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SPACE STATION: RISKS AND VISION

*Ken Pedersen**

A particular aphorism seems to be cropping up in a lot of places lately. Attributed variously to a number of personalities, most frequently Mark Twain, it holds that "predictions are hard things to make, especially when they deal with the future." Perhaps the frequency of its appearance says something about the current mood of many members of officialdom and the public alike, a feeling that we have been victimized by failed optimism about our abilities to manage the future. Despite the economic recovery in the U.S., much of the developed world is still mired in a recession characterized by chronically high unemployment and stagnating industries—strengthening the view of many that economics is truly the dismal science. Simple theories of economic development for the Third World, once purported to offer a step-wise blueprint for industrial take-off, lie abandoned in the wake of governmental inefficiency, the climb in energy prices, and the resulting burden of debt. Political schemes aimed at enhancing international stability have, in many eyes, left us instead a world beset by the unpredictable violence of terrorism, a heightened nuclear threat and the current agony of South Africa.

It is not surprising, therefore, that a preoccupation with "muddling through" seems to dominate so many of today's international agendas. It is easy in such times to discount the role leadership and vision play in political life. Indeed, it is the special requirement of effective political leadership to cause people to elevate their sightlines and to provide them with goals that reflect a broadened sense of purpose and direction.

The internationally developed and operated Space Station proposed in January, 1984, by President Reagan, has the potential to be a visionary project, providing a focal point for man's presence in space until well into the twenty-first century. It is a program with the capacity to capture the public's imagination, reward its participants with valuable scientific and technical returns and stand as a high profile symbol of the ability of nations, both West and East, to work peacefully and productively together. The near-term, practical uses of the Station are many, including a platform for astronomy and astrophysics observation, a "factory" for developing new materials and drugs, a laboratory for conducting biomedical research, a staging and repair depot for satellites and spacecraft, and a framework for enhanced earth observation and communications.[1] Constructing and operating the Station as a partnership venture involv-

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1. *See* AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, *Space Station: Policy, Planning and Utilization*, AIAA AEROSPACE ASSESSMENT SERIES Vol. 10 (1983) (description of many potential Space Station capabilities).

ing the U.S., Europe, Japan and Canada offers all of the participants the opportunity to create the most capable facility possible by sharing costs and pooling the best available engineering and scientific talent. Despite its outward appeal, the proposed international Space Station is encountering some obstacles abroad, based in part on the growing autonomy of overseas space programs and on the increased economic competitiveness of the space arena. This article examines a few of these obstacles, looks at the efforts being made to overcome them, and reflects on some of the possible consequences of success or failure. It concludes that the international Space Station proposal can offer important benefits which transcend its utilitarian, near-term rewards and that it may require keeping a close political eye on these more "visionary" values to surmount the practical barriers to success which loom ahead.

II

The events surrounding and immediately following the President's decision to develop a permanently-manned Space Station within a decade and to invite international participation have been covered elsewhere.[2] A few words about more recent occurrences may be useful, however. In late Spring and early Summer of 1985, following a year of negotiations, NASA signed with its counterpart agencies in Europe, Japan and Canada three bilateral Memoranda of Understanding committing the four parties to work together during the Space Station Phase B period.[3] The Phase B period, which is now underway, is devoted to definition and design work and is scheduled to run through calendar year 1986, with hardware development scheduled to begin shortly thereafter. Successful completion of the pre-Phase B negotiations in such a relatively short period of time was an impressive and important achievement. Among other things, it has enabled the parties to begin their respective Phase B activities in parallel, a critical step if the rigorous timetable for joint decision making is to be respected. This timetable currently calls for freezing the overall Space Station configuration by Summer, 1986, and also for obtaining by that time commitments as to the hardware elements that each of the partners plan to take forward into preliminary design.[4]

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2. *See, e.g.*, K. Pedersen, Space Station: Opportunity for International Cooperation and Utilization (Oct. 1984) (paper presented to International Astronautical Federation Congress, Lausanne, Switzerland).

3. Memorandum of Understanding for Conduct of Parallel Definition and Design Studies (Phase B) of Permanently Manned Space Station, June 3, 1985, NASA—European Space Agency; Memorandum of Understanding for Definition and Design Activities Program of Permanently Manned Space Station, May 9, 1985, NASA—Science and Technology Agency of Japan; Memorandum of Understanding for Definition and Design Program (Phase B) of Permanently Manned Space Station, April 16, 1985, NASA—Canadian Ministry of State for Science and Technology.

4. A schedule of Phase B decisions and a description of the commitments foreseen are found in Articles III and IV of the Memoranda of Understanding, *supra* note 3.

These commitments will not represent binding governmental decisions to proceed with the *development* of the identified elements. Such decisions involve large financial obligations and must await the conclusion of the entire Phase B process, including successful negotiation during 1986 of agency-level and intergovernmental agreements covering both the development and operations phases (Phases C/D and E). Nonetheless, these early commitments to undertake preliminary design work are essential to stabilizing the configuration of the initial Station, as well as defining its engineering requirements and performance capabilities. Because they form a basis for making important and, in some cases, nearly irreversible design decisions, the scope and nature of these assurances assume more than passing importance.

At the time this article is being written the working relationships between the Phase B partners seem to be progressing rather well. A nearly continuous dialogue is taking place through a broad network of multilateral and bilateral committees and working groups. The Europeans and Japanese have located full-time Space Station liaison personnel in Washington and at the Johnson Space Center in Houston, where responsibility for overall systems engineering is located. The schedule is extremely demanding and has given rise to stressed nerves and some friction. However, this is predictable, and resolving political and programmatic tensions among the international partners will remain a continuing management chore.

Looking ahead, both the Japanese and the Europeans are studying the development of pressurized laboratory modules and, assuming favorable negotiations, their contributions to the Station will take at least this form. A critical, and as yet undecided, question concerns the specific functional capabilities (e.g., microgravity research, biomedical research) that each laboratory will contain. The U.S. has expressed a strong desire for the partners to spread the various capabilities across the three or four total laboratory modules foreseen on the initial Station. By coordinating responsibilities, the U.S. hopes to minimize duplication and thereby gain the broadest spectrum of capabilities possible. The American view is encountering some resistance from the Europeans and Japanese who wish to retain greater unilateral control over the outfitting of their modules and see U.S. efforts to impose a division of labor as threatening their independence of action. There will be more on this point later. The Europeans are also studying the development of a polar platform, largely dedicated to remote sensing, which would be tended initially by the Space Shuttle. The Canadians are focusing most of their attention on payload handling and servicing hardware for the Station. This focus is a natural outgrowth of Canadian experience gained in developing the highly successful Canadarm for the Shuttle.

The U.S. will develop most of the "service capabilities" for the initial Station, e.g., the command module, living quarters, power supply. In addition, the U.S. has interests in each of the areas being studied abroad. Thus, NASA is certain to want to develop at least one pressurized laboratory and polar platform for the initial Station. Similarly, because robotics and artificial intelli-

gence are considered areas of great importance for the nation's technical and economic future, the U.S. will doubtless also insist on NASA having a developmental role in the handling and servicing areas as well. Reaching agreement on a division of labor that is mutually acceptable on political, technical and financial grounds is perhaps the most pressing problem facing the partners as they move towards preliminary design commitments.

III

It is not the central purpose of this article, however, to explore all of the issues now confronting the partners. Rather, it will focus on only a few broadly-based problems and risks that are tied fundamentally to the long-term character of the Station and, as a result, will demand close attention for a long time to come.

