identified in § 217.70(a) must be conducted in a manner that minimizes, to the greatest extent practicable, adverse impacts on marine mammals and their habitats. When conducting operations identified in § 217.70(a), the mitigation measures contained in the Letter of Authorization issued under §§ 216.106 of this chapter and 217.76 must be implemented. These mitigation measures include (but are not limited to):

(1) Security overflights by helicopter associated with a launch will not approach occupied pinniped haulouts on Ugak Island by closer than 0.25 mile (0.4 km), and will maintain a vertical distance of 1000 ft (305 m) from the haulouts when within 0.5 miles (0.8 km), unless indications of human presence or activity warrant closer inspection of the area to assure that national security interests are protected in accordance with law;

(2) For missile and rocket launches, holders of Letters of Authorization must avoid launches during the harbor seal pupping season of May 15 through June 30, except when launches are necessary for the following purposes: human safety, national security, space vehicle launch trajectory necessary to meet mission objectives, or other purposes related to missile or rocket launches.

(3) All flights by fixed-wing aircraft associated with the marine mammal abundance quarterly surveys must maintain a minimum altitude of 500 ft (152 m) and remain 0.25 miles from recognized seal haulouts.

(4) If launch monitoring or quarterly aerial surveys indicate that the distribution, size, or productivity of the potentially affected pinniped populations has been affected due to the specified activity, the launch procedures and the monitoring methods will be reviewed, in cooperation with NMFS, and, if necessary, appropriate changes may be made through modifications to a given LOA, prior to conducting the next launch of the same vehicle under that LOA.

(5) Additional mitigation measures as contained in a Letter of Authorization.

(b) [Reserved]

§ 217.75 Requirements for monitoring and reporting.

(a) Holders of Letters of Authorization issued pursuant to §§ 216.106 of this chapter and 217.76 for activities described in § 217.70(a) are required to cooperate with NMFS, and any other Federal, State, or local agency with authority to monitor the impacts of the activity on marine mammals. Unless specified otherwise in the Letter of Authorization, the Holder of the Letter of Authorization must notify the Administrator, Alaska Region, NMFS, by letter, e-mail or telephone, prior to each launch. If the authorized activity identified in § 217.70(a) is thought to have resulted in the take of marine mammals not identified in § 217.70(b), then the Holder of the Letter of Authorization must notify the Director, Office of Protected Resources, NMFS, or designee, by telephone (301–713–2289), within 48 hours of the discovery of the take.

(b) Holders of Letters of Authorization must designate qualified protected species observers, approved in advance by NMFS, as specified in the Letter of Authorization, to:

(1) Deploy for AAC a remote camera system designed to detect pinniped responses to rocket launches for at least the first five launches conducted under these regulations. AAC will conduct visual monitoring for at least 2 hours before, during, and 2 hours after launch;

(2) Ensure a remote camera system will be in place and operating in a location which allows visual monitoring of a harbor seal rookery, if a launch during the harbor seal pupping season cannot be avoided;

(3) Relocate the camera system to or re-aim the camera system on another haulout to be chosen in cooperation with NMFS after the first five launches with harbor seals present;

(4) Review and log pinniped presence, behavior, and re-occupation time data from the visual footage obtained from the remote camera system and report results to NMFS within 90 days post launch;

(5) Obtain, whenever a new class of rocket is flown from the Kodiak Launch Complex, a real-time sound pressure and sound exposure record for documentation purposes and to correlate with the behavioral response record. Two monitors shall be used: one shall be placed at the established recording location known as Narrow Cape, and the other as close as practical to the remote video system;

(6) Conduct quarterly aerial surveys, ideally during midday coinciding with low tide, to obtain data on pinniped presence, abundance, and behavior within the action area to determine long-term trends in pinniped haulout use. Results of these quarterly surveys will be reported once as part of the year-end summary report that will accompany the request for a new LOA.

(c) Holders of Letters of Authorization must conduct additional monitoring as required under an annual Letter of Authorization.

(d) Holders of Letters of Authorization must submit a report to the Alaska Region Administrator, NMFS, within 90 days after each launch. This report must contain the following information:

(1) Date(s) and time(s) of the launch;

(2) Location of camera system and acoustic recorders (if used);

(3) Design of the monitoring program and a description of how data is stored and analyzed; and

(4) Results of the monitoring program, including, but not necessarily limited to:

(i) Numbers of pinnipeds, by species and age class (if possible), present on the haulout prior to commencement of the launch;

(ii) Numbers of pinnipeds, by species and age class (if possible), that may have been harassed, including the number that entered the water as a result of launch noise;

(iii) The length of time pinnipeds remained off the haulout during post-launch monitoring;

(iv) Number of harbor seal pups that may have been injured or killed as a result of the launch; and

(v) Other behavioral modifications by pinnipeds that were likely the result of launch noise.

(5) Results of sound pressure and sound exposure level monitoring will be reported in flat weighted, A-weighted, and peak measurements.

(e) An annual report must be submitted at the time of request for a renewal of the Letter of Authorization; it will include results of the aerial quarterly trend counts of pinnipeds at Ugak Island.

(f) A final report must be submitted at least 90 days prior to expiration of these regulations if new regulations are sought or 180 days after expiration of regulations. This report will:

(1) Summarize the activities undertaken and the results reported in all previous reports;

(2) Assess the impacts of launch activities on pinnipeds within the action area, including potential for pup injury and mortality; and

(3) Assess the cumulative impacts on pinnipeds and other marine mammals from multiple rocket launches.

§ 217.76 Letter of Authorization.

(a) A Letter of Authorization, unless suspended or revoked, will be valid for a period of time specified in the Letter of Authorization, but a Letter of Authorization may not be valid beyond the effective period of the regulations.

(b) A Letter of Authorization with a period of validity less than the effective period of the regulations in this subpart may be renewed subject to renewal conditions in § 217.76.

(c) A Letter of Authorization will set forth:

(1) The number of marine mammals, by species and age class, authorized to be taken;

(2) Permissible methods of incidental taking;

(3) Specified geographical region;

(4) Means of effecting the least practicable adverse impact on the species of marine mammals authorized for taking and its habitat; and

(5) Requirements for monitoring and reporting incidental takes.

(d) Issuance of a Letter of Authorization will be based on a determination that the total taking by the activity as a whole will have no more than a negligible impact on the affected species or stocks of marine mammal(s).

(e) Notice of issuance or denial of a Letter of Authorization will be published in the **Federal Register** within 30 days of a determination.

§ 217.77 Renewal of a Letter of Authorization and adaptive management.

(a) A Letter of Authorization issued under § 216.106 of this chapter and § 217.76 for the activity identified in § 217.70(a) will be renewed annually upon:

(1) Notification to NMFS that the activity described in the application for a Letter of Authorization submitted under § 217.76 will be undertaken and that there will not be a substantial modification to the described activity, mitigation, or monitoring undertaken during the upcoming season;

(2) Timely receipt of and acceptance by NMFS of the monitoring reports required under § 217.75;

(3) A determination by NMFS that the mitigation, monitoring, and reporting measures required under §§ 217.74 and 217.75 and the Letter of Authorization were undertaken and will be undertaken during the upcoming period of validity of a renewed Letter of Authorization; and

(4) A determination that the number of marine mammals taken by the activity will have no more than a negligible impact on the affected species or stocks of marine mammal(s), and that the level of taking will be consistent with the findings made for the total taking allowable under these regulations.

(b) If a request for a renewal of a Letter of Authorization issued under §§ 216.106 and 216.128 of this chapter indicates that a substantial modification to the described work, mitigation, or monitoring undertaken during the upcoming season will occur, NMFS will provide the public a period of 30 days to review and comment on the request. Review and comment on renewals of Letters of Authorization are restricted to:

(1) New cited information and data indicating that the determinations made in this document are in need of reconsideration; and

(2) Proposed changes to the mitigation and monitoring requirements contained in these regulations or in the current Letter of Authorization.

(c) A notice of issuance or denial of a renewal of a Letter of Authorization will be published in the **Federal Register** within 30 days of a determination.

(d) NMFS, in response to new information and in consultation with the AAC, may modify the mitigation or monitoring measures in subsequent LOAs if doing so creates a reasonable likelihood of more effectively accomplishing the goals of mitigation or monitoring set forth in the preamble of these regulations. Below are some of the possible sources of new data that could contribute to the decision to modify the mitigation or monitoring measures:

(1) Results from the AAC's monitoring from the previous year.

(2) Results from general marine mammal and sound research.

§ 217.78 Modifications to a Letter of Authorization.

(a) Except as provided in paragraph (b) of this section, no substantive modification (including withdrawal or suspension) to a Letter of Authorization issued pursuant to the provisions of this subpart shall be made by NMFS until after notification and an opportunity for public comment has been provided. A renewal of a Letter of Authorization under § 217.77 without modification is not considered a substantive modification.

(b) If the Assistant Administrator determines that an emergency exists that poses a significant risk to the well-being of the species or stocks of marine mammals specified in § 217.70(b), a Letter of Authorization may be substantively modified without prior notification and an opportunity for public comment. Notification will be published in the **Federal Register** within 30 days subsequent to the action.

[FR Doc. 2011–6886 Filed 3–22–11; 8:45 am]

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648–XA216

Taking and Importing Marine Mammals; Taking Marine Mammals Incidental to Space Vehicle and Missile Launch Operations at Kodiak Launch Complex, Alaska

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice of issuance of a Letter of Authorization.

SUMMARY: In accordance with the Marine Mammal Protection Act (MMPA), as amended, and implementing regulations, notification is hereby given that a Letter of Authorization (LOA) has been issued to the Alaska Aerospace Corporation (AAC) to take two species of seals and sea lions incidental to space vehicle and missile launch operations at the Kodiak Launch Complex (KLC) in Kodiak, Alaska.

DATES: Effective from April 30, 2011, through April 29, 2012.

ADDRESSES: The LOA and supporting documentation are available for review by writing to P. Michael Payne, Chief, Permits, Conservation and Education Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910–3225, by telephoning the contact listed under **FOR FURTHER INFORMATION CONTACT**, or on the Internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications.* Documents cited in this notice may also be viewed, by appointment, during regular business hours at the above address.

FOR FURTHER INFORMATION CONTACT: Michelle Magliocca, Office of Protected Resources, NMFS, 301–713–2289, ext 123.

SUPPLEMENTARY INFORMATION:

Background

Sections 101(a)(5)(A) of the MMPA (16 U.S.C. 1361 *et seq.*) directs the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued. Under the MMPA, the term "take" means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill marine mammals.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the identified species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth in the regulations. NMFS has defined "negligible impact" in 50 CFR 216.103 as "* * * an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

Regulations governing the taking of Steller sea lions (*Eumetopias jubatus*), by harassment, and harbor seals (*Phoca vitulina*), adults by harassment and pups by injury or mortality, incidental to space vehicle and missile launch operations at the KLC, were issued on March 22, 2011 (76 FR 16311, March 23, 2011), and remain in effect until March 21, 2016. For detailed information on this action, please refer to that document. The regulations include mitigation, monitoring, and reporting requirements for the incidental take of marine mammals during space vehicle and missile launch operations at the KLC.

This LOA is effective from April 30, 2011, through April 29, 2012, and authorizes the incidental take of the two marine mammal species listed above that may result from the launching of up to 12 space launch vehicles, long-range ballistic target missiles, and other smaller missile systems at the KLC. Steller sea lion and harbor seal haulouts exist on Ugak Island, which lies approximately 3.4 miles to the southeast of the launch site. The KLC primarily supports launches of small to medium space launch vehicles—which by definition are those used to boost satellites to orbit—ranging in size from the small space-launch Castor 120 motor (used in the Athena, Minotaur IV, Minotaur V, and Taurus I systems) to the under-development medium-lift Taurus II. The KLC is also configured to support launch of the Minuteman I-derived Minotaur I Space Launch System, and to support launch of long-range ballistic systems such as the Polaris derived A–3 STARS, the Minuteman-derived Minotaur II and III, and the C–4.

The activities under these regulations are a major source of noise on Kodiak Island, as the operation of launch vehicle engines produce substantial sound pressures. Generally, four types of noise occur during a launch: (1) Combustion noise; (2) jet noise from interaction of combustion exhaust gases with the atmosphere; (3) combustion noise proper; and (4) sonic booms. Sonic booms are not a concern for pinnipeds on Ugak Island, as sonic booms created by ascending rockets launched from the KLC reach the Earth's surface over deep ocean, well past the edge of the outer continental shelf (FAA 1996). The noise generated by operations at the KLC may result in the incidental harassment of pinnipeds, both behaviorally and in terms of physiological (auditory) impacts. The noise and visual disturbances from space vehicle and missile launch operations may cause the animals to move towards or enter the water. If launches occur during the harbor seal pupping season, it is possible that harbor seal pups could be injured or killed as a result of the adults flushing in response to the rocket noise, or the mother/pup bond could be permanently broken.

However, NMFS does not expect harbor seal pup injury and mortality to occur to a great degree due to the pups' precociousness and the mothers' overt attention. Furthermore, take of any pinnipeds will be minimized through implementation of the following mitigation measures: (1) Security overflights immediately associated with the launch will not approach occupied pinniped haulouts on Ugak Island by closer than 0.25 mile (0.4 km), and will maintain a vertical distance of 1,000 ft (305 m) from the haulouts when within 0.5 miles (0.8 km), unless indications of human presence or activity warrant closer inspection of the area to assure that national security interests are protected in accordance with law; (2) the AAC will avoid launches during the harbor seal pupping season (May 15 to June 30), unless constrained by factors including, but not limited to, human safety and national security; and (3) if launch monitoring detects pinniped injury or death, or if long-term trend counts from quarterly aerial surveys indicate that the distribution, size, or productivity of the potentially affected pinniped populations has been affected due to the specified activity, the launch procedures and the monitoring methods will be reviewed, in cooperation with NMFS.

The AAC will also use audio-recording equipment and a remote live-streaming video system to monitor a harbor seal haulouts before, after, and during the first five launches. After the first five launches with harbor seal presence, the AAC and NMFS will reassess the efficiency of the video system before potentially relocating or re-aiming it to another haulout. Reports will be submitted to NMFS at the time of request for a renewal of the LOA, and a final comprehensive report, which will summarize all previous reports and assess cumulative impacts, will be submitted before the rule expires. This LOA will be renewed annually based on review of the annual monitoring report.

Dated: April 29, 2011.

James H. Lecky,

Director, Office of Protected Resources, National Marine Fisheries Service.

[FR Doc. 2011–11453 Filed 5–10–11; 8:45 am]

BILLING CODE 3510–22–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648–XA449

Takes of Marine Mammals Incidental to Specified Activities; Harbor Activities Related to the Delta IV/Evolved Expendable Launch Vehicle at Vandenberg Air Force Base, CA

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; issuance of an incidental harassment authorization.

SUMMARY: In accordance with the Marine Mammal Protection Act (MMPA) regulations, notification is hereby given that NMFS has issued an Incidental Harassment Authorization (IHA) to United Launch Alliance (ULA), to take marine mammals, by Level B harassment, incidental to conducting *Delta Mariner* operations, cargo unloading activities, and harbor maintenance activities related to the Delta IV/Evolved Expendable Launch Vehicle (Delta IV/EELV) at south Vandenberg Air Force Base, CA (VAFB).

DATES: Effective June 7, 2011, through June 6, 2012.

ADDRESSES: A copy of the authorization, application, and associated Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) may be obtained by writing to P. Michael Payne, Chief, Permits, Conservation and Education Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East West Highway, Silver Spring, MD 20910, telephoning the contact listed below (see **FOR FURTHER INFORMATION CONTACT**), or visiting the Internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications.*

Documents cited in this notice may also be viewed, by appointment, during regular business hours, at the aforementioned address.

FOR FURTHER INFORMATION CONTACT: Jeannine Cody, NMFS, Office of Protected Resources, NMFS (301) 713–2289.

SUPPLEMENTARY INFORMATION:

Background

Section 101(a)(5)(D) of the MMPA (16 U.S.C. 1371 (a)(5)(D)) directs the Secretary of Commerce to authorize, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock, by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

Authorization for incidental taking of small numbers of marine mammals shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). The authorization must set forth the permissible methods of taking, other means of effecting the least practicable adverse impact on the species or stock and its habitat, and monitoring and reporting of such takings. NMFS has defined "negligible impact" in 50 CFR 216.103 as "* * * an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

Section 101(a)(5)(D) of the MMPA established an expedited process by which citizens of the United States can apply for an authorization to incidentally take small numbers of marine mammals by harassment. Section 101(a)(5)(D) of the MMPA establishes a 45-day time limit for NMFS' review of an application followed by a 30-day public notice and comment period on any proposed authorizations for the incidental harassment of small numbers of marine mammals. Within 45 days of the close of the public comment period, NMFS must either issue or deny the authorization. NMFS must publish a notice in the **Federal Register** within 30 days of its determination to issue or deny the authorization.

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as:

any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Summary of Request

NMFS received an application on August 4, 2010, from ULA requesting the taking by harassment, of small numbers of marine mammals, incidental to conducting *Delta Mariner* harbor operations for one year. NMFS reviewed the ULA application and identified a number of issues requiring further clarification. After addressing comments from NMFS, ULA modified its application and submitted a revised application on February 11, 2011. NMFS determined that application complete and adequate on March 29, 2011.

These activities (*i.e.,* transport vessel operations, cargo movement activities, and harbor maintenance dredging) will support Delta IV/EELV launch activities from the Space Launch Complex at VAFB Harbor and would occur in the vicinity of a known pinniped haul out site (Small Haul-out Site #1) located at 34°33.192′ N, 120° 36.580′ W.

Acoustic and visual stimuli generated by the use of heavy equipment during the *Delta Mariner* off-loading operations and the cargo movement activities, the increased presence of personnel, and harbor maintenance dredging may have the potential to cause California sea lions (*Zalophus californianus*), Pacific harbor seals (*Phoca vitulina*), and Northern elephant seals (*Mirounga angustirostris*) hauled out on Small Haul-out Site #1 to flush into VAFB Harbor or to cause a short-term behavioral disturbance for marine mammals in the area. These types of disturbances are the principal means of marine mammal taking associated with these activities, and ULA has requested an authorization to take 1,075 Pacific harbor seals; 86 California sea lions; and 43 Northern elephant seals by Level B harassment only.

Description of the Specified Geographic Region

The activities will take place in or near the VAFB harbor located on the central coast of California at 34° 33′ N, 120° 36′ W in the northeast Pacific Ocean. The harbor is approximately 2.5 miles (mi) (4.02 kilometers (km)) south of Point Arguello, CA, and approximately 1 mi (1.61 km) south of the nearest marine mammal rookery.

Description of the Specified Activity

ULA proposes to conduct Delta IV/EELV activities (transport vessel operations, harbor maintenance dredging, and cargo movement activities) between June 8, 2011, and June 7, 2012.

To date, NMFS has issued eight, 1-year IHAs to ULA for the conduct of the same activities from 2002 to 2010, with the last IHA expiring on September 3, 2010 (74 FR 46742, September 11, 2009).

The Delta IV/EELV launch vehicle is comprised of a common booster core (CBC), an upper stage, and a payload fairing. The size of the CBC requires it to be transported to the VAFB launch site by a specially designed vessel, the *Delta Mariner.* To allow safe operation of the *Delta Mariner,* maintenance dredging within a harbor located in Zone 6 of the Western Space and Missile Center (WSMC) in the Pacific Ocean (33 CFR 334.1130(a)(2)(vi)), ULA requires that the harbor undergo maintenance on a periodic basis.

Delta Mariner Operations

The *Delta Mariner* is a 312-foot (ft) (95.1-meter (m)) long, 84-ft (25.6-m) wide, steel-hulled, ocean-going vessel capable of operating at an 8-ft (2.4-m) draft. It is a roll-on, roll-off, self-propelled ship with an enclosed watertight cargo area, a superstructure forward, and a ramp at the vessel's stern.

Delta Mariner off-loading operations and associated cargo movements within the harbor would occur at a maximum frequency of four times per year. The 8,000-horsepower vessel would enter the harbor stern first at 1.5 to 2 knots (1.72 mi per hour (mph)) during daylight hours at high tide, approaching the wharf at less than 0.75 knot (less than one mph). At least one tugboat will always accompany the *Delta Mariner* during visits to the VAFB harbor. Departure will occur under the previously-stated conditions.

Harbor Maintenance Activities

ULA must perform maintenance dredging annually or twice per year, depending on the hardware delivery schedule. To accommodate the *Delta Mariner's* draft, ULA would need to remove up to 5,000 cubic yards of sediment per dredging cycle. Dredging would involve the use of heavy equipment, including a clamshell dredge, dredging crane, a small tug, dredging barge, dump trucks, and a skip loader. Dredge operations, from set-up to tear-down, would continue 24-hours a day for approximately 35 days.

ULA provides a more detailed description of the work proposed for 2011–2012 in the application and the Final U.S. Air Force EA for Harbor Activities Associated with the Delta IV Program at Vandenberg Air Force Base (ENSR International, 2001) which are available upon request (see **ADDRESSES**).

Cargo Movement Activities

Removal of the CBC from the vessel requires the use of an elevating platform transporter (EPT). The EPT is powered by a diesel engine manufactured by Daimler-Chrysler AG (Mercedes), model OM442A, 340HP. ULA would limit cargo unloading activities to periods of high tide. It takes approximately two hours to remove the first CBC from the cargo bay and six hours to remove a complement of three CBCs. It would take up to two additional hours to remove remaining cargo which may consist of two upper stages, one set of fairings, and one payload attach fitting. The total of 10 hours includes time required to move the flight hardware to the staging area. Flight hardware items, other than the CBCs, are packaged in containers equipped with retractable casters and tow bars. ULA would tow these containers off the vessel by a standard diesel truck tractor. Noise from the ground support equipment will be muted while inside the cargo bay and will be audible to marine mammals only during the time the equipment is in the harbor area. Cargo movement operations would occur for approximately 43 days (concurrent with the harbor maintenance activities).

NMFS outlined the purpose of the program in the Notice of Proposed IHA (76 FR 21862, April 19, 2011). The activities to be conducted have not changed between the Notice of Proposed IHA (76 FR 21862, April 19, 2011) and this final notice announcing the issuance of the IHA. For a more detailed description of the authorized action, including a discussion of associated noise sources from the harbor operations, NMFS refers the reader to the Notice of Proposed IHA (76 FR 21862, April 19, 2011), the application, and associated documents referenced earlier in this document.

Comments and Responses

NMFS published a notice of receipt of the ULA application and proposed IHA in the **Federal Register** on April 19, 2011 (76 FR 21862). During the 30-day public comment period, NMFS received two comments from the public and a letter from the Marine Mammal Commission (Commission). Following are the comments from the public commenter and the Commission with NMFS' responses.

Comment 1: One commenter opposed the project on the grounds that it would cause injury or mortality to marine mammals.

Response: As described in detail in the **Federal Register** notice of the proposed IHA (76 FR 21862, April 19, 2011), no marine mammal would be killed or injured as a result of the operations by ULA. The project would only result in Level B behavioral harassment only of a small number of marine mammals.

Comment 2: The commenter believed that NMFS inflated the population estimate for the California sea lion stock in the Notice of Proposed IHA (76 FR 21862, April 19, 2011).

Response: The Notice of Proposed IHA (76 FR 21862, April 19, 2011) states that the estimated population of the U.S. stock of California sea lion ranged from 141,842 to 238,000 animals in 2009. The peer-reviewed source for the estimate is the most recent NMFS Stock Assessment Report (SAR) for California sea lions (Carretta *et al.,* 2010). The SAR is available on the Internet at: *http://www.nmfs.noaa.gov/pr/pdfs/sars/po2009.pdf.*

Comment 3: The Commission recommended that NMFS issue the IHA, subject to inclusion of the proposed mitigation and monitoring measures and also recommended that in the case of injury or mortality that may have resulted from the proposed activities, NMFS require that ULA suspend its activities until the agency is able to review the circumstances of the take.

Response: NMFS has included all of the mitigation and monitoring measures proposed in the Notice of Proposed IHA (76 FR 21862, April 19, 2011). The IHA's reporting requirements direct ULA to report all injured or dead marine mammals (regardless of cause) to NMFS. In the unanticipated event that any taking of a marine mammal in a manner prohibited by the IHA occurs, such as an injury, serious injury, or mortality, and are judged to result from the activities, ULA shall report the incident to NMFS immediately. ULA will postpone the activities until NMFS is able to review the circumstances of the take. NMFS will work with ULA to determine whether modifications to the harbor activities are warranted.

Description of Marine Mammals in the Area of the Specified Activity

The marine mammal species most likely to be harassed incidental to conducting *Delta Mariner* operations, cargo unloading activities, and harbor maintenance activities at VAFB are the California sea lion, the Pacific harbor seal, and the northern elephant seal. California sea lions, Pacific harbor seals, and northern elephant seals are not listed as threatened or endangered under the U.S. Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*), nor are they categorized as depleted under the MMPA.

Other cetaceans that have the potential to transit in the vicinity of the VAFB harbor include the short-beaked common dolphin (*Delphinus delphis*), the Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), and the gray whale (*Eschrichtius robustus*). However, these species are rare in the immediate harbor area. NMFS included a more detailed discussion of the status of these stocks and their occurrence at VAFB in the Notice of Proposed IHA (76 FR 21862, April 19, 2011).

Potential Effects on Marine Mammals

Acoustic and visual stimuli generated by: The use of heavy equipment during the *Delta Mariner* off-loading operations and harbor dredging and the increased presence of personnel may have the potential to cause Level B harassment of any pinnipeds hauled out in the VAFB harbor. This disturbance from acoustic and visual stimuli is the principal means of marine mammal taking associated with these activities.

The effects of the harbor activities would be limited to short-term startle responses and localized behavioral changes and have the potential to temporarily displace the animals from a haul out site. NMFS would expect the pinnipeds to return to a haulout site within 60 minutes of the disturbance (Allen *et al.,* 1985) and does not expect that the pinnipeds would permanently abandon a haul-out site during the conduct of harbor maintenance and *Delta Mariner* operations.

Finally, no operations would occur on pinniped rookeries; therefore, NMFS does not expect mother and pup separation or crushing of pups to occur. For a more detailed discussion of the sound levels produced by the equipment, behavioral reactions of marine mammals to loud noises or looming visual stimuli, and some specific observations of the response of marine mammals to this activity gathered during previous monitoring, NMFS refers the reader to the Notice of Proposed IHA (76 FR 21862, April 19, 2011), the application, and associated documents.

Anticipated Effects on Habitat

NMFS does not anticipate that the operations would result in any temporary or permanent effects on the habitats used by the marine mammals in the VAFB harbor, including the food sources they use (*i.e.* fish and invertebrates). NMFS does not anticipate that there would be any physical damage to any habitat. While NMFS anticipates that the specified activity may result in marine mammals avoiding certain areas due to temporary ensonification and human presence, this impact to habitat is temporary and reversible which NMFS considered in further detail earlier in this document and the Notice of Proposed IHA (76 FR 21862, April 19, 2011), as behavioral modification.

Mitigation

In order to issue an incidental take authorization (ITA) under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and the availability of such species or stock for taking for certain subsistence uses.

ULA has based the mitigation measures described herein, to be implemented for the habor operations, on the following:

(1) Protocols used during previous operations as approved by NMFS; and

(2) Previous IHA applications and IHAs approved and authorized by NMFS.

To reduce the potential for disturbance from visual and acoustic stimuli associated with the activities, ULA/and or its designees shall implement the following mitigating measures for marine mammals: (1) If activities occur during nighttime hours, ULA will turn on lighting equipment before dusk and the lights shall remain on for the entire night to avoid startling pinnipeds; (2) initiate operations before dusk; (3) keep construction noises at a constant level (i.e., not interrupted by periods of quiet in excess of 30 minutes) while pinnipeds are present; (4) if activities cease for longer than 30 minutes and pinnipeds are in the area, ULA shall initiate a gradual start-up of activities to ensure a gradual increase in noise levels; (5) a NMFS-qualified marine mammal observer shall visually monitor the harbor seals on the beach adjacent to the harbor and on rocks for any flushing or other behaviors as a result of ULA's activities (see Monitoring); (6) the *Delta Mariner* and accompanying vessels shall enter the harbor only when the tide is too high for harbor seals to haul-out on the rocks; reducing speed to 1.5 to 2 knots (1.5–2.0 nm/hr; 2.8–3.7 km/hr) once the vessel is within 3 mi (4.83 km) of the harbor. The vessel shall enter the harbor stern first, approaching the wharf and moorings at less than 0.75 knot (1.4 km/hr); (7) as alternate dredge methods are explored, the dredge contractor may introduce quieter techniques and equipment.

NMFS has carefully evaluated the applicant's proposed mitigation measures and has considered a range of other measures in the context of ensuring that NMFS prescribes the means of effecting the least practicable impact on the affected marine mammal species and stocks and their habitat. Our evaluation of potential measures included consideration of the following factors in relation to one another: (1) The manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals; (2) the proven or likely efficacy of the specific measure to minimize impacts as planned; and (3) the practicability of the measure for applicant implementation.

Based on our evaluation of the applicant's proposed measures, as well as other measures considered by NMFS or recommended by the public, NMFS has determined that the mitigation measures provide the means of effecting the least practicable adverse impacts on marine mammals species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Monitoring

In order to issue an ITA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth "requirements pertaining to the monitoring and reporting of such taking". The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for IHAs must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the action area.

ULA will sponsor a marine mammal monitor during the present project, in order to implement the mitigation measures thus satisfying the monitoring requirements of the IHA. ULA's monitoring activities will consist of:

(1) A NMFS-qualified and VAFB-designated biologically trained observer monitoring the area for pinnipeds during all harbor activities. During nighttime activities, the monitor would use a night vision scope.

(2) Conducting baseline observations of pinnipeds in the project area prior to initiating project activities.

(3) Conducting and recording observations on pinnipeds in the vicinity of the harbor for the duration of the activity occurring when tides are low enough (less than or equal to 2 ft (0.61 m) for pinnipeds to haul out.

(4) Conducting post-construction observations of pinniped haul-outs in the project area to determine whether animals disturbed by the project activities return to the haul-out.

Reporting

ULA will notify NMFS two weeks prior to initiation of each activity. After the completion of each activity, ULA will submit a draft final monitoring report to NMFS within 120 days to the Director of Office of Protected Resources at NMFS Headquarters. If ULA receives no comments from NMFS on the draft Final Monitoring Report, NMFS would consider the draft Final Monitoring Report to be the Final Monitoring Report.

The final report shall provide dates, times, durations, and locations of specific activities, details of pinniped behavioral observations, and estimates of numbers of affected pinnipeds and impacts (behavioral or other). In addition, the report would include information on the weather, tidal state, horizontal visibility, and composition (species, gender, and age class) and locations of haul-out group(s).

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this Authorization, such as an injury (Level A Harassment), serious injury or mortality (*e.g.,* ship-strike, gear interaction, and/or entanglement), ULA shall immediately cease the specified activities and immediately report the incident to the Chief of the Permits, Conservation, and Education Division, Office of Protected Resources, NMFS, at 301–713–2289 and/or by e-mail to *Michael.Payne@noaa.gov* and *Jeannine.Cody@noaa.gov*, and the Southwest Regional Stranding Coordinators (*Joe.Cordaro@noaa.gov* and *Sarah.Wilkin@noaa.gov*). The report must include the following information: (a) Time, date, and location (latitude/longitude) of the incident; the name and type of vessel involved; the vessel's speed during and leading up to the incident; description of the incident; status of all sound source use in the 24 hours preceding the incident; water depth; environmental conditions (*e.g.,* wind speed and direction, Beaufort sea state, cloud cover, and visibility); description of marine mammal observations in the 24 hours preceding the incident; species identification or description of the animal(s) involved; the fate of the animal(s); and photographs or video footage of the animal (if equipment is available).

ULA shall not resume its activities until NMFS is able to review the circumstances of the prohibited take. NMFS shall work with ULA to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. ULA may not resume their activities until notified by NMFS via letter or e-mail, or telephone.

In the event that ULA discovers an injured or dead marine mammal, and the NMFS-qualified marine mammal observer determines that the cause of the injury or death is unknown and the death is relatively recent (i.e., in less than a moderate state of decomposition as described in the next paragraph), ULA will immediately report the incident to the Chief of the Permits Conservation, and Education Division, Office of Protected Resources, NMFS, and to the NMFS Southwest Stranding Coordinators. The report must include the same information identified in Condition (a). ULA may continue its activities while NMFS reviews the circumstances of the incident. NMFS will work with ULA to determine whether modifications in the activities are appropriate.

In the event that ULA discovers an injured or dead marine mammal, and the NMFS-qualified marine mammal observer determines that the injury or death is not associated with or related to the activities authorized in Condition 2 of this Authorization (*e.g.,* previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), ULA shall report the incident to the Chief of the Permits Conservation, and Education Division, Office of Protected Resources, NMFS, and to the NMFS Southwest Stranding Coordinators within 24 hours of the discovery. ULA shall provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network.

Estimated Take by Incidental Harassment

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as:

> any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

NMFS anticipates take by Level B harassment only as a result of the harbor maintenance and *Delta Mariner* operations in the VAFB harbor. Based on ULA's previous monitoring reports, with the same activities conducted in the operations area NMFS estimates that small numbers of Pacific harbor seals, California sea lions, and northern elephant seals could be potentially affected by Level B behavioral harassment over the course of the IHA.

For this IHA, NMFS has authorized the take of 1,075 Pacific harbor seals, 86 California sea lions, and 43 northern elephant seals. Because of the required mitigation measures and the likelihood that some pinnipeds will avoid the area due to wave inundation of the haulout area, NMFS expects no injury, serious injury, or mortality to occur, and no takes by injury or mortality are authorized.

Negligible Impact and Small Numbers Analysis and Determination

NMFS has defined "negligible impact" in 50 CFR 216.103 as "* * * an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival." In making a negligible impact determination, NMFS considers a variety of factors, including but not limited to:

(1) The number of anticipated mortalities;

(2) The number and nature of anticipated injuries;

(3) The number, nature, and intensity, and duration of Level B harassment; and

(4) The context in which the takes occur.

As mentioned previously, NMFS estimates that three species of marine mammals could be potentially affected by Level B harassment over the course of the IHA. For each species, these numbers are small (each, less than two percent) relative to the population size.

NMFS does not anticipate takes by Level A harassment, serious injury, or mortality to occur as a result of ULA's activities, and none are authorized. These species may exhibit behavioral modifications, including temporarily vacating the area during the proposed harbor maintenance and *Delta Mariner* operations to avoid the resultant acoustic and visual disturbances. However, NMFS anticipates only short-term behavioral disturbance due to the brief duration of the proposed activities; the availability of alternate areas near the VAFB harbor for pinnipeds to avoid the resultant noise from the maintenance and vessel operations; and that no operations would occur on pinniped rookeries. Due to the nature, degree, and context of the behavioral harassment anticipated, the activities are not expected to impact rates of recruitment or survival.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the mitigation and monitoring measures, NMFS finds that the impact of conducting harbor maintenance and vessel operations from June, 2011, through June, 2012, will result in the incidental take of small numbers of marine mammals, by Level B behavioral harassment only, and that the total taking from the ULA's activities will have a negligible impact on the affected species or stocks; and that impacts to affected species or stocks of marine mammals would be mitigated to the lowest level practicable.

Impact on Availability of Affected Species or Stock for Taking for Subsistence Uses

There are no relevant subsistence uses of marine mammals implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

Endangered Species Act (ESA)

This action will not affect species listed under the ESA that are under NMFS' jurisdiction. VAFB formally consulted with the U.S. Fish and Wildlife Service in 1998 on the possible take of southern sea otters during ULA's harbor activities at south VAFB. A Biological Opinion was issued in August 2001, which concluded that the EELV Program is not likely to jeopardize the continued existence of the southern sea otter, and no injury or mortality is expected. The activities covered by this IHA are analyzed in that Biological Opinion, and this IHA does not modify the action in a manner that was not previously analyzed.

National Environmental Policy Act (NEPA)

In 2001, the USAF prepared an Environmental Assessment (EA) for Harbor Activities Associated with the Delta IV Program at VAFB. In 2005, NMFS prepared an EA augmenting the information contained in the USAF EA and issued a Finding of No Significant Impact (FONSI) on the issuance of an IHA for ULA's harbor activities in accordance with section 6.01 of the NOAA Administrative Order 216–6 (Environmental Review Procedures for Implementing the National Environmental Policy Act, May 20, 1999). ULA's activities and impacts for 2011–2012 are within the scope of NMFS' 2005 EA and FONSI. NMFS has again reviewed the 2005 EA and determined that there are no new direct, indirect or cumulative impacts to the human and natural environment associated with the IHA requiring evaluation in a supplemental EA and NMFS, therefore, reaffirms the 2005 FONSI. A copy of the EA and the FONSI for this activity is available upon request (see **ADDRESSES**).

Authorization

As a result of these determinations, NMFS has issued an IHA to ULA to tak marine mammals, by Level B harassment only, incidental to conducting *Delta Mariner* operations, cargo unloading activities, and harbor maintenance activities at south VAFB, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated.

Dated: June 6, 2011.

Helen M. Golde,

Deputy Director, Office of Protected Resources, National Marine Fisheries Service.

[FR Doc. 2011–14335 Filed 6–8–11; 8:45 am]

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Syllabus

NOTE: Where it is feasible, a syllabus (headnote) will be released, as is being done in connection with this case, at the time the opinion is issued. The syllabus constitutes no part of the opinion of the Court but has been prepared by the Reporter of Decisions for the convenience of the reader. See *United States* v. *Detroit Timber & Lumber Co.,* 200 U. S. 321, 337.

SUPREME COURT OF THE UNITED STATES

Syllabus

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION ET AL. *v.* NELSON ET AL.

CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE NINTH CIRCUIT

No. 09–530. Argued October 5, 2010—Decided January 19, 2011

The National Aeronautics and Space Administration (NASA) has a workforce of both federal civil servants and Government contract employees. Respondents are contract employees at NASA's Jet Propulsion Laboratory (JPL), which is operated by the California Institute of Technology (Cal Tech). Respondents were not subject to Government background checks at the time they were hired, but that changed when the President ordered the adoption of uniform identification standards for both federal civil servants and contractor employees. The Department of Commerce mandated that contract employees with long-term access to federal facilities complete a standard background check, typically the National Agency Check with Inquiries (NACI), by October 2007. NASA modified its contract with Cal Tech to reflect the new requirement, and JPL announced that employees who did not complete the NACI process in time would be denied access to JPL and face termination by Cal Tech.

The NACI process, long used for prospective civil servants, begins with the employee filling out a standard form (here, Standard Form 85, the Questionnaire for Non-Sensitive Positions (SF–85)). SF–85 asks whether an employee has "used, possessed, supplied, or manufactured illegal drugs" in the last year. If so, the employee must provide details, including information about "treatment or counseling received." The employee must also sign a release authorizing the Government to obtain personal information from schools, employers, and others during its investigation. Once SF–85 is completed, the Government sends the employee's references a questionnaire (Form 42) that asks open-ended questions about whether they have "any reason to question" the employee's "honesty or trustworthiness," or have "adverse information" concerning a variety of other matters. All SF–85 and Form 42 responses are subject to the protections of the Privacy Act.

With the deadline for completing the NACI process drawing near, respondents brought suit, claiming, as relevant here, that the background-check process violates a constitutional right to informational privacy. The District Court declined to issue a preliminary injunction, but the Ninth Circuit reversed. It held that SF–85's inquiries into recent drug involvement furthered the Government's interest in combating illegal-drug use, but that the drug "treatment or counseling" question furthered no legitimate interest and was thus likely to be held unconstitutional. It also held that Form 42's open-ended questions were not narrowly tailored to meet the Government's interests in verifying contractors' identities and ensuring JPL's security, and thus also likely violated respondents' informational-privacy rights.

Held:

1. In two cases decided over 30 years ago, this Court referred broadly to a constitutional privacy "interest in avoiding disclosure of personal matters." *Whalen* v. *Roe*, 429 U. S. 589, 599–600; *Nixo*n v. *Administrator of General Services*, 433 U. S. 425, 457. In *Whalen,* the Court upheld a New York law permitting the collection of names and addresses of persons prescribed dangerous drugs, finding that the statute's "security provisions," which protected against "public disclosure" of patient information, 462 U. S., at 600–601, were sufficient to protect a privacy interest "arguably . . . root[ed] in the Constitution," *id.,* at 605. In *Nixon,* the Court upheld a law requiring the former President to turn over his presidential papers and tape recordings for archival review and screening, concluding that the federal Act at issue, like the statute in *Whalen*, had protections against "undue dissemination of private materials." 433 U. S, at 458. Since *Nixon,* the Court has said little else on the subject of a constitutional right to informational privacy. Pp. 8–10.

2. Assuming, without deciding, that the Government's challenged inquiries implicate a privacy interest of constitutional significance, that interest, whatever its scope, does not prevent the Government from asking reasonable questions of the sort included on SF–85 and Form 42 in an employment background investigation that is subject to the Privacy Act's safeguards against public disclosure. Pp. 10–24.

(a) The forms are reasonable in light of the Government interests at stake. Pp. 11–19.

(1) Judicial review of the forms must take into account the context in which the Government's challenged inquiries arise. When the Government acts in its capacity "as proprietor" and manager of its

"internal operation," *Cafeteria & Restaurant Workers* v. *McElroy*, 367 U. S. 886, 896, it has a much freer hand than when it regulates as to citizens generally. The questions respondents challenge are part of a standard background check of the sort used by millions of private employers. The Government has been conducting employment investigations since the Republic's earliest days, and the President has had statutory authority to assess an applicant's fitness for the civil service since 1871. Standard background investigations similar to those at issue became mandatory for federal civil-service candidates in 1953, and the investigations challenged here arose from a decision to extend that requirement to federal contract employees. This history shows that the Government has an interest in conducting basic background checks in order to ensure the security of its facilities and to employ a competent, reliable workforce to carry out the people's business. The interest is not diminished by the fact that respondents are contract employees. There are no meaningful distinctions in the duties of NASA's civil-service and contractor employees, especially at JPL, where contract employees do work that is critical to NASA's mission and that is funded with a multibillion dollar taxpayer investment. Pp. 12–15.

(2) The challenged questions on SF–85 and Form 42 are reasonable, employment-related inquiries that further the Government's interests in managing its internal operations. SF–85's "treatment or counseling" question is a followup question to a reasonable inquiry about illegal-drug use. In context, the drug-treatment inquiry is also a reasonable, employment-related inquiry. The Government, recognizing that illegal-drug use is both a criminal and medical issue, seeks to separate out those drug users who are taking steps to address and overcome their problems. Thus, it uses responses to the drug-treatment question as a mitigating factor in its contractor credentialing decisions. The Court rejects the argument that the Government has a constitutional burden to demonstrate that its employment background questions are "necessary" or the least restrictive means of furthering its interests. So exacting a standard runs directly contrary to *Whalen*. See 429 U. S., at 596–597. Pp. 16–18.

(3) Like SF–85's drug-treatment question, Form 42's open-ended questions are reasonably aimed at identifying capable employees who will faithfully conduct the Government's business. Asking an applicant's designated references broad questions about job suitability is an appropriate tool for separating strong candidates from weak ones. The reasonableness of such questions is illustrated by their pervasiveness in the public and private sectors. Pp. 18–19.

(b) In addition to being reasonable in light of the Government interests at stake, SF–85 and Form 42 are also subject to substantial protections against disclosure to the public. *Whalen* and *Nixon* recognized that a "statutory or regulatory duty to avoid unwarranted disclosures" generally allays privacy concerns created by government "accumulation" of "personal information" for "public purposes." *Whalen*, *supra,* at 605. Respondents attack only the Government's collection of information, and here, as in *Whalen* and *Nixon*, the information collected is shielded by statute from unwarranted disclosure. The Privacy Act—which allows the Government to maintain only those records "relevant and necessary to accomplish" a purpose authorized by law, 5 U. S. C. §552a(e)(1); requires written consent before the Government may disclose an individual's records, §552a(b); and imposes criminal liability for willful violations of its nondisclosure obligations, §552a(i)(1)—"evidence[s] a proper concern" for individual privacy. *Whalen*, *supra*, at 605; *Nixon*, *supra*, at 458–459. Respondents' claim that the statutory exceptions to the Privacy Act's disclosure bar, see §§552a(b)(1)–(12), leave its protections too porous to supply a meaningful check against unwarranted disclosures. But that argument rests on an incorrect reading of *Whalen, Nixon,* and the Privacy Act. Pp. 19–23.

530 F. 3d 865, reversed and remanded.

ALITO, J., delivered the opinion of the Court, in which ROBERTS, C. J., and KENNEDY, GINSBURG, BREYER, and SOTOMAYOR, JJ., joined. SCALIA, J., filed an opinion concurring in the judgment, in which THOMAS, J., joined. THOMAS, J., filed an opinion concurring in the judgment. KAGAN, J., took no part in the consideration or decision of the case.

SUPREME COURT OF THE UNITED STATES

No. 09–530

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, ET AL., PETITIONERS *v.* ROBERT M. NELSON ET AL.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE NINTH CIRCUIT

[January 19, 2011]

JUSTICE ALITO delivered the opinion of the Court.