Because the Space Station is an ambitious and visionary program, it portends large risks for its participants. First, it will be costly; and second, it incorporates a long term view that seeks to set in motion activities whose direct effects will be with its partners for decades. It is the largest civilian science and technology program ever proposed by the U.S. for international collaboration. The U.S. investment in defining, designing and developing its share of the initial complex is estimated to be at least $8 billion and, by the time the design work is complete, will almost certainly be more. Assuming successful negotiations, the Europeans, working principally through the European Space Agency (ESA), will spend at least $2.5 billion on their related Space Station items, which collectively are called the Columbus program. The Japanese program, centered around the Japanese Experimental Module (JEM), will cost around $1.5 billion and the Canadian investment could easily reach $500 million. Even allowing for error margins, these amounts are substantially greater than have been spent by these long-time partners of the U.S. on previous space collaborations. For example, the ESA investment in developing and manufacturing the first Spacelab unit for the Shuttle was about $1 billion, while the Canadians spent slightly more $100 million on the development and production of the initial Canadarm unit. For the Japanese, the Space Station would be their first major venture into the development of manned space systems and would represent, by far, their largest investment to date in an international space program.[5] These figures increase significantly when future Space Station operating costs, which the partners will share, and costs for developing on-board experiments and other utilization hardware are added. Future requirements could easily double the partners' financial stakes.

When assessing the Space Station program it is especially important to take account of the long term perspective embodied in the proposal. Specifically, what the U.S. has proposed to its allies abroad is a partnership that does

5. The Japanese chose not to participate in the Space Shuttle program, in part due to a feeling that their space program was not sufficiently mature in the early 1970's to support such an undertaking.

not end with development, but includes joint use and operation of the Space Station for a period extending well into the twenty-first century. Accordingly, the Station is being designed to permit evolution, diversification and expansion of its capabilities in response to user requirements. (In this respect it differs from other long-lived facilities like Skylab or the Hubble Space Telescope which are, in evolutionary terms, either deadends or intended for highly specialized use.) Indeed, it is not hard to imagine that the initial Space Station configuration now being discussed by the four parties could become just one facility in a dispersed complex of manned and man-tended Space Stations, internationally managed, crewed and utilized on a permanent basis. This is, admittedly, a long-term vision, and one which contrasts with international business-as-usual both in space and on earth.

It is this long-term aspect of the Space Station that gives rise to one of the most significant obstacles to its short-term realization. Lasting international partnerships, like lasting marriages, involve complex compromises between independence and interdependence. The U.S. Space Station proposal foresees its participants entering a complex web of developmental and operational interdependence of indefinite duration. It is a view which conflicts, however, with urges toward independence and autonomy which are clearly surfacing in some quarters abroad.

Put plainly, it is not clear to what degree the U.S. Space Station plan—incorporating a long-term, evolving relationship without a predetermined end—is shared by its potential partners, in particular the Europeans. For example, spokesmen for the European Space Agency, and for some of its member nations, have repeatedly referred to the prospect of cooperation with the U.S. on Space Station as a "stepping stone" to an autonomous European Station, serviced by their Ariane launch vehicle and by a European-devised spaceplane called Hermes. In some European-sketched scenarios, their independent space station could be flying as early as the first decade of the next century or only about ten years after the initial configuration of the U.S. proposed international Station becomes operational.[6]

Naturally, the Europeans have their reasons. For years, they occupied a dependency position in space matters vis-a-vis the U.S., owing in large measure to America's Free World monopoly on launch vehicles. This situation changed dramatically in the early 1980's with the successful operation of the ESA-developed Ariane launch vehicle, which has subsequently captured a significant share of the world's commercial launch business. For many Europeans, the independence of action provided by Ariane's successes is a great source of technical and political pride. Accordingly, there is concern in some European political quarters that an open-ended Space Station partnership with the U.S., particularly where the Americans are the largest "shareholders", could become

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6. *See* Feazel, *Europeans Believe Shuttle Costs, Capacity May Limit Station Use*, AVIATION WEEK & SPACE TECH., Oct. 21, 1985, at 146, 147 (for many European politicians the "main goal [of initial cooperation] is to give Europe the capability to launch an independent space station early in the 21st century".

another form of long-term dependency, choking off both the funding and political will necessary for undertaking further space projects directed toward strengthening the Continent's own technological capabilities.

To these anxieties and aspirations must be added the fact that the U.S. and Europe are in the early stages of high stakes negotiations aimed at producing international agreements to govern both the developmental and operational phases of the Space Station program. From the outset of these negotiations, the U.S. has made clear that it preferred to develop and operate the Space Station on an international basis but was prepared to go it alone if necessary. This posture gives the U.S. significant bargaining leverage. It should surprise no one, therefore, that the Europeans may have decided, as a matter of negotiating strategy, to adopt a stance which emphasizes their own hard-earned sense of equality, capability and independence. Nor is the European concern unique; while the Europeans have been the most outspoken on the subject of "going their own way", the Japanese have also expressed an interest in following a very similar path.

This emphasis on independence and autonomy could, unchecked, pose a significant threat to meaningful Space Station cooperation. There is a plausible argument which holds that fiscal realism and positive early experiences with Space Station collaboration will, with time, diminish the appeal of wholly separate Space Station paths. While perhaps persuasive, this argument presumes a threshold of experience which may, in practice, not be reached. By depicting Space Station cooperation as a short-term expedient, whether for policy or negotiating reasons, the Europeans and Japanese may lead the U.S. to conclude that the prospective benefits from cooperation simply do not outweigh the risks and uncertainties created by a short-term relationship. In this case, no agreement to proceed with development will emerge. More likely, the partners will reach an initial cooperative agreement. But their distrust of one another's motives could cause them to incorporate into the arrangement restrictions and reservations of a type which could seriously erode the parties' chances of experiencing the shared successes needed to overcome their respective worries and sustain a long term partnership.

Roy Gibson, former Director General of ESA, has summed up the dilemma quite succinctly: "Is it sensible," he asks, "to take on-board a partner whose declared aim is to set up in business for himself as quickly as possible?"[7] Entering into a cooperative project of Space Station's magnitude with the avowed aim of getting a quick fix of experience before moving on is, to return to the marital metaphor, a bit like treating marriage as a short-term precursor to life as an adult single. While hardly unknown in either political or human affairs, it is not a situation designed to promote meaningful relationships.

Difficulties with balancing independence and interdependence in the face of expanding space capabilities abroad is just one factor threatening the long-term viability of Space Station cooperation. Another complicating factor is the

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7. Gibson, *Europe—towards a new long-term programme,* 1 SPACE POLICY 3,5 (Feb. 1985).

growing importance of space as a competitive economic arena. There is a bit of a paradox here since the commercial potential of space is a major impetus propelling the Space Station project forward. Still, it would be naive to ignore the constraining effects competitive anxieties can have on cooperation. For example, protection of technology takes on added weight as concerns for commercial advantage grow in importance. To the extent that the Space Station is envisioned as a "factory in space," and this is certainly one objective of its creators, potential partners will approach long-term cooperative entanglements warily. Balancing partnership with protection of technology and proprietary materials has been a problem for the U.S. all along and it is of concern to Europe, Japan and Canada as well.

The heightened importance of space as a competitive economic arena also means that the proposed international Space Station must compete directly for funds and political support with a growing number of foreign space projects, many of which have strong national constituencies and clear commercial objectives. The pot of money available for civil space programs abroad is finite and expands slowly, just as in the U.S. In Europe, the Columbus project must compete for funding with proposals to up-grade and man-rate the Ariane launch vehicle and to build Hermes.[8] These efforts are considered by many Europeans to be central to Europe's long-term viability as a commercial launching power and are closely related to their aspirations for "space independence." A similar situation exists in Japan where the Japanese Experimental Module must vie for funding with an ambitious program to build a new national launch vehicle, the H-2. The H-2 will employ indigenously developed cryogenic engines and is directly targeted at making Japan another provider of commercial launch services on a global scale. Basic H-2 development costs are estimated to be at least $800 million, with first flight scheduled for 1992, exactly in the same developmental time frame as the Space Station.[9] While competition among indigenous and cooperative programs is not likely to assume a true zero-sum format, fiscal constraints and competing commercial objectives will require difficult choices which could adversely affect the shape and pace that international Space Station cooperation will take.

IV

Clearly, if the Space Station is to succeed as a long-term international program, it must take constructive account of the changing international environment. For this reason, the U.S. has proposed several new groundrules for cooperation which seek to respond to factors like the enhanced independent space

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8. *See* Lenorovitz, *France Selects Aerospatiale, Dassault to Develop Spaceplane*, AVIATION WEEK & SPACE TECH., Oct. 28, 1985, at 18. (R&D and production costs for first two Hermes spaceplanes is estimated at $1.1 billion). Many experts believe this figure is too low.

9. Lenorovitz, *Japan Schedules First Flight of H-2 Launch Vehicle for 1992*, AVIATION WEEK & SPACE TECH., Oct. 21, 1985, at 127.

capabilities of its partners and the growing commercial competitiveness of the space area.

First, the U.S. has said it is prepared to share overall management authority for the Station with its European, Japanese and Canadian partners. This combined authority would pertain during both the development and the operational phases. While implementation details will have to be negotiated, it is clear that the U.S. is talking about a sharing of decision-making responsibility going significantly beyond that practiced in past cooperative projects. Second, the U.S. has said it will guarantee its partners open, continuing and non-discriminatory access to their Space Station facilities via the Space Shuttle and, on a reciprocal basis, to U.S. government-supplied laboratories and platforms as well. Once again, detailed groundrules must be negotiated to assure fairness and day-to-day workability, but the U.S. has stated that this right of access will apply to foreign private firms as well as to government entities so long as equal treatment is afforded U.S. participants, both private and public, vis-a-vis foreign-supplied facilities. Third, the U.S. has stated that other launch vehicles, such as Ariane, H-2 or the proposed Hermes will have ready access to the Station so long as such access is achieved in a manner compatible with safe and non-disruptive operation.

These proposed principles for cooperation represent important modification in NASA's traditional posture on manned flight activities which, among other things, has characteristically insisted on a sharp distinction between the development phase and the operations phase. Foreign partners have historically had little or no direct role in the latter period. The Spacelab and Canadarm, where the hardware was transferred entirely to NASA control following development, are examples of this traditional pattern.

The changed guidelines suggest that there is some new wine to go in the new bottle. It is not evident, however, that the fresh vintage will be strong enough to overcome fully the inhibitions and fears abroad which, at bottom, originate in uncertainties about the benefits and sincerity of the long-term relationship being proposed. Gaining ground on the issues confronting the partners will be further complicated by the fact that many of the issues are intricately interlinked and, consequently, cannot easily be resolved piecemeal. A pair of examples will illustrate this. The objective of preserving autonomy and independence, which is expressed so forcefully by some European and Japanese spokesmen may be more easily satisfied by their countries assuming roles as short-term "users" of a U.S.-run Space Station than by playing the roles of long-term partners in an international facility. Either of the roles can doubtless be made to work. But the "user" formulation is fundamentally incompatible with the principle of *shared* overall management and operation of the Space Station, a principle which the Europeans and Japanese have sought as a matter of equality and which, as noted above, the U.S. has accepted. The extent to which the U.S. is prepared to share decision-making authority is almost certainly going to depend on the degree to which the other side is prepared to offer commensurate financial and *temporal* commitments. The two issues must be resolved in tandem. Not only is this fair, but it reflects the fact that today's management decisions frequently involve making choices carrying long-term

consequences with which the decision-makers should be expected to live.

In a similar manner, the principle of open access to all facilities of the initial Space Station complex is tightly linked in the U.S. mind to a willingness by the international partners to accept a division of labor which distributes capabilities among the various laboratory modules in a way which avoids duplication and permits building the most efficient and fully functional Station possible. Each partner must be prepared to forego independent development of certain important capabilities in its own laboratories and accept dependence for these capabilities on a laboratory provided by another. This, in turn, requires confidence that each facility will be openly accessible and will remain an integral part of the Station complex for a sustained period of time. While moving toward greater laboratory self-sufficiency may ease the difficulties inherent in working out an access scheme, it also eliminates a major reason for considering cooperation in the first place: the increase in diverse capabilities made possible through a coordinated pooling and application of resources.

The stakes involved in resolving these and other difficult issues in the next round of Space Station negotiations are extremely high. Decisions that the U.S. and its potential partners will make in the next year or so carry with them economic, technological and political consequences extending well into the next century. For example, it seems certain at this point that the U.S. will go ahead with the development of a permanently-manned Space Station under any circumstances, and that U.S. civil space plans *in all disciplines* will increasingly assume and be designed for use with that Station. Failure by the U.S. and its traditional partners to reach satisfactory agreement to jointly build and operate a Space Station strengthens substantially the possibility that their respective space programs in science and applications will also increasingly take separate paths. In this respect, the Space Station is not just another large, self-contained project. It is principally a piece of enabling infrastructure, a tool, capable of stimulating and supporting a diversity of cooperative activities between its partners for years to come. Only by seeing Space Station in its long-term context, as a means rather than an end, can one grasp fully the significance of the choices about to be made. While the term "crossroads" is overused, it appears genuinely applicable in this case.

V.

Since the notion that success breeds success is generally valid, the mutually satisfactory outcome to the Phase B deliberations should create a momentum that will be of great benefit. At the same time, it is important to stress that resolution of many of the most central questions was simply deferred to the Phase C/D/E negotiations which begin in the Summer of 1986.[10] The Phase

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10. *See, e.g.*, Memorandum of Understanding for Conduct of Parallel Definition and Design Studies (Phase B) of Permanently Manned Space Station, June 3, 1985, NASA—European Space Agency, art. I § 1 (specifying nine issue areas requiring resolution during C/D/E negotiations, including principles regarding access to and use of all elements of Station, pricing policies, allocation of operational costs, protection of com-

B agreements are essentially "invitations to struggle." They legitimize and create a framework within which the parties will seek to resolve difficult and fundamental issues while trying to advance and protect their respective self-interests. The first-round agreements do not ordain future success, either in the Phase C/D/E negotiations or in the hardware development and Station operations which would follow.

It is, of course, a mistake to negotiate at any time out of a fear of failure; some bargains are better not struck. It would be equally a mistake, however, to assume that successful outcomes will emerge easily. Overconfidence can displace time-consuming attention to detail, the true currency of successful international bargaining. Overconfidence can also promote ill-conceived brinksmanship, leading either to last minute "rescue" attempts which prove to be too little, too late, or too unsatisfactory band-aids with no staying power—a particularly undesirable outcome in potentially long-lived projects like the Space Station.

If the international Space Station proposal is to succeed, it will require hard day-to-day work at the bargaining table and in management councils. Overcoming the obstacles ahead will also depend on leaders who grasp the long-term visionary significance of the concept. This is especially true in the wake of the tragic Challenger accident. Only by keeping the political dimension strongly at the forefront can the overall Space Station design prosper. President Reagan recognized this in deciding to place the international Space Station proposal on the agenda of the London Economic Summit in June, 1984, shortly after introducing the concept in his State of the Union Message. This permitted him to discuss the project personally with his counterparts in Europe, Japan and Canada and proved to be a vital—probably essential— step in securing the high level attention required to negotiate and sign the initial agreements less than one year later. An active and visible interest in the Space Station program by the respective heads of government together with their relevant executive and parlimentary colleagues will remain a critical need in the future.

Their political foresight will be needed to recognize that competitive and cooperative objectives in space are not inevitably incompatible, but are often mutually reinforcing. Indeed, the Space Station can be a particularly good example of this principle. The cooperative infrastructure being discussed by the U.S. and its international partners—pressurized laboratories, co-orbiting platforms, polar platforms, satellite servicing facilities—is, in fact, a commercial/industrial framework which will enable the partners and their industries to compete even more aggressively and effectively with one another in space. Cooperation need not dull or stifle competitive rivalries. It can, as with Space Station, foster commercial opportunities beyond the capabilities of any one partner acting alone. It is those that fear, not those that seek, competition who should probably resist the Space Station's progress.