In two cases decided more than 30 years ago, this Court referred broadly to a constitutional privacy "interest in avoiding disclosure of personal matters." *Whalen* v. *Roe*, 429 U. S. 589, 599–600 (1977); *Nixo*n v. *Administrator of General Services*, 433 U. S. 425, 457 (1977). Respondents in this case, federal contract employees at a Government laboratory, claim that two parts of a standard employment background investigation violate their rights under *Whalen* and *Nixon*. Respondents challenge a section of a form questionnaire that asks employees about treatment or counseling for recent illegal-drug use. They also object to certain open-ended questions on a form sent to employees' designated references.

We assume, without deciding, that the Constitution protects a privacy right of the sort mentioned in *Whalen* and *Nixon*. We hold, however, that the challenged portions of the Government's background check do not violate this right in the present case. The Government's interests as employer and proprietor in managing its internal operations, combined with the protections against public dissemination provided by the Privacy Act of 1974, 5 U. S. C. §552a, satisfy any "interest in avoiding disclosure" that may "arguably ha[ve] its roots in the Constitution." *Whalen*, *supra*, at 599, 605.

I

A

The National Aeronautics and Space Administration (NASA) is an independent federal agency charged with planning and conducting the Government's "space activities." Pub. L. 111–314, §3, 124 Stat. 3333, 51 U. S. C. §20112(a)(1). NASA's workforce numbers in the tens of thousands of employees. While many of these workers are federal civil servants, a substantial majority are employed directly by Government contractors. Contract employees play an important role in NASA's mission, and their duties are functionally equivalent to those performed by civil servants.

One NASA facility, the Jet Propulsion Laboratory (JPL) in Pasadena, California, is staffed exclusively by contract employees. NASA owns JPL, but the California Institute of Technology (Cal Tech) operates the facility under a Government contract. JPL is the lead NASA center for deep-space robotics and communications. Most of this country's unmanned space missions—from the Explorer 1 satellite in 1958 to the Mars Rovers of today—have been developed and run by JPL. JPL scientists contribute to NASA earth-observation and technology-development projects. Many JPL employees also engage in pure scientific research on topics like "the star formation history of the universe" and "the fundamental properties of quantum fluids." App. 64–65, 68.

Twenty-eight JPL employees are respondents here. Many of them have worked at the lab for decades, and none has ever been the subject of a Government background investigation. At the time when respondents were hired, background checks were standard only for federal civil servants. See Exec. Order No. 10450, 3 CFR 936 (1949–1953 Comp.). In some instances, individual contracts required background checks for the employees of federal contractors, but no blanket policy was in place.

The Government has recently taken steps to eliminate this two-track approach to background investigations. In 2004, a recommendation by the 9/11 Commission prompted the President to order new, uniform identification standards for "[f]ederal employees," including "contractor employees." Homeland Security Presidential Directive/HSPD–12—Policy for a Common Identification Standard for Federal Employees and Contractors, Public Papers of the President, George W. Bush, Vol. 2, Aug. 27, p. 1765 (2007) (hereinafter HSPD–12), App. 127. The Department of Commerce implemented this directive by mandating that contract employees with long-term access to federal facilities complete a standard background check, typically the National Agency Check with Inquiries (NACI). National Inst. of Standards and Technology, Personal Identity Verification of Federal Employees & Contractors, pp. iii–vi, 1–8, 6 (FIPS PUB 201–1, Mar. 2006) (hereinafter FIPS PUB 201–1), App. 131–150, 144–145.[1]

An October 2007 deadline was set for completion of these investigations. Memorandum from Joshua B. Bolten, Director, OMB, to the Heads of all Departments and Agencies (Aug. 5, 2005), App. 112. In January 2007, NASA modified its contract with Cal Tech to reflect the new background-check requirement. JPL management

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[1] As alternatives to the NACI process, the Department of Commerce also authorized federal agencies to use another "Office of Personnel Management . . . or National Security community investigation required for Federal employment." App. 145. None of these alternative background checks are at issue here.

informed employees that anyone failing to complete the NACI process by October 2007 would be denied access to JPL and would face termination by Cal Tech.

B

The NACI process has long been the standard background investigation for prospective civil servants. The process begins when the applicant or employee fills out a form questionnaire. Employees who work in "nonsensitive" positions (as all respondents here do) complete Standard Form 85 (SF–85). Office of Personnel Management (OPM), Standard Form 85, Questionnaire for Non-Sensitive Positions, App. 88–95.[2]

Most of the questions on SF–85 seek basic biographical information: name, address, prior residences, education, employment history, and personal and professional references. The form also asks about citizenship, selective-service registration, and military service. The last question asks whether the employee has "used, possessed, supplied, or manufactured illegal drugs" in the last year. *Id.,* at 94. If the answer is yes, the employee must provide details, including information about "any treatment or counseling received." *Ibid.* A "truthful response," the form notes, cannot be used as evidence against the employee in a criminal proceeding. *Ibid.* The employee must certify that all responses on the form are true and must sign a release authorizing the Government to obtain personal information from schools, employers, and others during its investigation.

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[2] For public-trust and national-security positions, more detailed forms are required. See OPM, Standard Form 85P, Questionnaire for Public Trust Positions, online at http://www.opm.gov/Forms/pdf_fill/sf85p.pdf; (all Internet materials as visited Jan. 13, 2011, and available in Clerk of Court's case file); OPM, Standard Form 86, Questionnaire for National Security Positions, online at http://www.opm.gov/Forms/pdf_fill/sf86.pdf.

Once a completed SF–85 is on file, the "agency check" and "inquiries" begin. 75 Fed. Reg. 5359 (2010). The Government runs the information provided by the employee through FBI and other federal-agency databases. It also sends out form questionnaires to the former employers, schools, landlords, and references listed on SF–85. The particular form at issue in this case—the Investigative Request for Personal Information, Form 42—goes to the employee's former landlords and references. *Ibid.*[3]

Form 42 is a two-page document that takes about five minutes to complete. See *ibid.* It explains to the reference that "[y]our name has been provided by" a particular employee or applicant to help the Government determine that person's "suitability for employment or a security clearance." App. 96–97. After several preliminary questions about the extent of the reference's associations with the employee, the form asks if the reference has "any reason to question" the employee's "honesty or trustworthiness." *Id.,* at 97. It also asks if the reference knows of any "adverse information" concerning the employee's "violations of the law," "financial integrity," "abuse of alcohol and/or drugs," "mental or emotional stability," "general behavior or conduct," or "other matters." *Ibid.* If "yes" is checked for any of these categories, the form calls for an explanation in the space below. That space is also available for providing "additional information" ("derogatory" or "favorable") that may bear on "suitability for government employment or a security clearance." *Ibid.*

All responses to SF–85 and Form 42 are subject to the protections of the Privacy Act. The Act authorizes the Government to keep records pertaining to an individual

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[3] The Government sends separate forms to employers (Form 41), educational institutions (Form 43), record repositories (Form 40), and law enforcement agencies (Form 44). 75 Fed. Reg. 5359. None of these forms are at issue here.

only when they are "relevant and necessary" to an end "required to be accomplished" by law. 5 U. S. C. §552a(e)(1). Individuals are permitted to access their records and request amendments to them. §§552a(d)(1),(2). Subject to certain exceptions, the Government may not disclose records pertaining to an individual without that individual's written consent. §552a(b).

C

About two months before the October 2007 deadline for completing the NACI, respondents brought this suit, claiming, as relevant here, that the background-check process violates a constitutional right to informational privacy. App. 82 (Complaint for Injunctive and Declaratory Relief).[4] The District Court denied respondents' motion for a preliminary injunction, but the Ninth Circuit granted an injunction pending appeal, 506 F. 3d 713 (2007), and later reversed the District Court's order. The court held that portions of both SF–85 and Form 42 are likely unconstitutional and should be preliminarily enjoined. 512 F. 3d 1134, vacated and superseded, 530 F. 3d 865 (2008).

Turning first to SF–85, the Court of Appeals noted respondents' concession "that most of the questions" on the form are "unproblematic" and do not "implicate the constitutional right to informational privacy." 530 F. 3d, at 878. But the court determined that the "group of questions concerning illegal drugs" required closer scrutiny. *Ibid.* Applying Circuit precedent, the court upheld SF–85's inquiries into recent involvement with drugs as "necessary to further the government's legitimate interest" in combating illegal-drug use. *Id.*, at 879. The court went on to hold, however, that the portion of the form requiring

[4] Respondents sought to represent a class of "JPL employees in nonsensitive positions." App. 79. No class has been certified.

disclosure of drug "treatment or counseling" furthered no legitimate interest and was thus likely to be held unconstitutional. *Ibid.*

Form 42, in the Court of Appeals' estimation, was even "more problematic." *Ibid.* The form's "open-ended and highly private" questions, the court concluded, were not "narrowly tailored" to meet the Government's interests in verifying contractors' identities and "ensuring the security of the JPL." *Id.*, at 881, 880. As a result, the court held, these "open-ended" questions, like the drug-treatment question on SF–85, likely violate respondents' informational-privacy rights.[5]

Over the dissents of five judges, the Ninth Circuit denied rehearing en banc. 568 F. 3d 1028 (2009). We granted certiorari. 559 U. S. ___ (2010).

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[5] In the Ninth Circuit, respondents also challenged the criteria that they believe the Government will use to determine their "suitability" for employment at JPL. Respondents relied on a document, which had been temporarily posted on the JPL intranet, that listed factors purportedly bearing on suitability for federal employment. App. 98–104. Among the listed factors were a failure to "mee[t] financial obligations," "health issues," and "mental, emotional, psychological, or psychiatric issues." *Id.,* at 98, 102. Other factors, which were listed under the heading "Criminal or Immoral Conduct," included "indecent exposure," "voyeurism," "indecent proposal[s]," and "carnal knowledge." *Id.,* at 98. The document also stated that while "homosexuality," "adultery," and "illegitimate children" were not "suitability" issues in and of themselves, they might pose "security issue[s]" if circumstances indicated a "susceptibility to coercion or blackmail." *Id.,* at 102. The Court of Appeals rejected respondents' "challenges to . . . suitability determination[s]" as unripe. 530 F. 3d, at 873. Although respondents did not file a cross-petition from that portion of the Ninth Circuit's judgment, they nonetheless discuss these suitability criteria at some length in their brief before this Court. Respondents' challenge to these criteria is not before us. We note, however, the Acting Solicitor General's statement at oral argument that "NASA will not and does not use" the document to which respondents object "to make contractor credentialing decisions." Tr. of Oral Arg. 22.

II

As noted, respondents contend that portions of SF–85 and Form 42 violate their "right to informational privacy." Brief for Respondents 15. This Court considered a similar claim in *Whalen*, 429 U. S. 589, which concerned New York's practice of collecting "the names and addresses of all persons" prescribed dangerous drugs with both "legitimate and illegitimate uses." *Id.*, at 591. In discussing that claim, the Court said that "[t]he cases sometimes characterized as protecting 'privacy'" actually involved "at least two different kinds of interests": one, an "interest in avoiding disclosure of personal matters";[6] the other, an interest in "making certain kinds of important decisions" free from government interference.[7] The patients who brought suit in *Whalen* argued that New York's statute "threaten[ed] to impair" both their "nondisclosure" interests and their interests in making healthcare decisions independently. *Id.*, at 600. The Court, however, upheld the statute as a "reasonable exercise of New York's broad police powers." *Id.*, at 598.

Whalen acknowledged that the disclosure of "private information" to the State was an "unpleasant invasion of privacy," *id.*, at 602, but the Court pointed out that the New York statute contained "security provisions" that

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[6] 429 U. S., at 598–599, and n. 25 (citing *Olmstead* v. *United States*, 277 U. S. 438, 478 (1928) (Brandeis, J., dissenting) (describing "the right to be let alone" as "the right most valued by civilized men"); *Griswold* v. *Connecticut*, 381 U. S. 479, 483 (1965) ("[T]he First Amendment has a penumbra where privacy is protected from governmental intrusion"); *Stanley* v. *Georgia*, 394 U. S. 557, 559, 568 (1969); *California Bankers Assn.* v. *Shultz*, 416 U. S. 21, 79 (1974) (Douglas, J., dissenting); and *id.*, at 78 (Powell, J., concurring)).

[7] 429 U. S., at 599–600, and n. 26 (citing *Roe* v. *Wade*, 410 U. S. 113 (1973); *Doe* v. *Bolton*, 410 U. S. 179 (1973); *Loving* v. *Virginia*, 388 U. S. 1 (1967); *Griswold* v. *Connecticut*, *supra; Pierce* v. *Society of Sisters*, 268 U. S. 510 (1925); *Meyer* v. *Nebraska*, 262 U. S. 390 (1923); and *Allgeyer* v. *Louisiana*, 165 U. S. 587 (1897)).

protected against "public disclosure" of patients' information, *id.*, at 600–601. This sort of "statutory or regulatory duty to avoid unwarranted disclosures" of "accumulated private data" was sufficient, in the Court's view, to protect a privacy interest that "arguably ha[d] its roots in the Constitution." *Id.*, at 605–606. The Court thus concluded that the statute did not violate "any right or liberty protected by the Fourteenth Amendment." *Id.*, at 606.

Four months later, the Court referred again to a constitutional "interest in avoiding disclosure." *Nixon,* 433 U. S., at 457 (internal quotation marks omitted). Former President Nixon brought a challenge to the Presidential Recordings and Materials Preservation Act, 88 Stat. 1695, note following 44 U. S. C. §2111, a statute that required him to turn over his presidential papers and tape recordings for archival review and screening. 433 U. S., at 455–465. In a section of the opinion entitled "Privacy," the Court addressed a combination of claims that the review required by this Act violated the former President's "Fourth and Fifth Amendmen[t]" rights. *Id.*, at 455, and n. 18, 458–459. The Court rejected those challenges after concluding that the Act at issue, like the statute in *Whalen*, contained protections against "undue dissemination of private materials." 433 U. S., at 458. Indeed, the Court observed that the former President's claim was "weaker" than the one "found wanting . . . in *Whalen*," as the Government was required to return immediately all "purely private papers and recordings" identified by the archivists. *Id.*, at 458–459. Citing Fourth Amendment precedent, the Court also stated that the public interest in preserving presidential papers outweighed any "legitimate expectation of privacy" that the former President may have enjoyed. *Id.,* at 458 (citing *Katz* v. *United States*, 389 U. S. 347 (1967); *Camara* v. *Municipal Court of City and County of San Francisco,* 387 U. S. 523 (1967); and *Terry*

v. *Ohio*, 392 U. S. 1 (1968)).[8]

The Court announced the decision in *Nixon* in the waning days of October Term 1976. Since then, the Court has said little else on the subject of an "individual interest in avoiding disclosure of personal matters." *Whalen*, *supra*, at 599; *Nixon*, *supra*, at 457. A few opinions have mentioned the concept in passing and in other contexts. See *Department of Justice* v. *Reporters Comm. for Freedom of Press*, 489 U. S. 749, 762–763 (1989); *New York* v. *Ferber*, 458 U. S. 747, 759, n. 10 (1982). But no other decision has squarely addressed a constitutional right to informational privacy.[9]

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[8] The Court continued its discussion of Fourth Amendment principles throughout the "Privacy" section of the opinion. See 433 U. S., at 459 (citing *United States* v. *Miller*, 425 U. S. 435 (1976), *United States* v. *Dionisio*, 410 U. S. 1 (1973), and *Katz*, 389 U. S. 347)); 433 U. S., at 460–462 (addressing the former President's claim that the Act was "tantamount to a general warrant" under *Stanford* v. *Texas*, 379 U. S. 476 (1965)); 433 U. S., at 463–465, and n. 26 (concluding that the challenged law was analogous to the wiretapping provisions of Title III of the Omnibus Crime Control and Safe Streets Act of 1968, notwithstanding the lack of a "warrant requirement").

[9] State and lower federal courts have offered a number of different interpretations of *Whalen* and *Nixon* over the years. Many courts hold that disclosure of at least some kinds of personal information should be subject to a test that balances the government's interests against the individual's interest in avoiding disclosure. *E.g.*, *Barry* v. *New York*, 712 F. 2d 1554, 1559 (CA2 1983); *Fraternal Order of Police* v. *Philadelphia*, 812 F. 2d 105, 110 (CA3 1987); *Woodland* v. *Houston*, 940 F. 2d 134, 138 (CA5 1991) *(per curiam); In re Crawford*, 194 F. 3d 954, 959 (CA9 1999); *State* v. *Russo*, 259 Conn. 436, 459–464, 790 A. 2d 1132, 1147–1150 (2002). The Sixth Circuit has held that the right to informational privacy protects only intrusions upon interests "that can be deemed fundamental or implicit in the concept of ordered liberty." *J. P.* v. *DeSanti*, 653 F. 2d 1080, 1090 (1981) (internal quotation marks omitted). The D. C. Circuit has expressed "grave doubts" about the existence of a constitutional right to informational privacy. *American Federation of Govt. Employees* v. *HUD*, 118 F. 3d 786, 791 (1997).

III

As was our approach in *Whalen*, we will assume for present purposes that the Government's challenged inquiries implicate a privacy interest of constitutional significance. 429 U. S., at 599, 605.[10] We hold, however,

[10] The opinions concurring in the judgment disagree with this approach and would instead provide a definitive answer to the question whether there is a constitutional right to informational privacy. *Post*, at 6–7 (opinion of SCALIA, J.); *post*, at 1 (opinion of THOMAS, J.). One of these opinions expresses concern that our failure to do so will "har[m] our image, if not our self-respect," *post,* at 7 (SCALIA, J.), and will cause practical problems, *post,* at 8–9. There are sound reasons for eschewing the concurring opinions' recommended course.

"The premise of our adversarial system is that appellate courts do not sit as self-directed boards of legal inquiry and research, but essentially as arbiters of legal questions presented and argued by the parties before them." *Carducci* v. *Regan*, 714 F. 2d 171, 177 (CADC 1983) (opinion for the court by Scalia, J.). In this case, petitioners did not ask us to hold that there is no constitutional right to informational privacy, and respondents and their *amici* thus understandably refrained from addressing that issue in detail. It is undesirable for us to decide a matter of this importance in a case in which we do not have the benefit of briefing by the parties and in which potential *amici* had little notice that the matter might be decided. See Pet. for Cert. 15 ("no need in this case" for broad decision on "the scope of a constitutionally-based right to privacy for certain information"). Particularly in cases like this one, where we have only the "scarce and open-ended" guideposts of substantive due process to show us the way, see *Collins* v. *Harker Heights*, 503 U. S. 115, 125 (1992), the Court has repeatedly recognized the benefits of proceeding with caution. *E.g.*, *Herrera* v. *Collins*, 506 U. S. 390, 417 (1993) (joined by SCALIA, J.) (assuming "for the sake of argument . . . that in a capital case a truly persuasive demonstration of 'actual innocence'" made after conviction would render execution unconstitutional); *Cruzan* v. *Director, Mo. Dept. of Health*, 497 U. S. 261, 279 (1990) (joined by SCALIA, J.) ("[W]e assume that the United States Constitution would grant a competent person a constitutionally protected right to refuse lifesaving hydration and nutrition"); *Regents of Univ. of Mich.* v. *Ewing*, 474 U. S. 214, 222–223 (1985) ("assum[ing], without deciding, that federal courts can review an academic decision of a public educational institution under a substantive due process standard"); *Board of Curators of Univ. of Mo.* v. *Horowitz*, 435 U. S. 78, 91–

that, whatever the scope of this interest, it does not prevent the Government from asking reasonable questions of the sort included on SF–85 and Form 42 in an employment background investigation that is subject to the Privacy Act's safeguards against public disclosure.

A

1

As an initial matter, judicial review of the Government's challenged inquiries must take into account the context in which they arise. When the Government asks respondents and their references to fill out SF–85 and Form 42, it does not exercise its sovereign power "to regulate or license." *Cafeteria & Restaurant Workers* v. *McElroy*, 367 U. S. 886, 896 (1961). Rather, the Government conducts the challenged background checks in its capacity "as proprietor" and manager of its "internal operation." *Ibid*. Time and again our cases have recognized that the Government has a much freer hand in dealing "with citizen employees than it does when it brings its sovereign power to bear on citizens at large." *Engquist* v. *Oregon Dept. of Agriculture*, 553 U. S. 591, 598 (2008); *Waters* v. *Churchill*, 511 U. S. 661, 674 (1994) (plurality opinion). This distinction is grounded on the "common-sense realization" that if

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92 (1978) (same); see also *New York State Club Assn., Inc*. v. *City of New York*, 487 U. S. 1, 20 (1988) (SCALIA, J., concurring in part and concurring in judgment) (joining the Court's opinion on the understanding that it "assumes for purposes of its analysis, but does not hold, the existence of a constitutional right of private association for other than expressive or religious purposes").

Justice SCALIA provides no support for his claim that our approach in this case will "dramatically increase the number of lawsuits claiming violations of the right to informational privacy," *post*, at 9, and will leave the lower courts at sea. We take the same approach here that the Court took more than three decades ago in *Whalen* and *Nixon*, and there is no evidence that those decisions have caused the sky to fall.

We therefore decide the case before us and leave broader issues for another day.

every "employment decision became a constitutional matter," the Government could not function. See *Connick* v. *Myers*, 461 U. S. 138, 143 (1983); see also *Bishop* v. *Wood*, 426 U. S. 341, 350 (1976) ("The Due Process Clause . . . is not a guarantee against incorrect or ill-advised personnel decisions").

An assessment of the constitutionality of the challenged portions of SF–85 and Form 42 must account for this distinction. The questions challenged by respondents are part of a standard employment background check of the sort used by millions of private employers. See Brief for Consumer Data Indus. Assn. et al. as *Amici Curiae* 2 (hereinafter CDIA Brief) ("[M]ore than 88% of U. S. companies . . . perform background checks on their employees"). The Government itself has been conducting employment investigations since the earliest days of the Republic. L. White, The Federalists: A Study in Administrative History 262–263 (1948); see OPM, Biography of An Ideal: History of the Federal Civil Service 8 (2002) (noting that President Washington "set a high standard" for federal office and finalized appointments only after "investigating [candidates'] capabilities and reputations"). Since 1871, the President has enjoyed statutory authority to "ascertain the fitness of applicants" for the civil service "as to age, health, character, knowledge and ability for the employment sought," Act of Mar. 3, 1871, Rev. Stat. §1753, as amended, 5 U. S. C. §3301(2), and that Act appears to have been regarded as a codification of established practice.[11] Standard background investigations similar to those

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[11] The debate on the 1871 Act in the House of Representatives contained this exchange on presidential authority to conduct background checks:

"Mr. PETERS: Has he not that power [to conduct the proposed investigations of candidates for the civil service] now?

"Mr. DAWES: He has all that power. If you will go up to the War Department or the Department of the Interior you will see pretty much at issue here became mandatory for all candidates for the federal civil service in 1953. Exec. Order No. 10450, 3 CFR 936. And the particular investigations challenged in this case arose from a decision to extend that requirement to federal contract employees requiring long-term access to federal facilities. See HSPD–12, at 1765, App. 127; FIPS PUB 201–1, at iii–vi, 1–8, App. 131–150.