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mercial and property rights, transfer of technology and participation in management and crewing).

Leadership vision will also be required to see that Space Station cooperation has a symbolic importance that extends beyond the competitive and independence-oriented stresses present in the current space environment. Much has been written about the strains that periodically bedevil the Western alliance, often caused by economic problems and Soviet attempts to drive political wedges between the U.S. and its allies. Yet, Free World security continues to depend ultimately on a perception both within *and without* the alliance that its members share a basic unity of purpose and possess the ability and will to work together. It seems vitally important in these times that the members of the industrialized democracies demonstrate visibly that, for all their competitive energies, they can cooperate successfully on large scale, high technology projects that pose significant management challenges. The Space Station by virtue of its magnitude, complexity, and long life offers the Western countries a unique opportunity to demonstrate their prowess and unity of purpose in non-military economic and technological arenas where, according to Mr. Gorbachev, competition with the Soviets is increasingly going to focus. While the Space Station and President Reagan's Strategic Defense Initiative (SDI) are both projects of visionary scale, they are not necessarily rivals. They operate in different time frames, in pursuit of quite different objectives and embody quite disparate political symbols. SDI will be fully successful only if the system it proposes never has to be used; the international Space Station will be successful only if the system it constructs is used actively, openly and continuously. .

Political insight will also be needed to visualize and act upon the significant East-West implications that could follow from an international Space Station built by the West. The Soviets have long depicted and operated their Salyut facilities as precursors to an eventual permanently-manned Space Station. As this article is being completed, they have just successfully launched a new space station facility, called *Mir*. This new facility underscores the Soviet's ability to construct very large, permanently-manned space complexes in the future.[11] Coupled with the acknowledged Russian development of a Space Shuttle similar to the U.S. version, the new *Mir* will, according to Soviet statements, become the basic building block of a modular Space Station comparable in size to that proposed by President Reagan.

For both competitive and cooperative reasons, this Soviet activity ought to be important to Western leaders considering their own Space Station prospects. Development of a "Western Space Station" will curtail the Soviet's ability to use their own Station as a political wedge. It is no secret that the Russians have actively sought to engage key Western countries in cooperative space activities, and there is evidence that this effort is increasing.[12] While

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11. *See* Office of Technology Assessment, "Salyut: Soviet Steps Toward Permanent Human Presence in Space." OTA Memorandum TM-ST1-14, Dec. 1983 (historical treatment of Soviet Salyut program).

12. The Russians have a sizable and growing cooperative scientific space program with the French. Recently, the USSR raised informally with the European Space

East-West space cooperation has been beneficial, it is only likely to remain so for the West when it can bargain, at a minimum, from a position of equality. Should the U.S. and its allies fail to reach accord on jointly developing and operating a Space Station, the Soviets will doubtless exploit the situation. One cannot dismiss the possibility that Soviet offers to use their manned space facilities will be directed to Western industry as well as governments. The USSR has displayed a growing interest in the commercial potential of space. The Russian system of government erects many practical obstacles to competing effectively in the global economy. Still, the opportunity to gain political and technological benefits may overcome the barriers the Soviets normally place around their more sensitive programs.[13] Should allied negotiations or subsequent Space Station dealings falter, leaving a residue of bad feeling and setting off a search for short-term alternatives, an opportunity to use Soviet facilities may be perceived by some in the West as an acceptable, if not ideal, option.

On a more positive note, a "Western Space Station" could make important contributions to East-West bridge-building efforts, should global political trends move in that direction. Periods of improved relations between the USSR and the West have in recent history been symbolized by an upsurge of civil space cooperation. Thus, it was no surprise that President Reagan, in his pre-Geneva Summit address to the American public, mentioned civil space collaboration as an area of promise for future concerted action between the First and Second World. Among the ambitious space projects prominently mentioned as lying within the combined capabilities of East and West are a manned mission to Mars and a return mission to the Moon to establish a permanent base. Both of these undertakings, and other similar missions, will be greatly facilitated and made more economic by the existence of staging and supply facilities in low earth orbit—in other words, by space stations. While history must judge whether grand cooperative voyages to other worlds can help bring peace to this one, only by beginning to build the infrastructure on both sides now will it be possible to test that proposition later.

In large measure, then, it comes down to weighing the promise of visions against the all-too-apparent risks of large scale international cooperation. Relationships among governments are not like those between a government and its domestic contractors or between industrial firms. States are sovereign and disagreements can, and do, become long-lived diplomatic incidents without readily available or effective means for prompt resolution. Even among close allies, it is all too easy for efforts at problem-solving to become stalemated, particu-

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Agency the possibility of launching two of that organization's scientific satellites, Cluster and SOHO, should a planned cooperative program with the U.S. involving those satellites fail to materialize.

13. The USSR recently announced its intention to bid for commercial contracts to launch satellites for the International Maritime Satellite Organization, INMARSAT, of which they are a member. The announcement that the Soviets are now considering joining INTELSAT raises the prospect that they may seek after that lucrative launch business.

larly where interests are strong and uncertainty is high. At these times, it often requires an act of political vision to recognize that inaction carries its own risks, which may be more severe and even more lasting in their consequences than the risks assumed in forthrightly confronting the issues. After all, it was also Mark Twain who said, "Courage is resistance to fear, mastery of fear—not absence of fear."

THE SPACE STATION: UNITED STATES PROPOSAL AND IMPLEMENTATION

*Eilene Galloway**

Introduction

The United States has proposed a permanently manned orbiting space station as a multidisciplinary international project requiring political and economic commitments by participating governments. In the planning, construction and operational phases, attention must be given to existing international law as well as applicable national laws. Government decisionmakers, scientists, engineers and others engaged in this project need to be aware of the sources of legal norms and ways in which future success in management and operations depends upon rational supervision.

Space law is international and national in providing for governing geographic areas and functions performed in such areas.[1] International space law takes the form of multilateral and bilateral agreements between nations; nationally, each State that participates in outer space activities has laws and regulations which should be integrated harmoniously with international agreements and treaties to which it is a party. In approaching a legal analysis of law that is already applicable to the U.S. space station, as well as space stations of other nations, it is necessary not only to consider the six space treaties formulated within the United Nations and later ratified by many nations,[2] but also to examine legal arrangements formed to create international intergovernmental space organizations and those regulating projects for various types of joint use of outer space by means of bilateral and multilateral agreements. A realistic approach toward erecting a management framework for an international operational space project would assign top priority to achieving harmony be-

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This article is an elaboration of the author's presentations during an International Colloquium on Space Stations held in Hamburg, October 3-4, 1984, and during the Congress of the International Federation held in Stockholm, October 7-12, 1985. *See* SPACE STATION: LEGAL ASPECTS OF SCIENTIFIC AND COMMERCIAL USE IN A FRAMEWORK OF TRANSATLANTIC COOPERATION 33-57 (Karl-Heinz Böckstiegel ed., Köln, 1985); Proc. 28th Colloquium on the Law of Outer Space (Am. Inst. of Aeronautics & Astronautics ed., New York, 1986)

1. Galloway, *Legal Aspects of International Cooperation in Space: Area and Functional Concepts in Defining Outer Space,* PROC. OF THE 26TH COLLOQUIUM ON THE LAW OF OUTER SPACE 197-203. (1984).

2. *See infra* notes 11-16.

tween all interacting parts. If care is taken to develop the body of space law with reference to a set of general guiding principles applicable to national and international situations, operational success can be achieved and unnecessary conflicts avoided. This has been the experience, for example, with the organization and management of the International Telecommuniciatoins Satellite Organization (INTELSAT).