As this long history suggests, the Government has an interest in conducting basic employment background checks. Reasonable investigations of applicants and employees aid the Government in ensuring the security of its facilities and in employing a competent, reliable workforce. See *Engquist*, *supra*, at 598–599. Courts must keep those interests in mind when asked to go line-by-line through the Government's employment forms and to scrutinize the choice and wording of the questions they contain.

Respondents argue that, because they are contract employees and not civil servants, the Government's broad authority in managing its affairs should apply with diminished force. But the Government's interest as "proprietor" in managing its operations, *Cafeteria & Restaurant Workers*, *supra*, at 896, does not turn on such formalities. See *Board of Comm'rs, Wabaunsee Cty.* v. *Umbehr*, 518 U. S. 668, 678, 679 (1996) (formal distinctions such as whether a "service provider" has a "contract of employment or a contract for services" with the government is a "very poor proxy" for constitutional interests at stake). The fact that respondents' direct employment relationship is with Cal Tech—which operates JPL under a Government contract—says very little about the interests at stake in this case. The record shows that, as a "practical matter," there are no "[r]elevant distinctions" between the duties per-

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all of this nailed up on the doors, in the form of rules and regulations." Cong. Globe, 41st Cong., 3d Sess., 1935 (1871).

formed by NASA's civil-service workforce and its contractor workforce. App. 221. The two classes of employees perform "functionally equivalent duties," and the extent of employees' "access to NASA . . . facilities" turns not on formal status but on the nature of "the jobs they perform." *Ibid.*

At JPL, in particular, the work that contract employees perform is critical to NASA's mission. Respondents in this case include "the lead trouble-shooter for . . . th[e] $568 [million]" Kepler space observatory, 7 Record 396; the leader of the program that "tests . . . all new technology that NASA will use in space," App. 60; and one of the lead "trajectory designers for . . . the Galileo Project and the Apollo Moon landings," *id.,* at 62. This is important work, and all of it is funded with a multibillion dollar investment from the American taxpayer. See NASA, Jet Propulsion Laboratory Annual Report 09, p. 35 (2010), online at http://www.jpl.nasa.gov/annualreport/2009-report.pdf. The Government has a strong interest in conducting basic background checks into the contract employees minding the store at JPL.[12]

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[12] In their brief, respondents also rely on the fact that many of them have been working at JPL for years and that Cal Tech previously vetted them through standard "employment reference checks." Brief for Respondents 52–53. The record indicates that this may be wrong as a factual matter. *E.g.*, 7 Record 391 ("I have not been required to undergo any type of background investigation to maintain my position with JPL"); *id.,* at 397 ("I have never been required to undergo any type of background investigation to maintain my position with JPL other than . . . [one] which required that I provide my name, social security number, and current address" to facilitate a "check for outstanding warrants, arrests, or convictions"); *id.*, at 356, 367, 386–387 (similar). Even if it were correct, the fact that Cal Tech once conducted a background check on respondents does not diminish the Government's interests in conducting its own standard background check to satisfy itself that contract employees should be granted continued access to the Government's facility. In any event, counsel abandoned this position at oral argument. Tr. of Oral Arg. 38.

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With these interests in view, we conclude that the challenged portions of both SF–85 and Form 42 consist of reasonable, employment-related inquiries that further the Government's interests in managing its internal operations. See *Engquist*, 553 U. S., at 598–599; *Whalen,* 429 U. S., at 597–598. As to SF–85, the only part of the form challenged here is its request for information about "any treatment or counseling received" for illegal-drug use within the previous year. The "treatment or counseling" question, however, must be considered in context. It is a followup to SF–85's inquiry into whether the employee has "used, possessed, supplied, or manufactured illegal drugs" during the past year. The Government has good reason to ask employees about their recent illegal-drug use. Like any employer, the Government is entitled to have its projects staffed by reliable, law-abiding persons who will "'efficiently and effectively'" discharge their duties. See *Engquist*, *supra*, at 598–599. Questions about illegal-drug use are a useful way of figuring out which persons have these characteristics. See, *e.g.*, Breen & Matusitz, An Updated Examination of the Effects of Illegal Drug Use in the Workplace, 19 J. Human Behavior in the Social Environment, 434 (2009) (illicit drug use negatively correlated with workplace productivity).

In context, the follow-up question on "treatment or counseling" for recent illegal-drug use is also a reasonable, employment-related inquiry. The Government, recognizing that illegal-drug use is both a criminal and a medical issue, seeks to separate out those illegal-drug users who are taking steps to address and overcome their problems. The Government thus uses responses to the "treatment or counseling" question as a mitigating factor in determining whether to grant contract employees long-term access to federal facilities.[13]

This is a reasonable, and indeed a humane, approach, and respondents do not dispute the legitimacy of the Government's decision to use drug treatment as a mitigating factor in its contractor credentialing decisions. Respondents' argument is that, if drug treatment is only used to mitigate, then the Government should change the mandatory phrasing of SF–85—"Include [in your answer] any treatment or counseling received"—so as to make a response optional. App. 94. As it stands, the mandatory "treatment or counseling" question is unconstitutional, in respondents' view, because it is "more intrusive than necessary to satisfy the government's objective." Brief for Respondents 26; 530 F. 3d, at 879 (holding that "treatment or counseling" question should be enjoined because the form "appears to *compel* disclosure").

We reject the argument that the Government, when it requests job-related personal information in an employment background check, has a constitutional burden to demonstrate that its questions are "necessary" or the least restrictive means of furthering its interests. So exacting a standard runs directly contrary to *Whalen*. The patients in *Whalen*, much like respondents here, argued that New York's statute was unconstitutional because the State could not "demonstrate the necessity" of its program. 429 U. S., at 596. The Court quickly rejected that argument, concluding that New York's collection of patients' prescription information could "not be held unconstitutional simply because" a court viewed it as "unnecessary, in whole or

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[13] Asking about treatment or counseling could also help the Government identify chronic drug abusers for whom, "despite counseling and rehabilitation programs, there is little chance for effective rehabilitation." 38 Fed. Reg. 33315 (1973). At oral argument, however, the Acting Solicitor General explained that NASA views treatment or counseling solely as a "mitigat[ing]" factor that ameliorates concerns about recent illegal drug use. Tr. of Oral Arg. 19.

in part." *Id.,* at 596–597.

That analysis applies with even greater force where the Government acts, not as a regulator, but as the manager of its internal affairs. See *Engquist*, *supra*, at 598–599. SF–85's "treatment or counseling" question reasonably seeks to identify a subset of acknowledged drug users who are attempting to overcome their problems. The Government's considered position is that phrasing the question in more permissive terms would result in a lower response rate, and the question's effectiveness in identifying illegal-drug users who are suitable for employment would be "materially reduced." Reply Brief for Petitioners 19. That is a reasonable position, falling within the "'wide latitude'" granted the Government in its dealings with employees. See *Engquist*, *supra*, at 600.

3

The Court of Appeals also held that the broad, "open-ended questions" on Form 42 likely violate respondents' informational-privacy rights. Form 42 asks applicants' designated references and landlords for "information" bearing on "suitability for government employment or a security clearance." App. 97. In a series of questions, the Government asks if the reference has any "adverse information" about the applicant's "honesty or trustworthiness," "violations of the law," "financial integrity," "abuse of alcohol and/or drugs," "mental or emotional stability," "general behavior or conduct," or "other matters." *Ibid.*

These open-ended inquiries, like the drug-treatment question on SF–85, are reasonably aimed at identifying capable employees who will faithfully conduct the Government's business. See *Engquist*, *supra*, at 598–599. Asking an applicant's designated references broad, open-ended questions about job suitability is an appropriate tool for separating strong candidates from weak ones. It would be a truly daunting task to catalog all the reasons why a person might not be suitable for a particular job, and references do not have all day to answer a laundry list of specific questions. See CDIA Brief 6–7 (references "typically have limited time to answer questions from potential employers," and "open-ended questions" yield more relevant information than narrow inquiries). Form 42, by contrast, takes just five minutes to complete. 75 Fed. Reg. 5359.

The reasonableness of such open-ended questions is illustrated by their pervasiveness in the public and private sectors. Form 42 alone is sent out by the Government over 1.8 million times annually. *Ibid.* In addition, the use of open-ended questions in employment background checks appears to be equally commonplace in the private sector. See, *e.g.*, S. Bock et al., Mandated Benefits 2008 Compliance Guide, Exh. 20.1, A Sample Policy on Reference Checks on Job Applicants ("Following are the guidelines for conducting a telephone reference check: . . . Ask open-ended questions, then wait for the respondent to answer"); M. Zweig, Human Resources Management 87 (1991) ("Also ask, 'Is there anything else I need to know about [candidate's name]?' This kind of open-ended question may turn up all kinds of information you wouldn't have gotten any other way"). The use of similar open-ended questions by the Government is reasonable and furthers its interests in managing its operations.

B

1

Not only are SF–85 and Form 42 reasonable in light of the Government interests at stake, they are also subject to substantial protections against disclosure to the public. Both *Whalen* and *Nixon* recognized that government "accumulation" of "personal information" for "public purposes" may pose a threat to privacy. *Whalen*, 429 U. S., at 605; see *Nixon* 433 U. S., at 457–458, 462. But both decisions also stated that a "statutory or regulatory duty to avoid unwarranted disclosures" generally allays these privacy concerns. *Whalen*, *supra*, at 605; *Nixon*, *supra,* at 458–459. The Court in *Whalen*, relying on New York's "security provisions" prohibiting public disclosure, turned aside a challenge to the collection of patients' prescription information. 429 U. S., at 594, and n. 12, 600–601, 605. In *Nixon,* the Court rejected what it regarded as an even "weaker" claim by the former President because the Presidential Recordings and Materials Preservation Act "[n]ot only . . . mandate[d] regulations" against "undue dissemination," but also required immediate return of any "purely private" materials flagged by the Government's archivists. 433 U. S., at 458–459.

Respondents in this case, like the patients in *Whalen* and former President Nixon, attack only the Government's *collection* of information on SF–85 and Form 42. And here, no less than in *Whalen* and *Nixon*, the information collected is shielded by statute from "unwarranted disclosur[e]." See *Whalen*, *supra,* at 605. The Privacy Act, which covers all information collected during the background-check process, allows the Government to maintain records "about an individual" only to the extent the records are "relevant and necessary to accomplish" a purpose authorized by law. 5 U. S. C. §552a(e)(1). The Act requires written consent before the Government may disclose records pertaining to any individual. §552a(b). And the Act imposes criminal liability for willful violations of its nondisclosure obligations. §552a(i)(1). These requirements, as we have noted, give "forceful recognition" to a Government employee's interest in maintaining the "confidentiality of sensitive information . . . in his personnel files." *Detroit Edison Co.* v. *NLRB*, 440 U. S. 301, 318, n. 16 (1979). Like the protections against disclosure in *Whalen* and *Nixon*, they "evidence a proper concern" for individual privacy. *Whalen*, *supra*, at 605; *Nixon*, *supra*, at 458–459.

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Notwithstanding these safeguards, respondents argue that statutory exceptions to the Privacy Act's disclosure bar, see §§552a(b)(1)–(12), leave its protections too porous to supply a meaningful check against "unwarranted disclosures," *Whalen*, *supra*, at 605. Respondents point in particular to what they describe as a "broad" exception for "routine use[s]," defined as uses that are "compatible with the purpose for which the record was collected." §§552a(b)(3), (a)(7).

Respondents' reliance on these exceptions rests on an incorrect reading of both our precedents and the terms of the Privacy Act. As to our cases, the Court in *Whalen* and *Nixon* referred approvingly to statutory or regulatory protections against "*unwarranted* disclosures" and "*undue* dissemination" of personal information collected by the Government. *Whalen*, *supra*, at 605; *Nixon*, *supra*, at 458. Neither case suggested that an ironclad disclosure bar is needed to satisfy privacy interests that may be "root[ed] in the Constitution." *Whalen*, *supra*, at 605. In *Whalen*, the New York statute prohibiting "[p]ublic disclosure of the identity of patients" was itself subject to several exceptions. 429 U. S., at 594–595, and n. 12. In *Nixon*, the protections against "undue dissemination" mentioned in the opinion were not even before the Court, but were to be included in forthcoming regulations "mandate[d]" by the challenged Act. 433 U. S., at 458; see *id.*, at 437–439 (explaining that the Court was limiting its review to the Act's "facial validity" and was not considering the Administrator's forthcoming regulations). Thus, the mere fact that the Privacy Act's nondisclosure requirement is subject to exceptions does not show that the statute provides insufficient protection against public disclosure.

Nor does the substance of the "routine use" exception relied on by respondents create any undue risk of public dissemination. None of the authorized "routine use[s]" of respondents' background-check information allows for release to the public. 71 Fed. Reg. 45859–45860, 45862 (2006); 60 Fed. Reg. 63084 (1995), as amended, 75 Fed. Reg. 28307 (2010). Rather, the established "routine use[s]" consist of limited, reasonable steps designed to complete the background-check process in an efficient and orderly manner. See *Whalen*, *supra*, at 602 (approving disclosures to authorized New York Department of Health employees that were not "meaningfully distinguishable" from routine disclosures "associated with many facets of health care"). One routine use, for example, involves a limited disclosure to persons filling out Form 42 so that designated references can "identify the individual" at issue and can understand the "nature and purpose of the investigation." App. 89. Authorized JPL employees also review each completed SF–85 to verify that all requested information has been provided. *Id.,* at 211. These designated JPL employees may not "disclose any information contained in the form to anyone else," *ibid*., and Cal Tech is not given access to adverse information uncovered during the Government's background check, *id.,* at 207–208. The "remote possibility" of public disclosure created by these narrow "routine use[s]" does not undermine the Privacy Act's substantial protections. See *Whalen*, 429 U. S., at 601–602 ("remote possibility" that statutory security provisions will "provide inadequate protection against unwarranted disclosures" not a sufficient basis for striking down statute).

Citing past violations of the Privacy Act,[14] respondents

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[14] *E.g.*, GAO, Personal Information: Data Breaches are Frequent, but Evidence of Resulting Identity Theft is Limited; However, the Full Extent Is Unknown 5, 20 (GAO 07–737, 2007) (over 3-year period, 788 data breaches occurred at 17 federal agencies).

note that it is possible that their personal information could be disclosed as a result of a similar breach. But data breaches are a possibility any time the Government stores information. As the Court recognized in *Whalen*, the mere possibility that security measures will fail provides no "proper ground" for a broad-based attack on government information-collection practices. *Ibid.* Respondents also cite a portion of SF–85 that warns of possible disclosure "[t]o the news media or the general public." App. 89. By its terms, this exception allows public disclosure only where release is "in the public interest" and would not result in "an unwarranted invasion of personal privacy." *Ibid.* Respondents have not cited any example of such a disclosure, nor have they identified any plausible scenario in which their information might be unduly disclosed under this exception.[15]

In light of the protection provided by the Privacy Act's nondisclosure requirement, and because the challenged portions of the forms consist of reasonable inquiries in an employment background check, we conclude that the Government's inquiries do not violate a constitutional right to informational privacy. *Whalen*, *supra*, at 605.

* * *

For these reasons, the judgment of the Court of Appeals is reversed, and the case is remanded for further proceedings consistent with this opinion.

It is so ordered.

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[15] Respondents further contend that the Privacy Act's ability to deter unauthorized release of private information is significantly hampered by the fact that the statute provides only "an *ex post* money-damages action," not injunctive relief. Brief for Respondents 44 (citing *Doe* v. *Chao*, 540 U. S. 614, 635 (2004) (GINSBURG, J., dissenting)). Nothing in *Whalen* or *Nixon* suggests that any private right of action—for money damages or injunctive relief—is needed in order to provide sufficient protection against public disclosure.

JUSTICE KAGAN took no part in the consideration or decision of this case.

SUPREME COURT OF THE UNITED STATES

No. 09–530

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, ET AL., PETITIONERS *v.* ROBERT M. NELSON ET AL.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE NINTH CIRCUIT

[January 19, 2011]

JUSTICE SCALIA, with whom JUSTICE THOMAS joins, concurring in the judgment.

I agree with the Court, of course, that background checks of employees of government contractors do not offend the Constitution. But rather than reach this conclusion on the basis of the never-explained assumption that the Constitution requires courts to "balance" the Government's interests in data collection against its contractor employees' interest in privacy, I reach it on simpler grounds. Like many other desirable things not included in the Constitution, "informational privacy" seems like a good idea—wherefore the People have enacted laws at the federal level and in the states restricting the government's collection and use of information. But it is up to the People to enact those laws, to shape them, and, when they think it appropriate, to repeal them. A federal constitutional right to "informational privacy" does not exist.

Before addressing the constitutional issues, however, I must observe a remarkable and telling fact about this case, unique in my tenure on this Court: Respondents' brief, in arguing that the Federal Government violated the Constitution, does not once identify which provision of the Constitution that might be. The Table of Authorities contains citations of cases from federal and state courts, federal and state statutes, Rules of Evidence from four states, two Executive Orders, a House Report, and even more exotic sources of law, such as two reports of the Government Accountability Office and an EEOC document concerning "Enforcement Guidance." And yet it contains not a single citation of the sole document we are called upon to construe: the Constitution of the United States. The body of the brief includes a single, fleeting reference to the Due Process Clause, buried in a citation of the assuredly inapposite *Lawrence* v. *Texas*, 539 U. S. 558 (2003), Brief for Respondents 42; but no further attempt is made to argue that NASA's actions deprived respondents of liberty without due process of law. And this legal strategy was not limited to respondents' filing in this Court; in the Ninth Circuit respondents asserted in a footnote that "courts have grounded the right to informational privacy in various provisions of the Constitution," Brief for Appellants in No. 07–56424, p. 25, n. 18, but declined to identify which ones applied here.

To tell the truth, I found this approach refreshingly honest. One who asks us to invent a constitutional right out of whole cloth should spare himself and us the pretense of tying it to some words of the Constitution. Regrettably, this Lincolnesque honesty evaporated at oral argument, when counsel asserted, apparently for the first time in this litigation, that the right to informational privacy emerged from the Due Process Clause of the Fifth Amendment. Tr. of Oral Arg. 28–29. That counsel invoked the infinitely plastic concept of "substantive" due process does not make this constitutional theory any less invented.

This case is easily resolved on the simple ground that the Due Process Clause does not "guarante[e] certain (unspecified) liberties"; rather, it "merely guarantees certain procedures as a prerequisite to deprivation of liberty." *Albright* v. *Oliver*, 510 U. S. 266, 275 (1994)

(SCALIA, J., concurring). Respondents make no claim that the State has deprived them of liberty without the requisite procedures, and their due process claim therefore must fail. Even under the formula we have adopted for identifying liberties entitled to protection under the faux "substantive" component of the Due Process Clause—that "the Due Process Clause specially protects those fundamental rights and liberties which are, objectively, deeply rooted in this Nation's history and tradition," *Washington* v. *Glucksberg*, 521 U. S. 702, 720–721 (1997) (internal quotation marks omitted)—respondents' claim would fail. Respondents do not even attempt to argue that the claim at issue in this case passes that test, perhaps recognizing the farcical nature of a contention that a right deeply rooted in our history and tradition bars the Government from ensuring that the Hubble Telescope is not used by recovering drug addicts.

The absurdity of respondents' position in this case should not, however, obscure the broader point: Our due process precedents, even our "substantive due process" precedents, do not support *any* right to informational privacy. First, we have held that the government's act of defamation does not deprive a person "of any 'liberty' protected by the procedural guarantees of the Fourteenth Amendment." *Paul* v. *Davis*, 424 U. S. 693, 709 (1976). We reasoned that stigma, standing alone, does not "significantly alte[r]" a person's legal status so as to "justif[y] the invocation of procedural safeguards." *Id.,* at 708–709. If outright defamation does not qualify, it is unimaginable that the mere disclosure of private information does.

Second, respondents challenge the Government's *collection* of their private information. But the Government's collection of private information is regulated by the Fourth Amendment, and "[w]here a particular Amendment provides an explicit textual source of constitutional protection against a particular sort of government behavior, that

Amendment, not the more generalized notion of substantive due process, must be the guide for analyzing these claims." *County of Sacramento* v. *Lewis*, 523 U. S. 833, 842 (1998) (internal quotation marks omitted; alteration in original). Here, the Ninth Circuit rejected respondents' Fourth Amendment argument, correctly holding that the Form 42 inquiries to third parties were not Fourth Amendment "searches" under *United States* v. *Miller*, 425 U. S. 435 (1976), and that the Fourth Amendment does not prohibit the Government from asking questions about private information. 530 F. 3d 865, 876–877 (2008). That should have been the end of the matter. Courts should not use the Due Process Clause as putty to fill up gaps they deem unsightly in the protections provided by other constitutional provisions.

In sum, I would simply hold that there is no constitutional right to "informational privacy." Besides being consistent with constitutional text and tradition, this view has the attractive benefit of resolving this case without resort to the Court's exegesis on the Government's legitimate interest in identifying contractor drug abusers and the comfortingly narrow scope of NASA's "routine use" regulations. I shall not fill the U. S. Reports with further explanation of the incoherence of the Court's "substantive due process" doctrine in its many manifestations, since the Court does not play the substantive-due-process card. Instead, it states that it will "assume, without deciding" that there exists a right to informational privacy, *ante*, at 1.

The Court's sole justification for its decision to "assume, without deciding" is that the Court made the same mistake before—in two 33-year-old cases, *Whalen* v. *Roe*, 429 U. S. 589 (1977), and *Nixon* v. *Administrator of General Services*, 433 U. S. 425 (1977).* *Ante*, at 11. But *stare*

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* Contrary to the Court's protestation, *ante*, at 11, n. 10, the Court's

decisis is simply irrelevant when the pertinent precedent assumed, without deciding, the existence of a constitutional right. "*Stare decisis* reflects a policy judgment that in most matters it is more important that the applicable rule of law be settled than that it be settled right." *State Oil Co.* v. *Khan*, 522 U. S. 3, 20 (1997) (internal quotation marks omitted). "It is the preferred course because it promotes the evenhanded, predictable, and consistent development of legal principles." *Ibid.* (internal quotation marks omitted). Here, however, there *is* no applicable rule of law that is settled. To the contrary, *Whalen* and *Nixon* created an uncertainty that the text of the Constitution did not contain and that today's opinion perpetuates.