This task involves making a distinction between general and specific requirements for management. A foundation of general guidelines already exists in ratified space treaties, but when any use of space is highly technical, scientific, and designed to operate for certain purposes, then it becomes necessary to negotiate specific provisions that are unique to that particular project. This step in the negotiating process requires a study of the national laws of participating states so that agreement is reached on well understood contractual arrangements. Decisions must be made by the institutions responsible for making specific agreements between states.

This analysis has several purposes: (1) to identify existing space law already applicable to the uses of outer space by the space station; (2) to describe some experiences that reveal the difference between general guiding principles and those required for specific operational functions; and (3) to indicate some of the issues that might arise so that they can be dealt with in a timely fashion.

Space Station Planning

NASA had worked on the detailed plans for a space station for a considerable time before the project was presented to President Reagan whose official approval was given in his State of the Union Message on January 25, 1984:

> We can follow our dreams to distant stars, living and working in space for peaceful, economic, and scientific gain. Tonight I am directing NASA to develop a permanently manned Space Station and to do it within a decade.
>
> A Space Station will permit quantum leaps in our research in science, communications and in metals and life-saving medicines which can be manufactured in space. We want our friends to help us meet these challenges and share in the benefits. NASA will invite other countries to participate so we can strengthen peace, build prosperity, and expand freedom for all who share our goals.[3]

NASA Administrator James M. Beggs recalled NASA's success for the past 27 years in international space cooperation and explained to the Congress the interest of European countries, Canada and Japan in the space station. For fiscal year 1985, Congress appropriated $150 million to begin the space station. In testifying before the Senate Committee on Commerce, Science, and Transportation on February 26, 1985, Dr. Beggs explained that—

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3. President's State of the Union Address, 20 WEEKLY COMP. PRES. DOC. 87 (Jan. 25, 1984).

> The Station will consist of a manned base with accompanying unmanned platforms, one of which is likely to be in polar orbit. The base and platforms would be carried aloft in modular sections by the space Shuttle which would assist in the on-orbit assembly and check-out of the Space Station. The Shuttle would also be used for logistics resupply and crew rotation. By utilizing both manned and unmanned elements, the Space Station will enjoy the substantial advantages offered by both modes of space flight. Combined with the unique advantages provided by a truly permanent presence, the Station will significantly enhance United States capabilities in space.
>
> The station is expected to perform a versatile range of functions. It will be—
>
> > a national laboratory in space, for the conduct of science as well as the development of new technologies and related commercial products;
> > a permanent observatory, to look down upon the Earth and out into the universe;
> > a servicing facility where payloads and spacecraft are resupplied, maintained, upgraded and, if necessary, repaired;
> > a transportation mode where payloads and vehicles are stationed, processed and propelled to their destinations;
> > an assembly facility where, due to ample time on orbit and the presence of appropriate equipment, large structures are put together and checked out;
> > a manufacturing facility where human resourcefulness and the servicing capability of the Station combine to enhance commercial opportunities in space;
> > a storage depot where payloads and parts are kept on orbit for subsequent deployment, and
> > a staging base for future endeavors in space.[4]

National and international commitments for designing and financing the space station were well advanced before the shattering explosion of the Challenger shuttle on January 28, 1986. The impact of this disaster on the projected space station required immediate decisions because planning was based upon using the shuttle for transportation between the Earth and the space facility. On February 4, 1986, in his State of the Union Message to the Congress, President Reagan stated;

> Yes, this nation remains fully committed to America's space program. We are going forward with our shuttle flights. We are going forward to build our space station. . .[5]

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4. *NASA Authorization for Fiscal Year 1986: Hearings Before the Subcomm. on Science, Technology and Space of the Senate Comm. on Commerce, Science and Transportation*, 99th Congress, 1st Session 28, 49 (1985).

5. President's State of the Union Address, 22 WEEKLY COMP. PRS. DOC. 135 (Feb. 4, 1986).

Nevertheless, it was obvious that there would be a delay in coordinating the space station with its essential transportation system. Meanwhile, however, engineers were already studying alternative systems. The nature of these vehicles can be determined from the activities of the Space Transportation Systems Committee of the International Astronautical Federation which is studying three different types of operations: (1) the development of launch vehicles capable of taking payloads from the Earth to low-Earth orbit; (2) orbital transfer vehicles which can transfer payloads from one orbit to another; and (3) reentry vehicles and advanced concepts such as winged stages, single stage to orbit, air launched vehicles, etc. Support operations for all three systems are being included in research and development.

This situation illustrates the necessity for analyzing the basic science and technology of any multidisciplinary project before calculating the interrelations of all other elements—political, economic, and legal. The decision to proceed with the space station naturally includes provision for a reliable transportation system with the objective of completing both parts simultaneously.

The U.S. budget for the space station was set in early 1986 for the next three fiscal years: $155.5 million for 1985; $205 million for 1986; $410 million for 1987. Preliminary estimates for future years were $1050.0 million for 1988; $2070.0 million for 1989; and $2270.0 million for 1990. The estimates for other participating countries are $2 billion from the European Space Agency and $1 billion from Japan.[6]

The pattern of international cooperation is shaped by separate memoranda of understanding signed between NASA and Canada on April 16, 1985; NASA and Japan on May 9, 1985; and NASA with the European Space Agency on June 3, 1985. The ways in which such negotiations are necessary for specific purposes will be pointed out following an analysis of space station technology and existing applicable space law.

Relating Technology to Law

Space station planning as a multidisciplinary task must combine all separate and interacting elements: political, economic, scientific, technological, psychological and legal which includes the creation of organizations for management involving jurisdiction and control over space functions. While legal elements are only one of the factors to be considered, nevertheless they are necessary following political and economic commitments. Before an analysis of the legal provisions can be undertaken it is necessary to acquire an understanding of space station technology.

A significant point to note for purposes of legal analysis is that the permanent space station is not one object but rather a cluster of manned and unmanned related objects designed so that additional sections can be added as required by advancing technology and missions. The space station may be visualized as a flotilla which is defined in Webster's New International Diction-

6. *See supra* note 4.

ary as "a group of ships with a common objective and sometimes a definite leader" and "a group (as of persons, planes or tractors) resembling a fleet of ships." The analogy is not perfect because normally all ships at sea would be floating in a much less hostile environment, and with more control by individual commanders of each ship than could be the case with a combination of various interconnected objects in outer space. Still, the observation is useful in dramatizing the point that we are dealing with a cluster of objects and not a single spacecraft, a technical fact which raises questions concerning "component parts" of a space object which is a legal concept already in place.

The preliminary definition of missions between 1991 and 2000 is foreseen in three categories: (1) science and applications will have programs devoted to astrophysics, earth science and applications, solar system exploration, life sciences, materials science and communication; (2) commercial uses will include materials processing in space, earth and oceans observations, and communications; (3) technology development is defined as materials and structures, energy conversion, computer science and electronics, propulsion, controls and human factors, space station systems, operations, fluid and thermal physics.[7] In brief, the space station will engage in both the exploration and uses of outer space. Among other uses will be the capability of assembling large structures and launching them into other orbits in outer space, as well as to the Moon, other celestial bodies and deep space probes. Some of the missions will be governmental while others represent private sector commercial activities.

The relation of military space activities to space stations was studied by the U.S. Department of Defense which reported that:

> Based on this DOD [Department of Defense] evaluation, we have concluded that there are no currently identifiable DOD mission requirements that could be uniquely satisfied by a manned space station. Further, no current DOD requirements were found where a manned space station would appear to provide a significant improvement to DOD over alternative methods of performing the given task. Over time, however, this situation may change. Therefore, we are devoting considerable attention to developing a better understanding of the potential future uses for the military role of man in space.[8]

Vulnerability is a factor in this situation. If a future requirement were to arise, DOD would consider having its own space station in polar orbit, different from that of the civilian space station. The civilian space station is appropriate for attracting total international cooperation.

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7. NASA, SPACE STATION DEFINITION, PRELIMINARY MISSION DATA BASE (1991-2000), 25 (1984) (table 3); *see also* THE SPACE STATION: AN IDEA WHOSE TIME HAS COME 295 (T. Simpson ed., 1985).

8. DeLauer, *Military Space Activities and a Space Station*, 1983, PROC. AIAA/NASA SYMPOSIUM ON THE SPACE STATION 40-41.

Approach Toward Legal Evaluation

In evaluating applicable international space law, there are certain basic tenets to keep in mind:

1. Space treaties cover both the use and exploration of outer space. All activities, functions and missions of a projected space station are uses of the space environment and consequently a station is already subject to a legal pattern of permitted and prohibited activities.

2. General provisions in the 1967 Outer Space Treaty,[9] which is often referred to as the Magna Charta of outer space, have been expanded into four additional treaties in order to keep space law abreast of technological space developments. The result is some overlapping of guidelines between the 1967 Treaty and the more detailed provisions on similar subjects in the succeeding agreements. Each new development achieves a harmonious progression of space law, however, by referring to the basic concepts incorporated in the 1967 Outer Space Treaty. In consequence, the result is some repetition which cannot be ignored because each of the six treaties formulated within the United Nations structure has a different membership of States Parties. If new international arrangements are being made, it is necessary to check on the membership of nations that have made commitments to each space treaty.

3. Only States that are parties to a treaty are bound by the terms of that specific document. However, the four treaties spun from the 1967 Outer Space Treaty are alike in following its major guiding principles.

4. Legal provisions to guide States in the conduct of space activities include documents stating the conditions for establishing institutions, management arrangements concerning jurisdiction and control, financing, representation, personnel practices, consultation among parties and the settlement of disputes.

It is the task of the legal profession to match the foresight and detailed analysis already exercised by scientists and engineers in planning a space station. The purpose of rules and regulations is to ensure orderly operations and avoid creating unnecessary restrictions. Toward this end, it is necessary for space scientists and engineers to explain what they require for successful and continuous operations; concomitantly, the legal and other professions in the social sciences have the responsibility of studying scientific and technical facts so that they can facilitate operations through equitable procedures. One purpose of this evaluation is to assist scientists and engineers by presenting major legal facts and situations which should be taken into account in further planning for the jurisdiction and control of a space station.

Early attention was focused on legal problems of space stations in an international colloquium organized by the Institute of Air and Space Law, University of Cologne, the German Society for Aeronautics and Astronautics, and the Federal Ministry for Research and Technology. The proceedings of this colloquium, which was held in Hamburg, Germany, October 3-4, 1984, have

9. *See infra* note 12.

been published with an introduction by Prof. Dr. Karl-Heinz Böckstiegel: "Space Stations: Legal Aspects of Scientific and Commercial Use in a Framework of Transatlantic Cooperation."[10]

Relevance of Space Treaties Formulated Within the United Nations

There are six treaties in this group:

Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, October 10, 1963."[11]

Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, October 10, 1967.[12]

Agreement on the Rescue of Astronauts, the Return of Astronauts the Return of Astronauts and the Return of Objects Launched into Outer Space, December 3, 1968.[13]

Convention on International Liability for Damage Caused by Space Objects, October 9, 1973.[14]

Convention on the Registration of Objects Launched into Outer Space, September 15, 1976.[15]

Agreement Governing the Activities of States on the Moon and Other Celestial

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10. SPACE STATION: LEGAL ASPECTS OF SCIENTIFIC AND COMMERCIAL USE IN A FRAMEWORK OF TRANSATLANTIC COOPERATION (Karl-Heinz Böckstiegel ed., Köln, 1985).

11. Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, October 10, 1963 [1963] 14 U.S.T. 1313, T.I.A.S. No. 5433, 480 U.N.T.D. 43 [hereinafter NTB 1963].

12. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, was signed on January 27, 1967 and entered into force October 10, 1967, [1967] 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205 [hereinafter OST 1967].

13. Agreement on the Rescue of Astronauts, and the Return of Objects Launched Into Outer Space, April 22, 1968, 19 U.S.T. 7570, T.I.A.S. No. 6599, 672 U.N.T.S. 119 [hereinafter Astronauts/Objects 1968].

14. Convention on International Liability for Damage Caused by Space Objects, March 29, 1972, 24 U.S.T. 2389, T.I.A.S. No. 7762 (effective Oct. 9, 1973) [hereinafter Liability 1973].

15. Convention on Registration of Objects Launched into Outer Space, was opened for signature on January 14, 1975, 28 U.S.T. 695, T.I.A.S. No. 8480 (effective Sept. 15, 1976) [hereinafter Registration 1976].

Bodies, July 11, 1984.[16]

Existing law that already applies to a space station will be reviewed according to major subjects in the first five treaties. The reason for this method is that each treaty repeats some provisions from previous treaties, a practice which is valuable in constructing a consistent and harmonious body of space law, but the repetition is not necessary when analyzing the manner in which each treaty develops major subjects.

The Moon Agreement will be evaluated separately, however, for several reasons: (1) only five States ratified it between 1979 and 1984 (Chile, Philippines, The Netherlands, Uruguay and Austria; (2) the Agreement has not been ratified by the United States and most nations considering participation in the projected space station; neither has it been ratified by the Soviet Union which has a space station program; (3) controversial provisions, and the lack of urgency in creating the conditions it is designed to regulate, indicate that any evaluation must give attention to a different time frame from that of the preceding space treaties. Nevertheless, there are provisions in the Moon Agreement which reveal new aspects of international space law which should be taken into account in any planning for future activities involving the Moon and other celestial bodies.

Space Treaty Provisions from 1963 to 1976

Provisions in the first five space treaties already applicable to space stations are grouped for analysis according to the following categories.

General Objectives: Exploration and use of outer space, the Moon and other celestial bodies shall be carried out for the benefit and interests of all countries and shall be the "province of all mankind." It should be noted that "the province of all mankind" is a different concept from that of "the common heritage of all mankind" which appears later in the Moon Agreement. "Province" refers to the place where space activities occur and does not imply inheritance or heritage. There shall be freedom of scientific investigation, no discrimination, encouragement of international cooperation, and activities must be conducted in accordance with international law, including the United Nations Charter.[17] "Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[18] Although nations cannot use a space

16. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, U.N. Doc. A/34/20 (1979) [hereinafter Moon 1984]. *See also* E. GALLOWAY, AGREEMENT GOVERNING THE ACTIVITIES OF STATES ON THE MOON AND OTHER CELESTIAL BODIES, SENATE COMM. ON COMMERCE, SCIENCE AND TRANSPORTATION, 96th Cong. 2nd Sess. (Comm. Print. 1980); C. CHRISTOL, THE MODERN INTERNATIONAL LAW OF OUTER SPACE 932 (1982).

17. OST 1967, Art. III.

18. *Id.* at Art. II.

station to make claims of sovereignty, nevertheless they have jurisdiction and control over their space objects according to provisions governing the launching authority and space objects.