A further reason *Whalen* and *Nixon* are not entitled to *stare decisis* effect is that neither opinion supplied any coherent reason why a constitutional right to informational privacy might exist. As supporting authority, *Whalen* cited *Stanley* v. *Georgia*, 394 U. S. 557 (1969), a

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failure to address whether there is a right to informational privacy cannot be blamed upon the Government's concession that such a right exists, and indeed the Government's startling assertion that *Whalen* and *Nixon* (which decided nothing on the constitutional point, and have not been so much as cited in our later opinions) were "seminal"—*seminal!*—decisions. Reply Brief for Petitioner 22. We are not bound by a litigant's concession on an issue of law. See, *e.g., Grove City College* v. *Bell*, 465 U. S. 555, 562, n. 10 (1984). And it should not be thought that the concession by the United States is an entirely self-denying act. To be sure, it subjects the Executive Branch to constitutional limitations on the collection and use of information; but the Privacy Act, 5 U. S. C. §552a (2006 ed. and Supp. III), already contains extensive limitations not likely to be surpassed by constitutional improvisation. And because Congress's power under §5 of the Fourteenth Amendment extends to the full scope of the Due Process Clause, see *City of Boerne* v. *Flores*, 521 U. S. 507 (1997), the United States has an incentive to give that Clause a broad reading, thus expanding the scope of federal legislation that it justifies. Federal laws preventing state disregard of "informational privacy" may be a twinkle in the Solicitor General's eye.

First Amendment case protecting private possession of obscenity; the deservedly infamous dictum in *Griswold* v. *Connecticut*, 381 U. S. 479 (1965), concerning the "penumbra" of the First Amendment; and three concurring or dissenting opinions, none of which remotely intimated that there might be such a thing as a substantive due process right to informational privacy. 429 U. S., at 599, n. 25. *Nixon* provided even less support. After citing the observation in *Whalen* that "[o]ne element of privacy has been characterized as the individual interest in avoiding disclosure of personal matters," *Nixon*, *supra*, at 457 (quoting *Whalen*, *supra*, at 599; internal quotation marks omitted), it proceeded to conduct a straightforward *Fourth Amendment* analysis. It "assume[d]" that there was a "legitimate expectation of privacy" in the materials, and rejected the appellant's argument that the statute at issue was "precisely the kind of abuse that the Fourth Amendment was intended to prevent." *Nixon*, *supra*, at 457–458, 460. It is unfathomable why these cases' passing, barely explained reference to a right separate from the Fourth Amendment—an unenumerated right that they held to be *not* applicable—should be afforded *stare decisis* weight.

At this point the reader may be wondering: "What, after all, is the harm in being 'minimalist' and simply refusing to say that violation of a constitutional right of informational privacy can never exist? The outcome in this case is the same, so long as the Court holds that any such hypothetical right was not violated." Well, there is harm. The Court's never-say-never disposition does damage for several reasons.

1. It is in an important sense not actually minimalist. By substituting for one real constitutional question (whether there exists a constitutional right to informational privacy) a different constitutional question (whether NASA's background checks would contravene a right to informational privacy if such a right existed), the Court

gets to pontificate upon a matter that is none of its business: the appropriate balance between security and privacy. If I am correct that there exists no right to informational privacy, all that discussion is an exercise in judicial *maximalism*. Better simply to state and apply the law forthrightly than to hold our view of the law *in pectore*, so that we can inquire into matters beyond our charter, and probably beyond our ken.

If, on the other hand, the Court believes that there *is* a constitutional right to informational privacy, then I fail to see the minimalist virtues in delivering a lengthy opinion analyzing that right while coyly noting that the right is "assumed" rather than "decided." Thirty-three years have passed since the Court first suggested that the right may, or may not, exist. It is past time for the Court to abandon this Alfred Hitchcock line of our jurisprudence.

2. It harms our image, if not our self-respect, because it makes no sense. The Court decides that the Government did not violate the right to informational privacy without deciding whether there *is* a right to informational privacy, and without even describing what hypothetical standard should be used to assess whether the hypothetical right has been violated. As I explained last Term in objecting to another of the Court's never-say-never dispositions:

> "[The Court] cannot decide that [respondents'] claim fails without first deciding what a valid claim would consist of. . . . [A]greeing to or crafting a *hypothetical* standard for a *hypothetical* constitutional right is sufficiently unappealing . . . that [the Court] might as well acknowledge the right as well. Or [it] could avoid the need to agree with or craft a hypothetical standard by *denying* the right. But embracing a standard while being coy about the right is, well, odd; and deciding this case while addressing *neither* the standard *nor* the right is quite impossible." *Stop the Beach Re-*

> *nourishment, Inc.* v. *Florida Dept. of Environmental Protection*, 560 U. S. ___, ___ (2010) (plurality opinion) (joined by ALITO, J.) (slip op., at 12–13).

Whatever the virtues of judicial minimalism, it cannot justify judicial incoherence.

The Court defends its approach by observing that "we have only the 'scarce and open-ended'" guideposts of substantive due process to show us the way." *Ante*, at 11, n. 10. I would have thought that this doctrinal obscurity should lead us to provide *more* clarity for lower courts; surely one vague opinion should not provide an excuse for another.

The Court observes that I have joined other opinions that have assumed the existence of constitutional rights. *Ibid.* It is of course acceptable to reserve difficult constitutional questions, so long as answering those questions is unnecessary to coherent resolution of the issue presented in the case. So in *Cruzan* v. *Director, Mo. Dept. of Health,* 497 U. S. 261, 279–280 (1990), we declined to decide whether a competent person had a constitutional right to refuse lifesaving hydration, because—under a constitutional standard we laid out in detail—such a right did not exist for an incompetent person. In *Herrera* v. *Collins,* 506 U. S. 390, 417–418 (1993), we declined to decide whether it would be unconstitutional to execute an innocent person, because Herrera had not shown that he was innocent. In *New York State Club Assn., Inc.* v. *City of New York,* 487 U. S. 1, 10–15 (1988), we declined to decide whether there was a constitutional right of private association for certain clubs, because the plaintiff had brought a facial challenge, which would fail if the statute was valid in many of its applications, making it unnecessary to decide whether an as-applied challenge as to some clubs could succeed. Here, however, the Court actually *applies* a constitutional informational privacy standard without giving a clue as to the rule of law it is applying.

3. It provides no guidance whatsoever for lower courts. Consider the sheer multiplicity of unweighted, relevant factors alluded to in today's opinion:

- It is relevant that the Government is acting "in its capacity 'as proprietor' and manager of its 'internal operation.'" *Ante*, at 12. Of course, given that we are told neither what the appropriate standard should be when the Government is acting as regulator nor what the appropriate standard should be when it is acting as proprietor, it is not clear *what* effect this fact has on the analysis; but at least we know that it is *something*.
- History and tradition have some role to play, *ante*, at 13–14, but how much is uncertain. The Court points out that the Federal Government has been conducting investigations of candidates for employment since the earliest days; but on the other hand it acknowledges that extension of those investigations to employees of contractors is of very recent vintage.
- The contract employees are doing important work. They are not mere janitors and maintenance men; they are working on a $568 million observatory. *Ante*, at 15. Can it possibly be that the outcome of today's case would be different for background checks of lower-level employees? In the spirit of minimalism we are never told.
- Questions about drug treatment are (hypothetically) constitutional because they are "reasonable," "useful," and "humane." *Ante*, at 16–17 (internal quotation marks omitted). And questions to third parties are constitutional because they are "appropriate" and "pervasiv[e]." *Ante*, at 18–19. Any or all of these adjectives may be the hypothetical standard by which violation of the hypothetical constitutional right to "informational privacy" is evaluated.

- The Court notes that a "'statutory or regulatory duty to avoid unwarranted disclosures' *generally* allays these privacy concerns," *ante*, at 20 (emphasis added), but it gives no indication of what the exceptions to this general rule might be. It then discusses the provisions of the Privacy Act in detail, placing considerable emphasis on the limitations imposed by NASA's routine-use regulations. *Ante*, at 21–23. From the length of the discussion, I would bet that the Privacy Act is necessary to today's holding, but how much of it is necessary is a mystery.

4. It will dramatically increase the number of lawsuits claiming violations of the right to informational privacy. Rare will be the claim that is supported by none of the factors deemed relevant in today's opinion. Moreover, the utter silliness of respondents' position in this case leaves plenty of room for the possible success of future claims that are meritless, but slightly less absurd. Respondents claim that *even though* they are Government contractor employees, and *even though* they are working with highly expensive scientific equipment, and *even though* the Government is seeking only information about drug treatment and information from third parties that is standard in background checks, and *even though* the Government is liable for damages if that information is ever revealed, and *even though* NASA's Privacy Act regulations are very protective of private information, NASA's background checks are unconstitutional. Ridiculous. In carefully citing *all* of these factors as the basis for its decision, the Court makes the distinguishing of this case simple as pie.

In future cases filed under 42 U. S. C. §1983 in those circuits that recognize (rather than merely hypothesize) a constitutional right to "informational privacy," lawyers will always (and I mean *always*) find some way around today's opinion: perhaps the plaintiff will be a receptionist or a janitor, or the protections against disclosure will be less robust. And oh yes, the fact that a losing defendant will be liable not only for damages but also for attorney's fees under §1988 will greatly encourage lawyers to sue, and defendants—for whom no safe harbor can be found in the many words of today's opinion—to settle. This plaintiff's claim has failed today, but the Court makes a generous gift to the plaintiff's bar.

* * *

Because I deem it the "duty of the judicial department to say what the law is," *Marbury* v. *Madison*, 1 Cranch 137, 177 (1803), I concur only in the judgment.

SUPREME COURT OF THE UNITED STATES

No. 09–530

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, ET AL., PETITIONERS *v.* ROBERT M. NELSON ET AL.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE NINTH CIRCUIT

[January 19, 2011]

JUSTICE THOMAS, concurring in the judgment.

I agree with JUSTICE SCALIA that the Constitution does not protect a right to informational privacy. *Ante*, at 1 (opinion concurring in judgment). No provision in the Constitution mentions such a right. Cf. *Lawrence* v. *Texas*, 539 U. S. 558, 605–606 (2003) (THOMAS, J., dissenting) ("I can find neither in the Bill of Rights nor any other part of the Constitution a general right of privacy . . ." (internal quotation marks and brackets omitted)). And the notion that the Due Process Clause of the Fifth Amendment is a wellspring of unenumerated rights against the Federal Government "strains credulity for even the most casual user of words." *McDonald* v. *Chicago*, 561 U. S. ___, ___ (2010) (THOMAS, J., concurring in part and concurring in judgment) (slip op., at 7).

United States Space Legislation
112th Congress, 1st Session

H.R. 1536: Space Shuttle Retirement Act
Introduced: April 14, 2011
Status: Referred to Committee

H.R. 1536: Space Shuttle Retirement Act
Introduced: April 15, 2011
Status: Referred to Committee

H.R. 1590: To provide for the disposition of the Space Shuttle Discovery upon retirement
Introduced: April 15, 2011
Status: Referred to Committee

H.R. 1727: Strengthening America's Satellite Industry Act
Introduced: May 4, 2011
Status: Referred to Committee

H.R. 2712: Shuttle Workforce Revitalization Act of 2011
Introduced: July 30, 2011
Status: Referred to Committee

H. Res. 97: Providing amounts for the expenses of the Committee on Science, Space, and Technology in the One Hundred Twelfth Congress
Introduced: Feb 17, 2011
Status: Referred to Committee

H. Res. 109: Providing amounts for the expenses of the Committee on Science, Space, and Technology in the One Hundred Twelfth Congress
Introduced: February 28, 2011
Status: Referred to Committee

S. 305: A bill to repeal a prohibition on the use of certain funds for the termination of the Constellation program of the National Aeronautics and Space Administration
Introduced: Feb. 8, 2011
Status: Referred to Committee

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PUBLIC LAW 112–55—NOV. 18, 2011

CONSOLIDATED AND FURTHER CONTINUING APPROPRIATIONS ACT, 2012

Public Law 112–55
112th Congress

An Act

Nov. 18, 2011
[H.R. 2112]

Making consolidated appropriations for the Departments of Agriculture, Commerce, Justice, Transportation, and Housing and Urban Development, and related programs for the fiscal year ending September 30, 2012, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Consolidated and Further Continuing Appropriations Act, 2012.

SECTION 1. SHORT TITLE.

This Act may be cited as the "Consolidated and Further Continuing Appropriations Act, 2012".

SEC. 2. TABLE OF CONTENTS.

The table of contents of this Act is as follows:

1 USC 1 note.

SEC. 3. REFERENCES.

Except as expressly provided otherwise, any reference to "this Act" contained in any division of this Act shall be treated as referring only to the provisions of that division.

SEC. 4. STATEMENT OF APPROPRIATIONS.

The following sums in this Act are appropriated, out of any money in the Treasury not otherwise appropriated, for the fiscal year ending September 30, 2012.

Science Appropriations Act, 2012.

TITLE III

SCIENCE

OFFICE OF SCIENCE AND TECHNOLOGY POLICY

For necessary expenses of the Office of Science and Technology Policy, in carrying out the purposes of the National Science and Technology Policy, Organization, and Priorities Act of 1976 (42 U.S.C. 6601–6671), hire of passenger motor vehicles, and services as authorized by 5 U.S.C. 3109, not to exceed $2,250 for official reception and representation expenses, and rental of conference rooms in the District of Columbia, $4,500,000.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SCIENCE

For necessary expenses, not otherwise provided for, in the conduct and support of science research and development activities, including research, development, operations, support, and services; maintenance and repair, facility planning and design; space flight, spacecraft control, and communications activities; program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses; purchase and hire of passenger motor vehicles; and purchase, lease, charter, maintenance, and operation of mission and administrative aircraft, $5,090,000,000, to remain available until September 30, 2013, of which up to $10,000,000 shall be available for a reimbursable agreement with the Department of Energy for the purpose of re-establishing facilities to produce fuel required for radioisotope thermoelectric generators to enable future missions: *Provided*, That NASA shall implement the recommendations of the most recent National Research Council planetary decadal survey and shall follow the decadal survey's recommended decision rules regarding program implementation, including a strict adherence to the recommendation that NASA include in a balanced program a flagship class mission, which may be executed in cooperation with one or more international partners, if such mission can be appropriately de-scoped and all NASA costs for such mission can be accommodated within the overall funding levels appropriated by Congress: *Provided further,* That the formulation and development costs (with development cost as defined under 51 U.S.C. 30104) for the James Webb Space Telescope shall not exceed $8,000,000,000: *Provided further,* That should the individual identified under subparagraph (c)(2)(E) of section 30104 of title 51 as responsible for the James Webb Space Telescope determine that the development cost of the program is likely to exceed that limitation, the individual shall immediately notify the Administrator and the increase shall be treated as if it meets the 30 percent threshold described in subsection (f) of section 30104 of title 51.

Implementation. 51 USC 20305 note.

Determination. Notification.

AERONAUTICS

For necessary expenses, not otherwise provided for, in the conduct and support of aeronautics research and development activities, including research, development, operations, support, and services; maintenance and repair, facility planning and design; space flight, spacecraft control, and communications activities; program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses; purchase and hire of passenger motor vehicles; and purchase, lease, charter, maintenance, and operation of mission and administrative aircraft, $569,900,000, to remain available until September 30, 2013.

SPACE TECHNOLOGY

For necessary expenses, not otherwise provided for, in the conduct and support of space research and technology development activities, including research, development, operations, support, and services; maintenance and repair, facility planning and design; space flight, spacecraft control, and communications activities; program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses; purchase and hire of passenger motor vehicles; and purchase, lease, charter, maintenance, and operation of mission and administrative aircraft, $575,000,000, to remain available until September 30, 2013.

EXPLORATION

For necessary expenses, not otherwise provided for, in the conduct and support of exploration research and development activities, including research, development, operations, support, and services; maintenance and repair, facility planning and design; space flight, spacecraft control, and communications activities; program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses; purchase and hire of passenger motor vehicles; and purchase, lease, charter, maintenance, and operation of mission and administrative aircraft, $3,770,800,000, to remain available until September 30, 2013: *Provided,* That not less than $1,200,000,000 shall be for the Orion multipurpose crew vehicle, not less than $1,860,000,000 shall be for the heavy lift launch vehicle system which shall have a lift capability not less than 130 tons and which shall have an upper stage and other core elements developed simultaneously, $406,000,000 shall be for commercial spaceflight activities, and $304,800,000 shall be for exploration research and development: *Provided further,* That not to exceed $316,500,000 of funds provided for the heavy lift launch vehicle system may be used for ground operations: *Provided further,* That $100,000,000 of the funds provided for commercial spaceflight activities shall only be available after the NASA Administrator certifies to the Committees on Appropriations, in writing, that NASA has published the required notifications of NASA contract actions implementing the acquisition strategy for the heavy lift launch vehicle system identified in section 302 of Public Law 111–267 and has begun to execute relevant contract actions in support of development of the heavy lift launch vehicle system: *Provided further,* That not

Certification.

to exceed $58,000,000 may be transferred to "Construction and Environmental Compliance and Restoration" for construction activities related to the Orion multipurpose crew vehicle and the heavy lift launch vehicle system: *Provided further,* That funds so transferred shall not be subject to the 10 percent transfer limitation described in the Administrative Provisions in this Act for the National Aeronautics and Space Administration and shall be treated as a reprogramming under section 505 of this Act.

SPACE OPERATIONS

For necessary expenses, not otherwise provided for, in the conduct and support of space operations research and development activities, including research, development, operations, support and services; space flight, spacecraft control and communications activities, including operations, production, and services; maintenance and repair, facility planning and design; program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses; purchase and hire of passenger motor vehicles; and purchase, lease, charter, maintenance and operation of mission and administrative aircraft, $4,233,600,000, to remain available until September 30, 2013: *Provided*, That not to exceed $41,000,000 may be transferred to "Construction and Environmental Compliance and Restoration" for construction activities only at NASA-owned facilities: *Provided further,* That funds so transferred shall not be subject to the 10 percent transfer limitation described in the Administrative Provisions in this Act for the National Aeronautics and Space Administration and shall be treated as a reprogramming under section 505 of this Act: *Provided further,* That acquisition of the Tracking and Data Relay Satellite-M may be funded incrementally in fiscal year 2012 and thereafter.

EDUCATION

For necessary expenses, not otherwise provided for, in carrying out aerospace and aeronautical education research and development activities, including research, development, operations, support, and services; program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses; purchase and hire of passenger motor vehicles; and purchase, lease, charter, maintenance, and operation of mission and administrative aircraft, $138,400,000, to remain available until September 30, 2013, of which $18,400,000 shall be for the Experimental Program to Stimulate Competitive Research and $40,000,000 shall be for the National Space Grant College program.

CROSS AGENCY SUPPORT

For necessary expenses, not otherwise provided for, in the conduct and support of science, aeronautics, exploration, space operations and education research and development activities, including research, development, operations, support, and services; maintenance and repair, facility planning and design; space flight, spacecraft control, and communications activities; program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses;

purchase and hire of passenger motor vehicles; not to exceed $63,000 for official reception and representation expenses; and purchase, lease, charter, maintenance, and operation of mission and administrative aircraft, $2,995,000,000, to remain available until September 30, 2013, of which $1,000,000 shall be transferred to "National Aeronautics and Space Administration, Office of Inspector General" and used by the Inspector General to commission a comprehensive independent assessment of NASA's strategic direction and agency management: *Provided*, That not less than $39,100,000 shall be available for independent verification and validation activities.

CONSTRUCTION AND ENVIRONMENTAL COMPLIANCE AND RESTORATION

For necessary expenses for construction of facilities including repair, rehabilitation, revitalization, and modification of facilities, construction of new facilities and additions to existing facilities, facility planning and design, and restoration, and acquisition or condemnation of real property, as authorized by law, and environmental compliance and restoration, $390,000,000, to remain available until September 30, 2017: *Provided*, That hereafter, notwithstanding section 315 of the National Aeronautics and Space Act of 1958 (42 U.S.C. 2459j), all proceeds from leases entered into under that section shall be deposited into this account and shall be available for a period of 5 years, to the extent provided in annual appropriations Acts: *Provided further*, That such proceeds shall be available for obligation for fiscal year 2012 in an amount not to exceed $3,960,000: *Provided further*, That each annual budget request shall include an annual estimate of gross receipts and collections and proposed use of all funds collected pursuant to section 315 of the National Aeronautics and Space Act of 1958 (42 U.S.C. 2459j).

Contracts.
Time period.
51 USC 20145 note.

Budget estimate.
51 USC 30103 note.

OFFICE OF INSPECTOR GENERAL

For necessary expenses of the Office of Inspector General in carrying out the Inspector General Act of 1978, $37,300,000, of which $500,000 shall remain available until September 30, 2013.

ADMINISTRATIVE PROVISIONS

Funds for announced prizes otherwise authorized shall remain available, without fiscal year limitation, until the prize is claimed or the offer is withdrawn.

Not to exceed 5 percent of any appropriation made available for the current fiscal year for the National Aeronautics and Space Administration in this Act may be transferred between such appropriations, but no such appropriation, except as otherwise specifically provided, shall be increased by more than 10 percent by any such transfers. Balances so transferred shall be merged with and available for the same purposes and the same time period as the appropriations to which transferred. Any transfer pursuant to this provision shall be treated as a reprogramming of funds under section 505 of this Act and shall not be available for obligation except in compliance with the procedures set forth in that section.

The unexpired balances of previous accounts, for activities for which funds are provided under this Act, may be transferred to the new accounts established in this Act that provide such activity. Balances so transferred shall be merged with the funds in the newly established accounts, but shall be available under the same terms, conditions and period of time as previously appropriated.

Section 40902 of title 51, United States Code, is amended by adding at the end the following:

"(d) AVAILABILITY OF FUNDS.—The interest accruing from the National Aeronautics and Space Administration Endeavor Teacher Fellowship Trust Fund principal shall be available in fiscal year 2012 for the purpose of the Endeavor Science Teacher Certificate Program.".

51 U.S.C. 20145(b)(1) is amended by inserting "(A)" before "A person" and by adding at the end thereof the following new subparagraph (B) as follows:

"(B) Notwithstanding subparagraph (A), the Administrator may accept in-kind consideration for leases entered into for the purpose of developing renewable energy production facilities.".

The spending plan required by section 538 of this Act shall be provided by NASA at the theme, program, project and activity level. The spending plan, as well as any subsequent change of an amount established in that spending plan that meets the notification requirements of section 505 of this Act, shall be treated as a reprogramming under section 505 of this Act and shall not be available for obligation or expenditure except in compliance with the procedures set forth in that section.

NATIONAL SCIENCE FOUNDATION

RESEARCH AND RELATED ACTIVITIES

For necessary expenses in carrying out the National Science Foundation Act of 1950, as amended (42 U.S.C. 1861–1875), and the Act to establish a National Medal of Science (42 U.S.C. 1880–1881); services as authorized by 5 U.S.C. 3109; maintenance and operation of aircraft and purchase of flight services for research support; acquisition of aircraft; and authorized travel; $5,719,000,000, to remain available until September 30, 2013, of which not to exceed $550,000,000 shall remain available until expended for polar research and operations support, and for reimbursement to other Federal agencies for operational and science support and logistical and other related activities for the United States Antarctic program: *Provided*, That receipts for scientific support services and materials furnished by the National Research Centers and other National Science Foundation supported research facilities may be credited to this appropriation: *Provided further,* That not less than $150,900,000 shall be available for activities authorized by section 7002(c)(2)(A)(iv) of Public Law 110–69: *Provided further,* That up to $50,000,000 of funds made available under this heading within this Act may be transferred to "Major Notification. Research Equipment and Facilities Construction": *Provided further,* That funds so transferred shall not be subject to the transfer limitations described in the Administrative Provisions in this Act for the National Science Foundation, and shall be available until expended only after notification of such transfer to the Committees on Appropriations.

MAJOR RESEARCH EQUIPMENT AND FACILITIES CONSTRUCTION

For necessary expenses for the acquisition, construction, commissioning, and upgrading of major research equipment, facilities, and other such capital assets pursuant to the National Science Foundation Act of 1950, as amended (42 U.S.C. 1861–1875), including authorized travel, $167,055,000, to remain available until expended: *Provided*, That none of the funds may be used to reimburse the Judgment Fund.

EDUCATION AND HUMAN RESOURCES

For necessary expenses in carrying out science, mathematics and engineering education and human resources programs and activities pursuant to the National Science Foundation Act of 1950, as amended (42 U.S.C. 1861–1875), including services as authorized by 5 U.S.C. 3109, authorized travel, and rental of conference rooms in the District of Columbia, $829,000,000, to remain available until September 30, 2013: *Provided*, That not less than $54,890,000 shall be available until expended for activities authorized by section 7030 of Public Law 110–69.

AGENCY OPERATIONS AND AWARD MANAGEMENT

For agency operations and award management necessary in carrying out the National Science Foundation Act of 1950, as amended (42 U.S.C. 1861–1875); services authorized by 5 U.S.C. 3109; hire of passenger motor vehicles; not to exceed $8,280 for official reception and representation expenses; uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; rental of conference rooms in the District of Columbia; and reimbursement of the Department of Homeland Security for security guard services; $299,400,000: *Provided*, That contracts may be entered into under this heading in fiscal year 2012 for maintenance and operation of facilities, and for other services, to be provided during the next fiscal year.

OFFICE OF THE NATIONAL SCIENCE BOARD

For necessary expenses (including payment of salaries, authorized travel, hire of passenger motor vehicles, the rental of conference rooms in the District of Columbia, and the employment of experts and consultants under section 3109 of title 5, United States Code) involved in carrying out section 4 of the National Science Foundation Act of 1950, as amended (42 U.S.C. 1863) and Public Law 86–209 (42 U.S.C. 1880 et seq.), $4,440,000: *Provided*, That not to exceed $2,500 shall be available for official reception and representation expenses.

OFFICE OF INSPECTOR GENERAL

For necessary expenses of the Office of Inspector General as authorized by the Inspector General Act of 1978, as amended, $14,200,000.

ADMINISTRATIVE PROVISION

Not to exceed 5 percent of any appropriation made available for the current fiscal year for the National Science Foundation in this Act may be transferred between such appropriations, but no such appropriation shall be increased by more than 15 percent by any such transfers. Any transfer pursuant to this section shall be treated as a reprogramming of funds under section 505 of this Act and shall not be available for obligation except in compliance with the procedures set forth in that section.

This title may be cited as the "Science Appropriations Act, 2012".

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Law Enforcement Use of Global Positioning (GPS) Devices to Monitor Motor Vehicles: Fourth Amendment Considerations

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Summary

As technology continues to advance, what was once thought novel, even a luxury, quickly becomes commonplace, even a necessity. Global Positioning System (GPS) technology is one such example. Generally, GPS is a satellite-based technology that discloses the location of a given object. This technology is used in automobiles and cell phones to provide individual drivers with directional assistance. Just as individuals are finding increasing applications for GPS technology, state and federal governments are as well. State and federal law enforcement use various forms of GPS technology to obtain evidence in criminal investigations. For example, federal prosecutors have used information from cellular phone service providers that allows real-time tracking of the locations of customers' cellular phones. Title III of the Omnibus Crime Control and Safe Streets Act of 1958 (P.L. 90-351) regulates the interception of wire, oral, and electronic communications. As such, it does not regulate the use of GPS technology affixed to vehicles and is beyond the scope of this report.

The increased reliance on GPS technology raises important societal and legal considerations. Some contend that law enforcement's use of such technology to track motor vehicles' movements provides for a safer society. Conversely, others have voiced concerns that GPS technology could be used to reveal information inherently private. Defendants on both the state and federal levels are raising Fourth Amendment constitutional challenges, asking the courts to require law enforcement to first obtain a warrant before using GPS technology.

Subject to a few exceptions, the Fourth Amendment of the U.S. Constitution requires law enforcement to obtain a warrant before conducting a search or making a seizure. Courts continue to grapple with the specific issue of whether law enforcement's use of GPS technology constitutes a search or seizure, as well as the broader question of how the Constitution should address advancing technology in general. The Supreme Court has not directly addressed the issue of whether law enforcement's use of GPS technology in connection with motor vehicles falls within the Fourth Amendment's purview. Lower federal courts have relied on Supreme Court precedent to arrive at arguably varying conclusions. For example, several district and circuit courts of appeals have concluded that law enforcement's current use of GPS technology does not constitute a search, and is thus permissible, under the Constitution. To date, while the U.S. Supreme Court has not provided a definitive answer regarding law enforcement's use of GPS technology, state legislatures and courts have approached the issue in various ways. Some states have enacted laws requiring law enforcement to obtain a warrant before using GPS technology. Some state courts have resolved the question under their own constitutions. Although they have reached somewhat differing conclusions, other state courts have relied on Supreme Court precedent, such as *United States v. Knotts*, 460 U.S. 276 (1983), to derive an answer.

This report discusses the basics of GPS technology, society's reliance on it, and some of the related legal and privacy implications. In addition, the report examines legislative and judicial responses on both federal and state levels.

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Global Positioning System (GPS) Technology

GPS "is a satellite-based technology that reveals information about the location, speed, and direction of a targeted subject. While it was initially developed for the U.S. military, countless civilian applications of GPS appear in the marketplace."[1] For example, many people rely on an automotive GPS device when they travel,[2] for navigational directions, or even to find dining options. Similarly, some companies equip their vehicles with built-in GPS devices that allow a command center to know the vehicle's location upon its involvement in an accident or track it if it is stolen.[3] Pet collars have been outfitted with GPS devices to enable owners to locate their lost pets.[4] Campers and hikers use portable GPS devices to determine their location and map out their journey.[5] Cellular phones are embedded with GPS devices to synchronize time changes when a person leaves a certain time zone.[6] Cartographers use GPS devices to make maps and surveyors to determine property boundaries.[7] Airlines use them to pilot and locate planes.[8] In short, not only are Americans finding an increased interest in GPS technology, but it is arguably becoming an essential aspect of many Americans' day-to-day lives.[9]

Law Enforcement's Uses of GPS Technology

The military and private sector are not alone in their interests and reliance on GPS technology. Federal and state governments have also incorporated it into many of their domestic activities. Examples include tracking stranded motorists and predicting natural disasters such as earthquakes, tsunamis, hurricanes, etc. Such tracking allows for more effective emergency relief to victims.[10]

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[1] Renee McDonald Hutchins, *Tied Up in Knotts? GPS Technology and the Fourth Amendment*, 55 UCLA L. Rev. 409, 414 (2007); *see also* the Global Positioning System, http://www.gps.gov (last visited November 2, 2010).

[2] *See* Global Positioning System, Roads & Highways, http://www.gps.gov/applications/roads (last visited November 2, 2010). One brand name example is a TomTom. The individual can enter into the device an address, and an automated voice, along with interactive maps, will guide the driver. *See* TomTom, How Does GPS Work?, http://www.tomtom.com/howdoesitwork/index.php?Language=1 (last visited November 2, 2010).

[3] *See, e.g.*, OnStar, Our Privacy Practices, Notice of Privacy Statement, July 2010, https://www.onstar.com/web/portal/privacystatement#otherInfo1 (last visited October 26, 2010). OnStar provides other limited circumstances when it will track the location of the vehicle, such as an in-car request for service, or when OnStar needs to conduct research or troubleshooting, it is delivering enhanced services, it is protecting its rights or the safety of the owner or others, or it is required to by law. *Id.*

[4] Adam Koppel, Note, *Warranting a Warrant: Fourth Amendment Concerns Raised by Law Enforcement's Warrantless Use of GPS and Cellular Tracking*, 64 U. Miami L. Rev. 1061, 1064 (2010).

[5] Joyce Priddy, *Different Uses of GPS Devices*, associatedcontent.com, (September 22, 2007), http://www.associatedcontent.com/article/389315/different_uses_of_gps_devices.html?cat=15; *see also* the Global Positioning System, Recreation, http://www.gps.gov/applications/recreation (last visited November 2, 2010).

[6] The Global Positioning System, Timing, http://www.gps.gov/applications/timing, (last visited November 2, 2010).

[7] The Global Positioning System, Surveying & Mapping, http://www.gps.gov/applications/survey (last visited November 2, 2010).

[8] The Global Positioning System, Aviation, http://www.gps.gov/applications/aviation (last visited November 2, 2010).

[9] Koppel, *supra* note 4, at 1064 (providing statistics on the growing trends in GPS technology).

[10] The Global Positioning System, Public Safety & Disaster Relief, http://www.gps.gov/applications/safety (last visited November 2, 2010).

Increasingly, law enforcement relies on and finds new uses for GPS technology to assist in monitoring and gathering evidence.[11] For example, sex offenders are outfitted with ankle monitors to track their movements 24 hours a day. Also, consider the following examples, taken by various state law enforcement authorities:

- After 11 attacks on women were reported during a six-month period in two Virginia counties, police installed a GPS device on the van owned by a man who lived near the crime scenes. The suspect was a convicted rapist who had served 17 years in prison. By tracking his movements with the device, police were able to intercept him in Falls Church, VA, where he was dragging a woman to a remote area. The series of assaults ceased after his arrest.[12]
- Wisconsin police, acting on a tip about a former methamphetamine manufacturer, attached a GPS device to the suspect's car without first obtaining a warrant. Information recorded on the device led them to a large tract of land visited by the suspect. With the consent of the landowner, they searched the property and found paraphernalia used to manufacture methamphetamines. The suspect was subsequently arrested.[13]
- Police in New York used evidence acquired from a GPS device (attached without first obtaining a warrant) that had been attached to a burglary suspect's car a year earlier. The device, which monitored the suspect's movement without interruption for more than two months, showed that the suspect had driven by a burglarized store. This evidence was used to corroborate a witness's testimony that the suspect had been observing the store to determine its vulnerable points.[14]
- In California, the Los Angeles Police Department "outfit[ted] its cruisers with air guns that can launch GPS-enabled 'darts' at passing cars."[15] Once affixed to a vehicle, police can track it in real time from police headquarters. The air guns are generally used in situations requiring immediate action such as a high-speed chase.[16]

Most new cellular phones include GPS capabilities.[17] As a result, federal prosecutors have been known to get information from cellular phone service providers that allows real time tracking of the locations of customers' cellular phones.[18] In one case, information obtained from a cellular

[11] To illustrate the government's growing use of GPS technology in the area of criminal investigation, consider that "[i]n response to a Freedom of Information Act request, police in one Virginia locality reported that they used GPS devices in nearly 160 cases from 2005 to 2007." *Id.*

[12] Ben Hubbard, *Police Turn to Secret Weapon: GPS Device*, Wash. Post, A1 (August 13, 2008), *available at* http://www.washingtonpost.com/wpdyn/content/article/2008/08/12/AR2008081203275.html?nav=rss_metro/va; *see also* Ramya Shah, *From Beepers to GPS: Can the Fourth Amendment Keep Up with Electronic Tracking Technology?*, 2009 U. Ill. J.L. Tech. & Pol'y 281, 281 (Spring 2009) (providing an example of law enforcement's use of a GPS device to tie a suspect to the murder).

[13] *United States v. Garcia*, 474 F.3d 994, 995 (7th Cir. 2007).

[14] *People v. Weaver*, 909 N.E.2d 1195, 1195-96 (N.Y. 2009).

[15] Hutchins, *supra* note 1, at 418-19. The darts consist of a miniaturized GPS receiver, radio transmitter, and battery embedded in a sticky compound material.

[16] *Id.* at 419-20 (internal citations omitted).

[17] *Id.* at 419.

[18] Michael Isikoff, *The Snitch in Your Pocket*, Newsweek (February 19, 2010), http://www.newsweek.com/2010/02/18/the-snitch-in-your-pocket.html.

phone's GPS helped prove that a key suspect had been within a mile of a murder scene. In another case, a Mexican drug-cartel truck was tracked. The truck was carrying over two tons of cocaine.[19] Title III of the Omnibus Crime Control and Safe Streets Act of 1958 (P.L. 90-351) regulates the interception of wire, oral, and electronic communications. As such, it does not regulate the use of GPS technology affixed to vehicles and is beyond the scope of this report.[20]

While there are many substantial benefits to the use of GPS technology, some have voiced concerns. Many of these concerns arise from the fact that law enforcement has used GPS technology without first obtaining a warrant to either attach the device or to monitor the suspect after the device has been attached. Some have argued that the warrantless use of GPS technology has the potential of interfering with individual privacy, protected by the Fourth Amendment to the United States Constitution.[21] Legal scholars assert that a warrant ensures that the police have probable cause to believe that criminal activity is taking place or is imminent, thus preventing unwarranted intrusion into a person's freedom and private life.[22] Others contend that GPS tracking is analogous to law enforcement conducting surveillance with its own eyes or with surveillance cameras or radio transmitting beepers. Therefore, some courts and legal scholars believe a warrant is unnecessary and the Fourth Amendment does not apply.[23]

The Fourth Amendment

The Fourth Amendment to the United States Constitution, which protects "[t]he right of the people to be secure ... against unreasonable searches and seizures,"[24] governs and circumscribes searches and seizures[25] made by the federal and the state governments.[26] The Amendment's operative text can be divided into two clauses. The first clause forbids the government from conducting any search or seizure that is "unreasonable." The second clause prohibits the

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[19] *Id.*

[20] For a discussion of wiretapping or electronic eavesdropping, refer to CRS Report 98-326, *Privacy: An Overview of Federal Statutes Governing Wiretapping and Electronic Eavesdropping*, by Gina Stevens and Charles Doyle.

[21] For example, in *Lopez v. United States*, 373 U.S. 427, 442 (1963), Chief Justice Warren remarked:

> That the fantastic advances in the field of electronic communication constitute a great danger to the privacy of an individual; that indiscriminate use of such devices in law enforcement raises grave constitutional questions under the Fourth and Fifth Amendment;…"

[22] *See, e.g.*, Hutchins, *supra* note 1, at 464-65; Koppel, *supra* note 4, at 1089; *Maynard*, 615 F.3d at 564; *Weaver*, 909 N.E.2d at 1201-02; Kip F. Wainscott, *Unwarranted Intrusion: GPS and the Fourth Amendment*, ACSblog (May 19, 2009, 11:52 AM), http://acslaw.org/node/13444?gclid=CLD254CK56QCFeFM5QodvBbU2A.

[23] *See, e.g.*, *Pineda-Moreno*, 591 F.3d at 1214-16; Tarik N. Jallad, Recent Development, *Old Answers to New Questions: GPS Surveillance and the Unwarranted Need for Warrants*, 11 N.C. J. L. & Tech. 351, 374-75 (Spring 2010); Orin Kerr, Does the Fourth Amendment Prohibit Warrantless GPS Surveillance?, The Volokh Conspiracy (December 13, 2009), http://volokh.com/2009/12/13/does-the-fourth-amendment-prohibit-warrantless-gps-surveillance/.

[24] "The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized." U.S. Const. amend. IV.

[25] This protection even includes searches and seizures conducted "beyond the sphere of criminal investigations." *City of Ontario v. Quon*, 130 S.Ct. 2619, 2627 (2010).

[26] Although the Fourth Amendment, like the Fifth Amendment, was originally understood to apply only to federal government action, *see Barron v. City of Baltimore*, 32 U.S. 243, 247-51 (1833), the Supreme Court later found that it became applicable to the states through the Due Process Clause of the Fourteenth Amendment. *Mapp v. Ohio*, 367 U.S. 643, 660 (1961).

government from issuing a warrant unless it is obtained based "upon probable cause," is "supported by Oath," and contains particularized descriptions of the "place to be searched" and what is "to be seized." Although "[t]here is nothing in the amendment's text to suggest that a warrant is required to make a search or seizure reasonable,"[27] the U.S. Supreme Court has long since read these two clauses together, generally holding that a warrantless search or seizure is presumptively (if not per se) unreasonable.[28] The Fourth Amendment does not apply, however, unless the government's conduct constitutes a search or seizure within the meaning of the Amendment, that is, where there is a justifiable expectation of privacy. In addition, even when the Amendment does apply, "because the ultimate touchstone of the Fourth Amendment is 'reasonableness,' the warrant requirement is subject to certain exceptions."[29]

At one time, the purpose of the Fourth Amendment was seen as a protection of people's property rights against unlawful physical trespasses.[30] However, it gradually came to be seen as a protection of something more.[31] "[T]he principal object of the Fourth Amendment," the Court has explained, "is the protection of privacy rather than property."[32] In addition, "the Fourth Amendment protects people—and not simply 'areas'—against unreasonable searches and seizures."[33] Thus, in its seminal decision in *Katz v. United States*,[34] the Court held that police officers violated the Fourth Amendment when they conducted a warrantless search using a listening and recording device placed on the outside of a public phone booth to eavesdrop on the conversation of a suspect who had "'justifiably relied' upon ... [the privacy of the] telephone booth."[35] The Court concluded that the Fourth Amendment protects both a person and that person's expectation of privacy from warrantless searches or seizures in places which are justifiably believed to be private.

It is not enough, however, for a person to have a subjective "expectation of privacy," for any person might claim that she expected privacy at any time and in any place. Indeed, many might argue that the police conducted a search by simply watching them. Therefore, they will reason, because the police did not have a warrant, they violated the Constitution and the evidence

[27] *Garcia*, 474 F.3d at 996.

[28] *See, e.g.*, *City of Ontario*, 130 S.Ct. at 2630; *Brigham City v. Stuart*, 547 U.S. 398, 403 (2006); *Groh v. Ramirez*, 540 U.S. 551, 559 (2004); *United States v. Ross*, 456 U.S. 798, 824-25 (1982); *Mincey v. Arizona*, 437 U.S. 385, 390 (1978); *Katz v. United States*, 389 U.S. 347, 357 (1967). The Court has gone back and forth on whether warrantless searches or seizures are presumptively unreasonable or per se unreasonable. It is unclear which approach the Court currently follows.

[29] *Brigham City*, 547 U.S. at 403. As the Court in *Brigham City* outlined, some of these exceptions include law enforcement's engaging "in hot pursuit of a fleeing suspect," preventing "the imminent destruction of evidence," extinguishing a fire on private property and investigating its cause, or assisting "persons who are seriously injured or threatened with such injury." *Id.* (internal quotations and citations omitted).

[30] *See, e.g.*, *Boyd v. United States*, 116 U.S. 616, 627 (1886); *Adams v. New York*, 192 U.S. 585, 598 (1904); *Olmstead v. United States*, 277 U.S. 438, 464-66 (1928); *Goldman v. United States*, 316 U.S. 129, 134-36 (1942); *see also Kyllo v. United States*, 533 U.S. 27, 31-33 (2001) (discussing the historical evolving emphasis of Fourth Amendment protection).

[31] *See, e.g.*, *Silverthorne Lumber Co. v. United States*, 251 U.S. 385 (1920); *Jones v. United States*, 362 U.S. 257, 266 (1960), *overruled on other grounds by United States v. Salvucci*, 448 U.S. 83 (1980); *Silverman v. United States*, 365 U.S. 505, 511-12 (1961); *Warden v. Hayden*, 387 U.S. 294, 304 (1967); *Rakas v. Illinois*, 439 U.S. 128, 143 (1986).

[32] *Warden*, 387 U.S. at 304-05 (discussing the shift from an emphasis from property to privacy).

[33] *Katz*, 389 U.S. at 353. This focus finds support in the Amendment's text, which begins by stating that it protects "[t]he right of the people." U.S. Const. amend. IV.

[34] 389 U.S. 347 (1967).

[35] *Kyllo*, 533 U.S. at 33 (quoting *Katz*, 389 U.S. at 353).

obtained cannot be used against them.[36] But the Court has rejected such broad interpretations of the term "search," holding instead "that visual observation is no 'search' at all."[37] Simply put, "the police cannot reasonably be expected to avert their eyes from ... activity that could have been observed by any member of the public. Hence, '[w]hat a person knowingly exposes to the public, even in his own home or office, is not a subject of Fourth Amendment protection.'"[38] Visual observation is not, in other words, a "search."[39]

To avoid misapplication of the principles set forth in *Katz* when determining whether law enforcement has conducted a search or a seizure within the meaning of the Fourth Amendment, the Court subsequently came to rely upon *Katz*'s concurring opinion. The concurring opinion clarified the Court's test as being "whether a person has a 'constitutionally protected reasonable expectation of privacy.'"[40] Courts presently examine law enforcement's conduct to make this threshold determination by following "a two-part inquiry: first, has the individual manifested a subjective expectation of privacy in the object of the challenged search? Second, is society willing to recognize that expectation as reasonable?"[41]

The Fourth Amendment and GPS Technology

State and federal courts have long since wrestled with whether and how to apply the *Katz* test to advancing technology. For example, the Supreme Court in *Katz* determined that when the suspect entered the phone booth and shut the door, he had a reasonable expectation of privacy in his being there. Thus, the police conducted an unreasonable search by using a listening and recording device without getting a warrant. Similarly, in *Kyllo v. United States*,[42] the Court decided that a suspect had a reasonable expectation of privacy in his home when the police, suspecting him of growing marijuana, used a thermal imaging device without a warrant to detect the heat emanating from it. In contrast, when the Court was asked in *United States v. Ciraolo*[43] to decide whether a suspect had a reasonable expectation of privacy in his 10-foot-high, fenced-in back yard after the police looked into it without a warrant from an airplane to see if he was growing marijuana, the Court concluded that he did not and that looking into the yard was not a search; thus, no warrant was necessary.

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[36] The Fourth Amendment's mandates are enforced through the application of an exclusionary rule which generally states that evidence illegally seized may not be used against the defendant. *See, Weeks v. United States*, 232 U.S. 383 (1914) (holding that the Fourth Amendment barred the use of evidence secured through a warrantless search); *Mapp v. Ohio*, 367 U.S. 643 (1961) (holding that the exclusionary rule applies to the states).