Launching Authority: Each State that launches or procures the launching of an object into outer space, including the moon and other celestial bodies, and each State from whose territory or facility an object is launched, is internationally liable for damage caused by such object or its component parts on the Earth, in air space or in outer space.[19] For purposes of the agreement concluded the following year, the term "launching authority" refers to the State responsible for launching, or under certain circumstances the international intergovernmental organization.[20] By 1973, agreement had been reached on the Liability Convention and for its purposes "launching" includes attempted launching, and "launching State" means "a State which launches or procures the launching of a space object; and "a State from whose territory or facility a space object is launched."[21] These definitions were necessary in order to establish responsibility for damage which is defined as "loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations." The launching authority must also be notified of emergencies so that rapid assistance can be given.[22]

If two or more States launch a space object, they are jointly and severally liable for any damage. These provisions apply to "any international intergovernmental organization" and the involved States must jointly determine which one shall register the object launched.[23]

In identifying problems of jurisdiction and control for a space station, it must be noted that the station is a facility and is not an international organization. Objects could be launched to the Moon and into deep space from the space station facility. A new international agreement on the space station should clarify the definition of a "launching authority" and specify equitable arrangements for responsibility and liability for damage, particularly if a number of nations are engaged on a permanent basis. Are the rules that apply for launching an object from the Earth to be identical with those for launching by international partners from an earth-orbiting facility? The question of defining launching authority for different purposes is related to provisions concerning objects launched into outer space.

Objects Launched into Outer Space: Objects launched into outer space, also referred to as space objects, are subject to prohibited and permitted func-

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19. *Id.* at Art. VII.

20. Astronauts/Objects 1968, Art. 6.

21. Liability 1973, Art. I.

22. Astronauts/Objects 1968, Arts. 1,2,3; Liability 1973, Art. III.

23. Liability 1973, Art. V; Registration 1975, Art. II.

tions. States are prohibited from sending into Earth orbit "any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install[ing] such weapons on celestial bodies, or station[ing] such weapons in outer space in any other manner."[24] States are internationally liable for launched objects under certain conditions.[25] A significant provision to keep in mind when planning a space station is that a State that registers a space object retains jurisdiction and control over it and any personnel in the object. "Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth."[26] Such objects or component parts are to be returned to the State of registry which is required, if requested, to identify the objects prior to their return.[27]

When considered in connection with a space station, these provisions raise questions of jurisdiction and control, ownership and registration. This situation is emphasized when additional provisions concerning space objects are found to be applicable to a space station. Article 5 of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space has detailed procedures concerning the discovery, return, and expenses involved with returning space objects and their component parts.[28]

The Liability Convention, for its purposes, has a definition: "The term 'space object' includes component parts of a space object as well as its launch vehicle and parts thereof."[29] Furthermore, Article III provides that "in the event of damage being caused elsewhere than on the surface of the earth to a space object of one launching State or to persons or property on board such a space object by a space object of another launching State, the latter shall be liable only if the damage is due to its fault or the fault of persons for whom it is responsible." If a space object and component parts return from outer space, the launching authority must inform the United Nations Secretary General.[30]

In order to analyze the full impact of space treaty provisions relevant to a space station, it is necessary to clarify provisions applicable to the launching authority and space objects.

Registration of Space Objects: The first reference to registration is in the

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24. OST 1967, Art. IV § 1.

25. *Id.* at Art. VII.

26. *Id.* at Art. VIII.

27. *Id.*

28. *See supra* note 11.

29. Liability 1973, Art. 1.

30. Astronauts/Objects 1968, Art. 5.

1967 Outer Space Treaty which provides that a State that registers an object launched into outer space "shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body."[31] When the Convention on Registration of Objects Launched into Outer Space went into force in 1976, more specific procedures were provided for a central register of objects launched into outer space established and maintained, on a mandatory basis, by the Secretary General of the United Nations.[32] Definitions for purposes of this convention are: "The term 'space object' includes component parts of a space object as well as its launch vehicle and parts thereof;" "The term 'State of registry' means a launching State on whose registry a space object is carried in accordance with Article II.[33] Article II is particularly relevant to an international space station. After providing for registration with the UN Secretary General, paragraph 2 continues:

> Where there are two or more launching States in respect of any such space object, they shall jointly determine which one of them shall register the object in accordance with paragraph 1 of this article, bearing in mind the provisions of article VIII of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, and without prejudice to appropriate agreements concluded or to be concluded among the launching States on jurisdiction and control over the space objects and over any personnel thereof.

Paragraph 3 provides:

> The contents of each registry and the conditions under which it is maintained shall be determined by the State of registry concerned.

This Convention also applies to an international intergovernmental organization if it conducts space activities and declares its acceptance of the rights and obligations required, and a majority of States in the organization are also parties to this Convention and the 1967 Outer Space Treaty.

Although definitions are given separately to achieve the purposes of each treaty, they are consistent and form one body of space law to which all the nations currently interested in a space station have made a commitment. The extent to which existing provisions are satisfactory and adequate for application to an international space station must be determined. It is obvious that the main problem involves jurisdiction and control over space objects and their component parts.

It will be necessary to define "component parts" of a space station because hitherto this term has meant parts of a single spacecraft, whereas the space

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31. OST 1967, Art. VIII.

32. Registration 1976, Art. III.

33. *Id.* at Art. 1(b),(c).

station is a cluster of objects, each one of which might be considered a component part of the total cluster; thus we could have two interpretations of "component parts."

Similarly, it will undoubtedly be found necessary to define "launching authority" for purposes of the space station because existing law gives responsibility to the State that launches or from whose territory the launch takes place. Such responsibility provides a basis for ownership and for liability for damage and would not be equitable if a group of nations is jointly engaged in establishing and operating a manned and unmanned space station on a continuous basis.

All the provisions for registration and dissemination of information by the UN Secretary General will require analysis for their impact on management of a space station. Such an evaluation could be undertaken in preparation for the mandatory review of the Convention by the United Nations General Assembly in 1986 "in order to consider in the light of past application of the Convention, whether it requires revision."[34] A separate international agreement among participating partners, each of whom is probably a party to the space treaties, would need to take into account the provisions of the Registration Convention to avoid conflicting rights and obligations in international space law.

Relation of National and International Activities: States are internationally responsible for national space activities whether carried on by the government or by non-governmental entities and must assure that these activities are in conformity with the Outer Space Treaty. "Authorization and continuing supervision" by States Parties are required for space activities of governmental and nongovernmental entities. An international organization must comply with the 1967 Outer Space Treaty, the responsibility also being borne by States Parties to the Treaty participating in the organization.[35] The national registry kept by space-launching States is also a factor in relating national and international space activities.

Such criteria must be studied to avoid difficulties in any international space venture. Continuing supervision by one State might differ substantially from that of another State, particularly in the treatment of personnel from different nations.

There is also a question of whether it is realistic to include a national "launch vehicle and parts thereof" as part of the definition of a space object.[36] Presumably when this provision was formulated, the assumption was that the launch vehicle was located on the Earth, but a different calculation may be necessary when a launch vehicle and its parts are located on a space station.

Nuclear Test Ban: States that have become parties to the Nuclear Test Ban Treaty undertake to prohibit, prevent, and not carry out any nuclear weapon test explosions or any other nuclear explosion under their jurisdiction

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34. *Id.* at Art. X.

35. OST 1967, Art. VI.

36. Registration 1976, Art. I(b).

and control in the atmosphere, beyond its limits, including outer space, or underwater, including territorial waters or high seas.[37] All the nations usually mentioned as possible participants in a future space station are parties to this treaty, except France. All the missions of the proposed space station would be for peaceful purposes and consequently would be governed by the provisions of this treaty.

Weapons and Military Roles: A space station would be subject to Article IV of the Outer Space Treaty and could not be used "to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner."[38] Furthermore, the moon and other celestial bodies must be used "exclusively for peaceful purposes." The space station could not be used to establish on the Moon and other celestial bodies any military bases, installations and fortifications or to test any type of weapons or for the conduct of military maneuvers. Military personnel could be used for scientific research or other types of peaceful purpose. Any equipment or facility necessary for peaceful exploration of the moon and other celestial bodies is not prohibited.

Harmful Interference: Harmful contamination and adverse changes in the Earth's environment from extraterrestrial matter must be avoided. Suspicion of potentially harmful interference with other States' peaceful exploration and use of outer space, the moon and other celestial bodies shall be subject to appropriate international consultations.[39] Interference with normal relations is also to be avoided when arrangements are made for visits by other States.[40] Arrangements can be made by other States to observe the flights of space objects.[41] Different types of harmful interference could be defined in planning for smooth operations of a space station.