[37] *Id.* at 32.

[38] *California v. Greenwood*, 486 U.S. 35, 40-41 (1988).

[39] "A search," the Court has explained, "comprises the individual interest in privacy; a seizure deprives the individual of dominion over his or her [person or] personal property." *Horton v. California*, 496 U.S. 128, 133 (1990). The use of a GPS to conduct surveillance would seem to fall under the rubric of a search; the attachment of a GPS device lends itself more to the concept of a seizure. *See United States v. Karo*, 468 U.S. 705, 712-13 (1984) (recognizing the difference in issues raised between the two concepts).

[40] *United States v. Ciraolo*, 476 U.S. 207, 211 (1986) (quoting *Katz v. United States*, 389 U.S. 347, 360 (1967) (Harlan, J., concurring)); *see also Kyllo*, 533 U.S. at 33-34.

[41] *Ciraolo*, 476 U.S. at 211; *see also Kyllo*, 533 U.S. at 34.

[42] 533 U.S. 27, 34 (2001).

[43] 476 U.S. 207, 213-15 (1986).

Likewise, the Court found that a defendant did not have a reasonable expectation of privacy in his car while traveling along public roads. In *United States v. Knotts,*[44] Minnesota law enforcement officers placed (with the seller's consent) a beeper in a chloroform container, believing that the defendant buyer was engaging in the production of illicit drugs. Officers subsequently followed the vehicle carrying the container, maintaining both a visual surveillance and a monitor receiving the beeper signals. Based on the beeper signals, the officers tracked the container to the defendant's secluded cabin. After a three-day visual surveillance of the cabin, the officers obtained and executed a search warrant and found the container and a drug laboratory in the cabin. The defendant sought to have the evidence suppressed, arguing that the warrantless monitoring of the beeper violated the Fourth Amendment.

The Court disagreed and held that the officers' actions did not constitute a search or seizure, as the defendant did not have a legitimate expectation of privacy because the beeper signal was not used to monitor movement of the container within a private residence. Instead, it was used to monitor movement along public highways and other areas visible to the naked eye.

However, in a similar scenario, when a beeper was activated while the suspect was inside his house, the Court held that the suspect did have a reasonable expectation of privacy in his home and that the absence of a warrant constituted an unreasonable search.[45] In *United States v. Karo,*[46] Drug Enforcement Administration (DEA) agents installed an electronic beeper in a can of ether with the consent of the owner (a government informant). The marked can was sold with others to the defendants, who intended to use the contents for cocaine production. Having tracked the can to several residences and storage facilities, law enforcement determined the can's location and obtained an arrest warrant. The defendants were arrested and charged with possession of cocaine with intent to distribute. One of the defendants sought to have the evidence suppressed as "tainted fruit" of an unlawful search. This case presented two issues for the Court to address: (1) whether the beeper's installation constituted a search or seizure when the container was delivered to a buyer without any knowledge of the beeper's presence and (2) whether the beeper's monitoring within an individual's residence falls within the Fourth Amendment's ambit when it reveals information that could not have been obtained through visual surveillance.

As to the first issue, the Court found that the defendant lacked a Fourth Amendment interest, as the owner's consent was sufficient to withstand the challenge. However, the Court found that the Fourth Amendment was violated when the agents used the beeper to locate the container in a private dwelling without first obtaining a search warrant. Although the transfer of the beeper to the defendant did not violate the Fourth Amendment, the monitoring of the beeper in a private residence not open to visual surveillance did violate the Fourth Amendment.[47]

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[44] 460 U.S. 276, 281-84 (1983).

[45] However, the Court found that the arrest warrant was valid, as it was based on an affidavit, which contained a significant amount of evidence from sources other than the beeper.

[46] 468 U.S. 705, 713-16 (1984).

[47] The Court declined to decide whether a search warrant to monitor a beeper would require probable cause or reasonable suspicion.

States' Responses

States have employed various approaches regarding the use of GPS technology and the Fourth Amendment's warrant requirement. Some states have addressed the issue statutorily by enacting laws "imposing civil and criminal penalties for the [improper] use of electronic tracking devices or expressly requiring exclusion of evidence produced by such a device unless obtained by the police acting pursuant to a warrant."[48] Judicially, state courts have reached differing conclusions. State courts in New York, Washington, Oregon, Delaware, and Massachusetts have determined that, absent some exigent circumstance, police officers must first obtain a warrant before using GPS technology (in some cases the court is interpreting its respective state constitution).[49] For example, in *State v. Weaver*,[50] the Court of Appeals of New York held that the "unconsented placement" of a GPS tracking device and subsequent monitoring of the vehicle constituted a search requiring a warrant under the state's constitution.[51] The court noted that it has interpreted its constitution to provide greater protections "in the areas of search and seizure."[52] The court found that the defendant had a reasonable expectation of privacy that was infringed by the state's action. While the court found that the defendant had a diminished expectation of privacy, "that expectation was not reduced to zero."

Conversely, state courts in Nevada and Virginia have found that GPS use does not raise any state or federal constitutional concerns.[53] In *Foltz v. Commonwealth*,[54] the court found that the law enforcement's use of a GPS tracking device to track a vehicle's movement on a public street did not constitute a search or seizure under either the federal or state constitutions. The defendant, a registered sex offender on probation for committing sexual assault, became a suspect in a new series of sexual assaults. Police attached a GPS device to the defendant's work vehicle. Upon observing, "in real time via a computer screen with a map,"[55] police noticed that the van was driven in and out of various neighborhoods where crimes had occurred. That evening another sexual assault occurred. The police followed the defendant the next day and witnessed him grab a woman and knock her down to the ground. The police stopped the assault and arrested the defendant. In reaching its decision, the court concluded that the defendant did not manifest a subjective expectation of privacy while driving down the street looking for victims. Moreover, the court concluded that the defendant "did nothing to prevent others from inspecting the bumper of

[48] *United States v. Maynard*, 615 F.3d 544, 564 (D.C. Cir. 2010)(listing several states and the relevant legislation in each). See, e.g., Utah Code Ann. §§ 77-23a-4, 77-23a-7, 77-23a-15.5; Minn. Stat. §§ 626A.37, 626A.35; Fla. Stat. §§ 934.06, 934.42; S.C.Code Ann. § 17-30-140; Okla. Stat., tit. 13, §§ 176.6, 177.6; Haw. Rev. Stat. §§ 803-42, 803-44.7; 18 Pa. Cons.Stat. § 5761.

[49] *See State v. Weaver*, 909 N.E.2d 1195 (N.Y. 2009) (GPS use, under state constitution, is unconstitutional without a warrant); *State v. Jackson*, 76 P.3d 217 (Wash. 2003); *State v. Campbell*, 759 P.2d 1040 (Or. 1988); *Delaware v. Biddle*, No. CRIM.A. 05-01-1052, 2005 WL 3073593, at *1 (Del. Com. Pl. May 5, 2005); *see also Commonwealth v. Connolly*, 913 N.E.2d 356 (Mass. 2009) (installation of a GPS device was a seizure).

[50] 909 N.E.2d 1195 (N.Y. 2009).

[51] *Id.* at 1202.

[52] *Id.*

[53] *See Osburn v. State*, 44 P.3d 523 (Nev. 2002); *Foltz v. Commonwealth*, 698 S.E.2d 281 (Va. Ct. App. 2010), *reh'g en banc granted and mandate stayed by* 699 S.E. 2d 522 (Va. Ct. App. 2010).

[54] 698 S.E.3d 281 (Va. Ct. App. 2010), *reh'g en banc granted and mandate stayed by* 699 S.E. 2d 522 (Va. Ct. App. 2010).

[55] *Id.* at 286.

the work van." Other state jurisdictions have simply not addressed the issue either legislatively or judicially as of this writing.

Federal Courts

The Supreme Court has not directly addressed the issue of whether law enforcement's use of GPS technology in connection with motor vehicles falls within the Fourth Amendment's purview. Lower federal courts have relied on Supreme Court precedent to arrive at arguably varying conclusions. For example, several district and circuit courts of appeals have concluded that law enforcement's current use of GPS technology does not constitute a search and is thus permissible under the Constitution.[56]

For example, in *United States v. Pineda-Moreno*,[57] the 9th Circuit decided a case involving criminal investigation of drug manufacturing that arose in Oregon. Without a warrant, DEA agents attached a GPS device to a Jeep owned by a man suspected of drug activity. The device was attached on several occasions over a four-month period.[58] Four times agents attached the device while the Jeep was parked on a public street; one time while it was parked at a public parking lot; and two times while it was parked on his property, necessitating that agents sneak onto it in the early morning hours to attach the device.[59] Eventually, the GPS "device alerted agents that [the suspect's] vehicle was leaving a suspected marijuana grow site." The suspect was then arrested and officers found marijuana in the Jeep.[60]

The court held that the DEA's actions did not constitute a search because a person does not have a reasonable expectation of privacy in a car's exterior, even when the car is parked on the person's driveway (unless the person has affirmatively sought to exclude others from entering his land).[61] The court then held that the DEA's monitoring of the suspect's travel was analogous to the facts in *Knotts*, where the police followed the suspect's car by using a beeper to track its movements along the streets, because using the GPS device disclosed information that the police "could have obtained by following the car."[62] The court then concluded by quoting *Knotts*: "'Insofar as [Pineda-Moreno's] complaint appears to be simply that scientific devices such as the [tracking devices] enabled the police to be more effective in detecting crime, it simply has no constitutional foundation. We have never equated police efficiency with unconstitutionality and decline to do so now.'"[63]

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[56] *See, e.g.*, *United States v. Garcia*, 474 F.3d 994 (7th Cir. 2007); *United States v. Marquez*, 605 F.3d 604 (8th Cir. 2010); *United States v. Pineda-Moreno*, 591 F.3d 1212 (9th Cir. 2010); *United States v. Eberle*, 993 F.Supp. 794 (D. Mont. 1998); *United States v. Moran*, 349 F. Supp. 2d 425 (N.D.N.Y.2005); *United States v. Burton*, 698 F. Supp. 2d 1303 (N.D. Fl. 2010); *United States v. Williams*, 650 F. Supp. 2d 633 (W.D. KY. 2009); *United States v. Jesus-Nunez*, No. 1:10-CR-00017-01, 2010 WL 2991229, at *1 (July 27, 2010).

[57] 591 F.3d 1212 (9th Cir. 2010).

[58] *Id.* at 1213.

[59] *Id.*

[60] *Id.* at 1214.

[61] *Id.* at 1214-15.

[62] *Id.* at 1216.

[63] *Id.* at 1216-17 (quoting *Knotts*, 460 U.S. at 284) (alterations in original).

Similar to *Pineda-Moreno*, many of the courts to follow this line of reasoning have analogized GPS devices to the beeper devices in *Knotts*. In addition, many have also included a caveat similar to the one the Supreme Court proffered in *Knotts*. In *Knotts*, the defendant argued that the Court's ruling would permit the government to conduct warrantless and unlimited surveillance with such technology: "[I]f such dragnet type law enforcement practices as the defendant envisions should eventually occur," the Court responded, "there will be time enough then to determine whether different constitutional principles may be applicable."[64] It is unclear what this "dragnet exception" means, and the differing outcomes in the federal circuits can be attributed to how the courts interpret it. The 9th Circuit, quoting with approval the 7th Circuit, stated it this way: "Should [the] government someday decide to institute programs of mass surveillance of vehicular movements, it will be time enough to decide whether the Fourth Amendment should be interpreted to treat such surveillance as a search."[65] Thus, the 9th and 7th Circuits interpreted *Knotts*'s dragnet exception to apply to mass police monitoring.

Conversely, the D.C. Circuit held that law enforcement's prolonged use of GPS technology does amount to a search and thus requires a warrant.[66] In reaching its conclusion, the court found that *Knotts*'s "dragnet exception" applied to an individual when the law enforcement's warrantless surveillance was constant and protracted, and is not limited to mass surveillance. In this case, the Federal Bureau of Investigation (FBI) installed a GPS device on a vehicle to track the "movements" of a club owner suspected of conspiracy to distribute cocaine. They monitored him "[for] 24 hours a day for 28 days as he moved among scores of places, thereby discovering the totality and pattern of his movements from place to place to place."[67] The information was subsequently used as evidence at trial to prove his involvement in the conspiracy.[68]

The court distinguished its holding from the decisions in the other circuits by noting that the rule in *Knotts* was limited. Whereas the other circuits had read *Knotts*'s dragnet exception to mean "mass surveillance," the court read it to apply to the individual and to mean prolonged, "'twenty-four hour surveillance.'"[69] The court also concluded that a person has a reasonable expectation of privacy in the totality of his movements over the course of a month, which he does not actually or constructively expose to the public, even though law enforcement could constitutionally conduct warrantless observation of his individual movements from one place to another while in public.[70]

Differing Decisions

Depending on how one reads the courts' decisions, one could conclude that there is a split in the courts regarding whether law enforcement must first obtain a warrant before using a GPS device. Conversely, one could also conclude that the courts' decisions are reconcilable and that the outcomes of the cases are fact sensitive. However one reads the differing decisions, courts will

[64] *Knotts*, 460 U.S. at 284.

[65] *Pineda-Moreno*, 591 F.3d at 1216 n.2 (quoting *Garcia*, 474 F.3d at 998).

[66] *United States v. Maynard*, 615 F.3d 544 (D.C. Cir. 2010).

[67] *Id.* at 558.

[68] *Id.* at 567.

[69] *Id.* at 556-58 ("In short, *Knotts* held only that '[a] person traveling in an automobile on public thoroughfares has no reasonable expectation of privacy in his movements from one place to another,' not that such a person has no reasonable expectation of privacy in his movements whatsoever, world without end.").

[70] *Id.* at 558-67.

continue to hear these claims and will likely reach alternative conclusions depending upon the facts of each case. Some courts, like the 7th and 9th Circuits, as well as the state court decisions in Nevada and Virginia, therefore, may decide to extend the Supreme Court's existing precedents to hold that a person has no reasonable expectation of privacy in his car when he travels about in public because he exposes himself and his car to the public. Thus, the current use of GPS technology would not constitute a search under the Fourth Amendment. A few courts may go so far as to conclude that any use of GPS technology, even when attaching it, is presumptively unreasonable unless law enforcement first obtains a valid warrant.[71] Other courts may decide that the warrantless use of GPS technology is permissible, subject to one of the already settled warrant exceptions, such as when the suspect is fleeing and the police are engaged in hot pursuit. The state court decisions in Washington, Oregon, and New York seem to have adopted this approach under their own constitutions. Finally, some courts may argue, which could be seen as an attempt to reconcile the already existing decisions, that using GPS devices for a minimal amount of time—for a few days, perhaps—is permissible, but when the monitoring becomes prolonged—for many days, weeks, or months—the intrusiveness reaches a point where it becomes a search requiring a warrant.[72] The state court's decision in New York might also be read this way, and the D.C. Circuit appears to have followed this approach.[73]

Competing Interests

In resolving disputes over law enforcement's warrantless use of GPS technology, courts and legislatures seek the appropriate balance of two competing interests: enhancing law enforcement efficiency versus protection of individual privacy. Some contend that it would be better for legislatures rather than the courts to conduct this balance.[74] Others argue that the courts are capable and equipped to do it, just as they have done reconciling the law to the usage of many other emerging technologies.[75] Regardless, as defendants continue to raise challenges to law enforcement's warrantless use of GPS technology in criminal investigations in state and federal courts, the courts must confront these conflicts and weigh the interests.

Those who argue that law enforcement does not need to obtain a warrant to use GPS technology contend that the many uses of GPS technology simply "enable[] the police to be more effective in

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[71] *See, e.g.*, *Connolly*, 913 N.E.2d at 822.

[72] This approach could be called the "Mosaic Theory." The idea is that when GPS surveillance is prolonged, the sum of otherwise publicly exposed activities reveals patterns that are reasonably expected to be private, thus constituting a search, which requires a warrant . *See* Orin Kerr, *D.C. Circuit Introduces "Mosaic Theory" of Fourth Amendment, Holds GPS Monitoring a Fourth Amendment Search*, The Volokh Conspiracy (August 6, 2010), http://volokh.com/2010/08/06/d-c-circuit-introduces-mosaic-theory-of-fourth-amendment-holds-gps-monitoring-a-fourth-amendment-search/. The court in *Maynard* used this theory and tied it to the Supreme Court's dragnet exception in *Knotts*. However, unlike the 9th and 7th Circuits, the D.C. Circuit read it to apply when law enforcement engages in prolonged surveillance, not just mass surveillance. *Maynard*, 615 F.3d at 557-63.

[73] Note that the United States has petitioned for a rehearing *en banc* to the court's decision in *Maynard*. Orin Kerr, *DOJ Petitions for Rehearing in DC Circuit "Mosaic Theory" GPS Surveillance Case*, The Volokh Conspiracy (September 22, 2010), http://volokh.com/2010/09/22/doj-petitions-for-rehearing-in-dc-circuit-mosaic-theory-gps-surveillance-case/.

[74] Orin S. Kerr, *The Fourth Amendment and New Technologies: Constitutional Myths and the Case for Caution*, 102 Mich. L. Rev. 801, 806 (2004).

[75] *See generally* Hutchins, supra note 1; *see also* Renee McDonald Hutchins, *The Anatomy of a Search: Intrusiveness and the Fourth Amendment*, 44 U. Rich. L. Rev. 1185, 1189 n.22 (May 2010) (noting the current debate between whether the legislature or the courts is the preferred arbiter in the area of GPS technology).

detecting crime,"[76] stamping it out at its earlier stages and preventing it from even occurring. Among others, the advantages in such technology, especially when police officers are engaged in a high-speed chase, decrease the likelihood of endangering the public, the police, or even the suspect from the potential hazards involved in such situations. Moreover, as already discussed, the efficiencies of GPS technology have enabled officers to prevent one woman from being raped and any further rapes from being committed by the suspect. Likewise, proponents of GPS use maintain that officers have been able to prevent drug production and distribution by the respective suspects they apprehended. GPS technology, then, can be preventive, saving lives and time; it decreases the cost of having officers out conducting surveillance while simultaneously allowing more places and people to be monitored and more action to be taken when criminal activity occurs. In short, from this perspective, GPS devices make law enforcement's job more efficient, safer, and effective, providing for a securer and safer society. They would argue that GPS technology functions "merely as an enhancing adjunct to the surveilling officer's eyes,"[77] and naked eye observation does not offend the Fourth Amendment because a person does not have a reasonable expectation of privacy in activity that any member of the public might observe. GPS technology is merely a matter of efficiency, they conclude, and the courts "have never equated police efficiency with unconstitutionality."[78]

Conversely, proponents of requiring law enforcement to obtain judicial permission before using a GPS device contend that efficiency, security, and safety come at some unacceptable costs.[79] At "the press of a button," for example, a GPS device can disclose one's activities that are "indisputably private [in] nature," such as "trips to the psychiatrist, the plastic surgeon, the abortion clinic, the AIDS treatment center, the strip club, the criminal defense attorney, the by-the-hour motel, the union meeting, the mosque, synagogue or church, the gay bar and on and on."[80] It does not only disclose "where we go, but by easy reference [it reveals] our associations—political, religious, amicable and amorous," as well as "the pattern of our professional and avocational pursuits."[81] GPS technology "is not a mere enhancement of human sensory capacity," because the information it can capture is potentially tantamount to, "at a minimum, millions of additional police officers and cameras on every street lamp."[82] A person does have a reasonable expectation of privacy from the government's ability to obtain such comprehensive and detailed information. The ability of the government to engage in monitoring that exposes this type of information, some even argue, foreshadows "Orwellian images of Big Brother secretly following your movements through the small device in your pocket"[83] or car, especially when the pervasive monitoring has been prolonged and continuous—for 28[84] and even

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[76] *Pineda-Moreno*, 591 F.3d at 1216 (quoting *Knotts*, 460 U.S. at 284).

[77] *Weaver*, 909 N.E.2d at 1199.

[78] *Knotts*, 460 U.S. at 284.

[79] Some cite, for example, an Historical Review of the Constitution and Government of Pennsylvania, title page (1759) (Arno Press reprint 1972) (stating that "[t]hose who would give up essential Liberty, to purchase a little temporary Safety, deserve neither Liberty nor Safety.") (commonly attributed to Benjamin Franklin).

[80] *Weaver*, 909 N.E. 2d at 1198-99.

[81] *Id.*

[82] *Id.*

[83] Michael Isikoff, *The Snitch in Your Pocket*, Newsweek, February 19, 2010, available at http://www.newsweek.com/2010/02/18/the-snitch-in-your-pocket.html; *see also Pineda-Moreno*, 617 F.3d 1120, 1121, 1126 (9th Cir. 2010) (Kozinski, C.J., dissenting from the denial of rehearing en banc).

[84] Maynard, 615 F.3d at 558.

65[85] days, in certain cases. Besides, they contend, unless the situation is an emergency, it is not that onerous a burden to require the police to take a few minutes to obtain judicial approval before they use such revealing technology; a warrant is just not that hard to get.[86]

Conclusion

Society's increased reliance on GPS technology raises both societal and legal considerations. Law enforcement has found many uses for GPS technology in criminal investigations. Some of these uses in connection with motor vehicle surveillance raise concerns over the technology's potential interference with privacy interests protected by the Fourth Amendment. Others have argued that GPS technology is comparable to naked eye observation, and its advantages in impeding and preventing criminal activity are substantial. Balancing these two competing but compelling interests is not easy. There are also questions as to whether this balancing should be done legislatively or judicially. It is important to note that the Fourth Amendment provides a floor for protection. No matter what the state legislatures or Congress does, the requirements of the Fourth Amendment must be met. Legislation provides two advantages: (1) clarification for procedural distinctions between warrantless and presumptively unreasonable searches, and (2) additional protection where reenforcement is thought necessary. Several state legislatures have enacted legislation governing the warrantless use of GPS devices.

Although the Supreme Court has not spoken to the use of GPS vehicle monitoring, state and lower federal courts have reached differing conclusions based on the facts presented, U.S. Supreme Court precedent, and/or state constitutions.

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Jeffrey Thomson, Law Clerk, assisted in the preparation of this report.

[85] Weaver, 909 N.E 2d at 1195.

[86] "[O]fficers in Utah can get electronic warrants in about 20 minutes. 'It's not that hard,'" a Utah County Sherriff stated. Janice Peterson, *Confliction views on no-warrant GPS ruling*, Daily Herald (September 5, 2010), available at http://www.heraldextra.com/news/local/article_6d44220a-c8d1-5d0b-a072-bee72e97a835.html

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B-321982

October 11, 2011

The Honorable Frank R. Wolf
Chairman, Subcommittee on Commerce
Justice, Science, and Related Agencies
Committee on Appropriations
House of Representatives

Subject: *Office of Science and Technology Policy—Bilateral Activities with China*

This responds to your request for our opinion on the propriety of activities undertaken in May 2011 by the Office of Science and Technology Policy (OSTP) with representatives of the government of the People's Republic of China. Letter from Representative Wolf to the Comptroller General (May 11, 2011) (Request Letter). Specifically, you point to meetings with Chinese representatives during the U.S.-China Dialogue on Innovation Policy (Innovation Dialogue) and the U.S.-China Strategic and Economic Dialogue (S&ED) held in Washington, D.C., in May 2011. You ask whether OSTP violated section 1340 of the Department of Defense and Full-Year Continuing Appropriations Act, 2011. Section 1340 prohibits the use of OSTP appropriations for bilateral activities between OSTP and China, or Chinese-owned companies, unless specifically authorized by laws enacted after the date of the appropriations act. Pub. L. No. 112-10, div. B, title III, 125 Stat. 38, 123 (Apr. 15, 2011).

As explained below, we conclude that OSTP's use of appropriations to fund its participation in the Innovation Dialogue and the S&ED violated the prohibition in section 1340. In addition, because section 1340 prohibited the use of OSTP's appropriations for this purpose, OSTP's involvement in the Innovation Dialogue and the S&ED resulted in obligations in excess of appropriated funds available to OSTP; as such, OSTP violated the Antideficiency Act, 31 U.S.C. § 1341(a)(1)(A).

Our practice when rendering legal opinions is to obtain the views of the relevant agency to establish a factual record and to elicit the agency's legal position on the subject matter of the request. GAO, *Procedures and Practices for Legal Decisions and Opinions*, GAO-06-1064SP (Washington, D.C.: Sept. 2006), *available at* www.gao.gov/legal/resources.html. In this case, OSTP provided us with its legal views and relevant supporting materials. Letter from General Counsel, OSTP to Assistant General Counsel, GAO, *Re: B-321982, Office of Science and Technology Policy – Bilateral Activities with China* (June 23, 2011) (OSTP Response). We also spoke by telephone with OSTP's General Counsel to ask questions about OSTP's June letter. Telephone Conversation with General Counsel, OSTP (Aug. 4, 2011) (August Conversation). *See also* Letter from General Counsel, OSTP to Senior Attorney, GAO, *Re: Follow-up to August 4, 2011, Telephone Call* (Aug. 29, 2011) (OSTP August Letter).

BACKGROUND

The Presidential Science and Technology Advisory Organization Act of 1976[1] established OSTP to "serve as a source of scientific and technological analysis and judgment for the President with respect to major policies, plans, and programs of the Federal Government." 42 U.S.C. § 6614(a). Part of the agency's mission is to "advise the President of scientific and technological considerations involved in areas of national concern including . . . foreign relations. . . ." 42 U.S.C. § 6613(b)(1).

Between May 6 and 10, 2011, OSTP "led and participated in a series of meetings with Chinese officials" as part of the Innovation Dialogue and the S&ED. OSTP Response, at 3. On May 6, 2011, the OSTP Director and Chinese Minister of Science and Technology participated in the Innovation Dialogue. According to OSTP, a goal of the Innovation Dialogue was to "serve as a forum for persuading the rollback of discriminatory, counterproductive Chinese procurement and intellectual property policies. . . ." OSTP Response, at 3. Among the topics discussed were "market access and technology transfer; innovation funding and incentives; standards and intellectual property; and government intervention." OSTP Response, at 4. OSTP informed our office that the OSTP Director opened and closed the Innovation Dialogue and served on discussion panels. OSTP August Letter, at 1. OSTP staff helped the Director prepare for and participate during the meetings. *Id.* *See* OSTP Response, at 5.

On May 8, 2011, OSTP hosted a dinner to honor Chinese dignitaries. Six U.S. participants attended the dinner, along with an unidentified number of "staff-level employees from other federal agencies." OSTP Response, at 4, n.13. The Director is the only listed dinner attendee from OSTP. There were six Chinese invitees. *Id*.

On May 9 and 10, 2011, OSTP participated in the S&ED. The purpose of the S&ED was to bring together various U.S. and Chinese government officials to "discuss a broad range of issues between the two nations," including on matters regarding trade and economic cooperation. U.S. Department of the Treasury, *U.S. –China Strategic and Economic Dialogue*, *available at* www.treasury.gov/initiatives/Pages/china.aspx (last visited Oct. 4, 2011). The Secretary of the Treasury and the Secretary of State co-chaired the S&ED along with the Vice Premier and State Councilor of the People's Republic of China. *Id*. Topics of discussion included "enhancement of trade and investment cooperation;

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[1] Pub. L. No. 94-282, title II, 90 Stat. 459, 463-68 (May 11, 1976), 42 U.S.C. §§ 6611–6624

an overview of bilateral relations; military-to-military relationships; cooperation on clean energy, energy security, climate change, and environment; customs cooperation; and energy security." OSTP Response, at 4. The OSTP Director spoke many times during the various sessions, including on U.S.-China cooperation on climate science. August Conversation. OSTP also had at least one staff member attend the S&ED in addition to the Director. *Id*.

The Full-Year Continuing Appropriations Act, 2011, enacted into law on April 15, 2011, included appropriations for OSTP for fiscal year 2011 in title III of division B. Pub. L. No. 112-10, div. B. Section 1340 of title III provides:

> "None of the funds made available by this division may be used for the National Aeronautics and Space Administration or the Office of Science and Technology Policy to develop, design, plan, promulgate, implement, or execute a bilateral policy, program, order, or contract of any kind to participate, collaborate, or coordinate bilaterally in any way with China or any Chinese-owned company unless such activities are specifically authorized by a law enacted after the date of enactment of this division."

Pub. L. No. 112-10, § 1340.

OSTP informed us that it incurred costs of approximately $3,500 to participate in the week's activities, including the cost of staff time for nine employees preparing for and participating in the discussions, as well as the cost of the dinner OSTP hosted on May 8. OSTP Response, at 5.

DISCUSSION

At issue in this opinion is whether OSTP violated section 1340's proscription, and, if so, whether the agency violated the Antideficiency Act.

As with any question involving the interpretation of statutes, our analysis begins with the plain language of the statute. *Jimenez v. Quarterman*, 555 U.S.113 (2009). When the language of a statute is "clear and unambiguous on its face, it is the plain meaning of that language that controls." B-307720, Sept. 27, 2007; B-306975, Feb. 27, 2006; *see also Lynch v. Alworth-Stephens Co.*, 267 U.S. 364, 370 (1925).

The plain meaning of section 1340 is clear. OSTP may not use its appropriations to participate, collaborate, or coordinate bilaterally in any way with China or any Chinese-owned companies. Here, OSTP's participation in the Innovation Dialogue and S&ED contravened the appropriations restriction. The Director opened the Innovation Dialogue and moderated discussions therein. OSTP staff prepared materials for and attended the discussions. OSTP then invited U.S. and Chinese officials to a dinner that it paid for using its appropriation. Finally, OSTP participated in the S&ED, during which the Director spoke on multiple occasions, including on climate science. OSTP did not identify, nor are we aware of, any specific authority to do so that was enacted after the date of the Continuing Appropriations Act, 2011.

OSTP does not deny that it engaged in activities prohibited by section 1340. OSTP Response; August Conversation. OSTP argues, instead, that section 1340, as applied to the events at issue here, is an unconstitutional infringement on the President's constitutional prerogatives in foreign affairs.[2] OSTP Response, at 1; August Conversation; Letter from Director, OSTP, to the Speaker of the House of Representatives, *Re: Section 1340 of the Department of Defense and Full-Year Continuing Appropriations Act of 2011* (May 16, 2011) (OSTP May 16 Letter). OSTP claims that section 1340 is "unconstitutional to the extent its restrictions on OSTP's use of funds would bar the President from employing his chosen agents for the conduct of international diplomacy." OSTP Response, at 1. OSTP asserts that the President has "exclusive constitutional authority to determine the time, place, manner, and content of diplomatic communications and to select the agents who will represent the President in diplomatic interactions with foreign nations." OSTP May 16 Letter. OSTP argues that, for this reason, Congress may not "use its appropriations power to infringe upon the President's exclusive constitutional authority in this area." *Id.*

It is not our role nor within our province to opine upon or adjudicate the constitutionality of duly enacted statutes such as section 1340. *See* B-300192, Nov. 13, 2002; s*ee also* B-306475, Jan. 30, 2006. In our view, legislation that was passed by Congress and signed by the President, thereby satisfying the Constitution's bicameralism and presentment requirements, is entitled to a heavy presumption in favor of constitutionality. B-302911, Sept. 7, 2004. *See Bowen v. Kendrick*, 487 U.S. 589, 617 (1988). Determining the constitutionality of legislation is a province of the courts. U.S. Const. art. III, § 2. *Cf. Fairbank v. United States*, 181 U.S. 283, 285 (1901). Therefore, absent a judicial opinion from a federal court

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[2] The Department of Justice characterizes section 1340 as a "valid limitation on OSTP's use of appropriated funds only to the extent that its restrictions do not infringe upon the President's exclusive constitutional authority over international diplomacy." Letter from Assistant Attorney General, Office of Legislative Affairs to Representative Wolf (June 28, 2011). Justice advised OSTP that OSTP was "permitted to engage in diplomatic activities with Chinese representatives to the extent that it would be doing so as an agent of the President for diplomacy with China, notwithstanding Section 1340." *Id. See* Memorandum Opinion for the General Counsel, OSTP, *Unconstitutional Restrictions on Activities of the Office of Science and Technology Policy in Section 1340(a) of the Department of Defense and Full-Year Continuing Appropriations Act, 2011*, OLC Opinion, Sept. 19, 2011, *available at* www.justice.gov/olc/memoranda-opinions.html (last visited Oct. 4, 2011). OSTP asserts that the U.S.-China Agreement on Cooperation in Science and Technology designates OSTP as the executive branch authority charged with "collaboration and coordination with China in support of U.S.-China science and technology policy cooperation." OSTP Response, at 3.

of jurisdiction that a particular provision is unconstitutional, we apply laws as written to the facts presented. *See* B-114578, Nov. 9, 1973. In 1955, for example, we stated that we "accord full effect to the clear meaning of an enactment by the Congress so long as it remains unchanged by legislative action and unimpaired by judicial determination." B-124985, Aug. 17, 1955. We see no reason to deviate here. Indeed, we are unaware of any court that has had occasion to review the provision, let alone adjudicate its constitutionality, nor did OSTP advise of any judicial determination or ongoing litigation.

As a consequence of using its appropriations in violation of section 1340, OSTP violated the Antideficiency Act. Under the Antideficiency Act, an officer or employee of the U.S. Government may not make or authorize an expenditure or obligation exceeding an amount available in an appropriation. 31 U.S.C. § 1341. *See* B-300192, Nov. 13, 2002. If Congress specifically prohibits a particular use of appropriated funds, any obligation for that purpose is in excess of the amount available. 71 Comp. Gen. 402 (1992); 62 Comp. Gen. 692 (1983); 60 Comp. Gen. 440 (1981). By using its fiscal year 2011 appropriation in a manner specifically prohibited, OSTP violated the Antideficiency Act. Accordingly, OSTP should report the violation as required by the act.[3]

Sincerely,

Lynn H. Gibson
General Counsel

[3] *See* 31 U.S.C. § 1351. The Office of Management and Budget has published requirements for executive agencies for reporting violations. OMB Circular No. A-11, *Preparation, Submission, and Execution of the Budget*, §§ 145, 145.8, *available at* www.whitehouse.gov/omb/circulars_a11_current_year_a11_toc (last visited Oct. 4, 2011).

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CHAPTER 2011-153

Senate Bill No. 652

An act relating to the liability of spaceflight entities; amending s. 331.501, F.S.; revising the definition of the term "spaceflight entity" to include certain manufacturers and suppliers for purposes of specified provisions for immunity from liability; saving a provision from future repeal which provides spaceflight entities with immunity from liability for the loss, damage, or death of a participant resulting from the inherent risks of spaceflight activities; providing an effective date.

Be It Enacted by the Legislature of the State of Florida:

Section 1. Section 331.501, Florida Statutes, is amended to read:

331.501 Spaceflight; informed consent.—

(1) For purposes of this section, the term:

(a) "Participant" means any spaceflight participant as that term is defined in 49 U.S.C. s. 70102.

(b) "Spaceflight activities" means launch services or reentry services as those terms are defined in 49 U.S.C. s. 70102.

(c) "Spaceflight entity" means any public or private entity holding a United States Federal Aviation Administration launch, reentry, operator, or launch site license for spaceflight activities. <u>The term also includes any manufacturer or supplier of components, services, or vehicles that have been reviewed by the United States Federal Aviation Administration as part of issuing such a license, permit, or authorization.</u>

(2)(a) Except as provided in paragraph (b), a spaceflight entity is not liable for injury to or death of a participant resulting from the inherent risks of spaceflight activities so long as the warning contained in subsection (3) is distributed and signed as required. Except as provided in paragraph (b), a participant or participant's representative may not maintain an action against or recover from a spaceflight entity for the loss, damage, or death of the participant resulting exclusively from any of the inherent risks of spaceflight activities.

(b) Paragraph (a) does not prevent or limit the liability of a spaceflight entity if the spaceflight entity does any one or more of the following:

1. Commits an act or omission that constitutes gross negligence or willful or wanton disregard for the safety of the participant and that act or omission proximately causes injury, damage, or death to the participant;

2. Has actual knowledge or reasonably should have known of a dangerous condition on the land or in the facilities or equipment used in the spaceflight activities and the danger proximately causes injury, damage, or death to the participant; or

3. Intentionally injures the participant.

(c) Any limitation on legal liability afforded by this subsection to a spaceflight entity is in addition to any other limitation of legal liability otherwise provided by law.

(3)(a) Every spaceflight entity providing spaceflight activities to a participant, whether such activities occur on or off the site of a facility capable of launching a suborbital flight, shall have each participant sign the warning statement specified in paragraph (b).

(b) The warning statement described in paragraph (a) shall contain, at a minimum, the following statement:

> "WARNING: Under Florida law, there is no liability for an injury to or death of a participant in a spaceflight activity provided by a spaceflight entity if such injury or death results from the inherent risks of the spaceflight activity. Injuries caused by the inherent risks of spaceflight activities may include, among others, injury to land, equipment, persons, and animals, as well as the potential for you to act in a negligent manner that may contribute to your injury or death. You are assuming the risk of participating in this spaceflight activity."

(c) Failure to comply with the warning statement requirements in this section shall prevent a spaceflight entity from invoking the privileges of immunity provided by this section.

~~(4) This section expires October 2, 2018, unless reviewed and saved from repeal through reenactment by the Legislature.~~

Section 2. This act shall take effect July 1, 2011.

Approved by the Governor June 17, 2011.

Filed in Office Secretary of State June 17, 2011.

Chapter 3

S.B. No. 115

AN ACT

relating to limiting the liability of space flight entities.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

SECTION 1. Title 4, Civil Practice and Remedies Code, is amended by adding Chapter 100A to read as follows:

CHAPTER 100A. LIMITED LIABILITY FOR SPACE FLIGHT ACTIVITIES

Sec. 100A.001. DEFINITIONS. In this chapter:

(1) "Launch" means a placement or attempted placement of a vehicle or rocket and any payload, crew, or space flight participant in a suborbital trajectory, earth orbit, or outer space, including activities involved in the preparation of a launch vehicle or payload for launch.

(2) "Reentry" means a purposeful return or attempt to return a reentry vehicle and the payload, the crew, or a space flight participant from earth orbit or from outer space to earth.

(3) "Space flight activities" means activities and training in all phases of preparing for and undertaking space flight, including:

(A) the preparation of a launch vehicle, payload, crew, or space flight participant for launch, space flight, and reentry;

(B) the conduct of the launch;

(C) conduct occurring between the launch and reentry;

(D) the preparation of a reentry vehicle, payload, crew, or space flight participant for reentry;

(E) the conduct of reentry and descent;

(F) the conduct of the landing; and

(G) the conduct of postlanding recovery of a reentry vehicle, payload, crew, or space flight participant.

(4) "Space flight entity" means a person who has obtained the appropriate Federal Aviation Administration license or other authorization, including safety approval and a payload determination. The term includes:

(A) a manufacturer or supplier of components, services, or vehicles used by the entity and reviewed by the Federal Aviation Administration as part of issuing the license or other authorization; and

(B) an employee, officer, director, owner, stockholder, member, manager, or partner of the entity, manufacturer, or supplier.

(5) "Space flight participant" means an individual, who is not crew, carried aboard a launch vehicle or reentry vehicle.

(6) "Space flight participant injury" means an injury sustained by a space flight participant, including bodily injury, emotional distress, death, property damage, or any other loss arising from the individual's participation in space flight activities.

Sec. 100A.002. LIMITED LIABILITY. (a) Except as provided by Subsection (b), a space flight entity is not liable to any person for a space flight participant injury or damages arising out of the space flight participant injury if the space flight participant has signed the agreement required by Section 100A.003 and given written consent as required by 49 U.S.C. Section 70105.

(b) This section does not limit liability for an injury:

(1) proximately caused by the space flight entity's gross negligence evidencing wilful or wanton disregard for the safety of the space flight participant; or

(2) intentionally caused by the space flight entity.

Sec. 100A.003. WARNING REQUIRED. (a) A space flight participant must sign an agreement and warning statement before participating in any space flight activity. The agreement must include the following language and any other language required by federal law:

AGREEMENT AND WARNING

I UNDERSTAND AND ACKNOWLEDGE THAT A SPACE FLIGHT ENTITY IS NOT LIABLE FOR ANY INJURY TO OR DEATH OF A SPACE FLIGHT PARTICIPANT RESULTING FROM SPACE FLIGHT ACTIVITIES. I UNDERSTAND THAT I HAVE ACCEPTED ALL RISK OF INJURY, DEATH, PROPERTY DAMAGE, AND OTHER LOSS THAT MAY RESULT FROM SPACE FLIGHT ACTIVITIES.

(b) An agreement under Subsection (a) is considered effective and enforceable if it is:

(1) in writing;

(2) in a document separate from any other agreement between the space flight participant and the space flight entity other than a different warning, consent, or assumption of risk statement;

(3) printed in not less than 10-point bold type; and

(4) signed by the space flight participant and a competent witness.

Sec. 100A.004. AGREEMENT EFFECTIVE AND ENFORCEABLE. (a) Except as provided by Subsection (b), an agreement between a space flight entity and a space flight participant limiting or otherwise affecting liability arising out of space flight activity is effective and enforceable and is not unconscionable or against public policy.

(b) An agreement described by this section may not limit liability for an injury:

(1) proximately caused by the space flight entity's gross negligence evidencing wilful or wanton disregard for the safety of the space flight participant; or

(2) intentionally caused by a space flight entity.

SECTION 2. The change in law made by this Act applies only to a cause of action that accrues on or after the effective date of this Act. A cause of action that accrues before the effective date of this Act is governed by the law in effect immediately before the effective date of this Act, and that law is continued in effect for that purpose.

SECTION 3. This Act takes effect immediately if it receives a vote of two-thirds of all the members elected to each house, as provided by Section 39, Article III, Texas Constitution. If this Act does not receive the vote necessary for immediate effect, this Act takes effect September 1, 2011.

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SmC

S.B. No. 115

David Dewhurst
President of the Senate

Joe Straus
Speaker of the House

I hereby certify that S.B. No. 115 passed the Senate on March 15, 2011, by the following vote: Yeas 31, Nays 0.

Patsy Spaw
Secretary of the Senate

I hereby certify that S.B. No. 115 passed the House on April 12, 2011, by the following vote: Yeas 147, Nays 0, one present not voting.

Robert Haney
Chief Clerk of the House

Approved:

21 APR '11
Date

Rick Perry
Governor

FILED IN THE OFFICE OF THE
SECRETARY OF STATE
6:30pm O'CLOCK
APR 21 2011
Hope Andrade
Secretary of State

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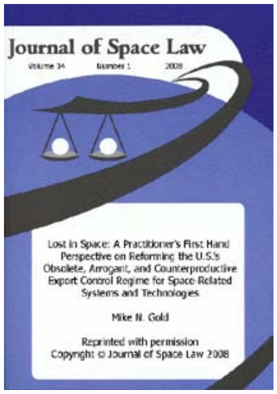
The National Center for Remote Sensing, Air, and Space Law has the following books available for purchase. For Book Descriptions and ordering information, please visit our website at: Http://www.spacelaw.olemiss.edu/.



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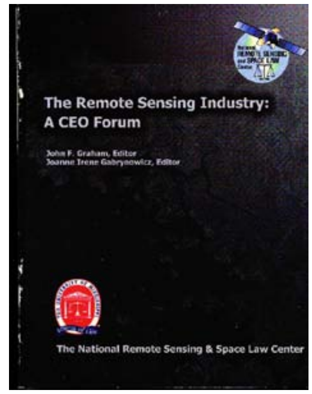

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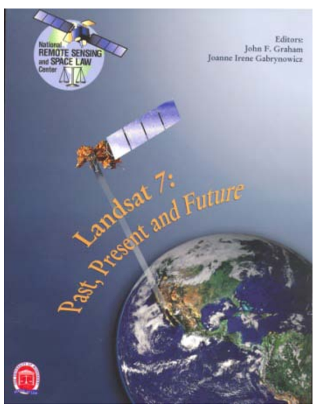

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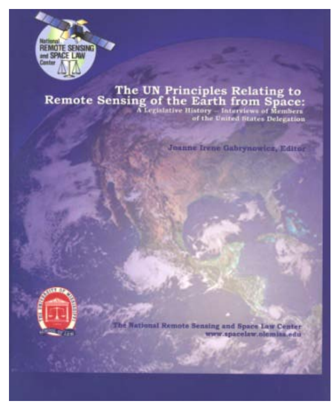

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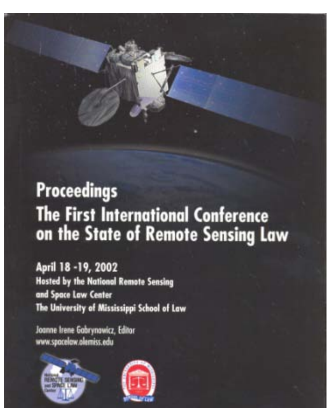

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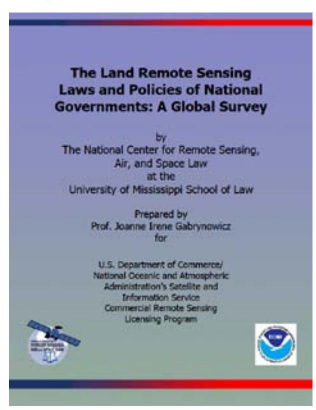

The Land Remote Sensing Laws and Policies of National Governments: A Global Survey - available free online

National Center for Remote Sensing, Air, and Space Law

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