Role of the United Nations Secretary General: As space treaties have increased their coverage of activities, the role of the UN Secretary General has been expanded. Requirements have been created for reporting information which can be disseminated widely on such subjects as phenomena that might endanger life and health of astronauts; the nature of space activities; emergencies arising from unintended landings; maintenance of a national register; objects no longer in earth orbit; and identification markings on space objects. A space station would be required to comply with these provisions.

Moon Agreement: Although only five nations have ratified the Moon Agreement, it went into force with the fifth ratification by Austria on July 11,

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37. NTB 1963, Art. I.

38. OST 1967, Art. IV, § 1.

39. *Id.* at Art IX.

40. *Id.* at Art. XII.

41. *Id.* at Art. X.

1984. In ten years, this Agreement will automatically be placed on the agenda of the United Nations General Assembly to review and determine whether experience indicates revision is advisable. This review will take place in 1994 shortly after the date forecast for the operational space station.

Article I is relevant to space station planning because it provides that the Agreement's provisions apply to the Moon and other celestial bodies within the solar system—other than the Earth—"except in so far as specific legal norms enter into force with respect to any of these celestial bodies."[42] In working out a specific legal norm for the space station, which may involve future activities concerning the Moon and other celestial bodies, it will be necessary to analyze the Moon Agreement to determine the applicability and acceptability of its provisions, and the extent to which new legal norms may be required for the space station.

Expanding from Article IV of the 1967 Outer Space Treaty, this Agreement emphasizes that the Moon shall be used "exclusively for peaceful purposes."[43] Many of the details of the Agreement correspond to guiding principles already established in the Outer Space Treaty, but Article II adds new features which must be analyzed for their probable consequences. The Moon and its natural resources are declared to be "the common heritage of mankind", finding its expression in this Agreement. The concept of the common heritage of mankind should not be confused with the "province of all mankind" as used in the 1967 Outer Space Treaty where it is understood to mean only the location where space activities occur.

The States that have ratified the Agreement "undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible."[44] The main purposes of the international regime include orderly and safe development of natural resources, rational management, expansion of opportunities to use the resources and "an equitable sharing by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the moon, shall be given special consideration."[45]

It seems unlikely that the five nations that first ratified this Agreement (Chile, Phillippines, Netherlands, Uruguay and Austria) would develop space technology sufficiently to achieve feasibility in exploiting the natural resources of the Moon. Of course, additional States may become parties to this Agreement during the next eight to ten years. Still, it is likely that nations operating a space station would be first in achieving the capacity to engage in activities

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42. Moon 1984, Art. 1.

43. *Id.* at Art. 3.

44. *Id.* at Art. 11.

45. *Id.*

on the Moon and other celestial bodies. However, they are apt to have more reasons for their peaceful activities than that of the limited purpose of exploitation of natural resources. They might emphasize international cooperation in exploration of the Moon and deep space beyond. However, asteroids are celestial bodies and there could be plans for using their mineral resources by means of a space station. Should "celestial bodies" other than the Moon be considered for a separate legal status? The States parties to the Moon Agreement might establish an international regime, but if the nations cooperating in the management of a permanent space station were not parties to that regime, the result could be confusion rather than benefits to mankind.

The best procedure in this situation is for nations participating in a space station to work out an agreement tailored to meet all their requirements and with due regard for the general principles to which they are already committed by space law. The possibility of such a "specific legal norm" was foreseen and exempted in the Moon Agreement.

Allocation of the radio spectrum is not dealt with in the space treaties and for this indispensable element in outer space activities it is necessary to explain the role of the International Telecommunication Union (ITU).

International Telecommunication Convention and Radio Regulations[46]

The ITU Convention, adopted in 1947 to ensure order in use of the radio spectrum and its frequency bands, has treaty status, and its radio regulations (including the table of frequency allocations) are legally binding upon States. Almost all nations of the world are parties to this Convention, whose rules and regulations protect them from harmful interference with communications. With the advent of the space age, the ITU expanded its regulations to include satellite services. Dr. Abderrazak Berrada, a member of the ITU's International Frequency Registration Board (IFRB), summarized the satellite situation when he stated that, "Whether active or passive, manned or not, destined to return to earth or not, every satellite needs radiocommunications to perform one or more of the following functions:

> transmission and reception by the launch vehicle, the positioning vehicle or the satellite itself of signals for telecommand (to give instructions to the vehicle or satellite), telemetry (to collect measurements made aboard the vehicle or satellite) and tracking (reception of a signal emitted by the vehicle or satellite to indicate its position);
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> reception by the satellite of data emitted by an earth station or any

46. *See* ITU, GENERAL SECRETARIAL, INTERNATIONAL TELECOMMUNICATION CONVENTION, NAIROBI 1982 (Geneva 1982); ITU TWENTY-THIRD REPORT BY THE INTERNATIONAL TELECOMMUNICATION UNION ON TELECOMMUNICATION AND THE PEACEFUL USES OF OUTER SPACE, Booklet No. 32, 1984; International Telecommunications Convention, Malaga-Torremolinos, October 25, 1973, 28 U.S.T. 2495, T.I.A.S. No. 8572 (with annexes and protocols).

> other object in space for possible processing before retransmission to an earth station or any other object in space;
>
> communications with a manned satellite during launch operation and return to earth;
>
> collection of data on natural radioelectric phenomena on earth or at any other point in the universe.[47]

Since all space activities depend upon radiocommunications, particularly important when using the geostationary orbit, it is essential that plans for a space station include careful attention to ITU regulations. From voluminous technical provisions, only a few major points can be selected for attention here, but they should be sufficient to indicate the overriding importance of this particular convention.

A space station is defined as "a station located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth's atmosphere."[48]

An earth station is one "located either on the Earth's surface or within the major portion of the Earth's atmosphere intended for communication with one or more space stations; or with one or more stations of the same kind by means of one or more passive satellites or other objects in space."[49]

A Space system is "any group of co-operating earth and/or space stations employing space radiocommunication for specific purposes."[50]

A satellite system is defined as "a space system using one or more artificial earth satellites."[51] Special regulations govern coordinating procedures between a space station in the broadcasting satellite service and terrestrial stations.

Regulations for space communications have been revised to take account of changing conditions and advances in space technology in 1959, 1963, 1971, 1973, 1977, 1979, 1982 and 1983. Concern has been with the "rational use of the radio frequency spectrum and the geostationary orbit." In 1979, the ITU's World Administrative Radio Conference (WARC) adopted Resolution 2, providing:

> since all countries have equal rights in the use, both of the radio frequencies allocated to various space radio communication services and of the geostationary satellite orbit for those services, the registration with the IFRB of frequency assignments for space radio-communica-

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47. A. Berrada, *Space and Radio Communications,* MAINTAINING OUTER SPACE FOR PEACEFUL USES 163, 165 (N.Jasentuliyana ed. 1984).

48. ITU Radio Reg., 21A, Spa. 2.

49. *Id.* at 21B, Spa. 2.

50. *Id.* at 84F, Spa. 2.

51. *Id.* at 84AFA, Spa. 2.

> tion services and their *use should not confer any permanent priority on any individual country or group of countries and should not create an obstacle to the establishment of space systems by other countries.*[52]

When the ITU held its Plenipotentiary Conference in Nairobi in 1982, Article 33 of the Convention was revised and entered into force on January 1, 1984:

> In using frequency bands for space radio services Members shall bear in mind that *radio frequencies and the geostationary satellite orbit are limited natural resources* and that they must be used efficiently and economically in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to both, taking into account the special needs of the developing countries and the geographical situation of particular countries.[53]

WARC held a conference in Geneva in 1985 and will hold another in 1988 on Use of the Geostationary Orbit and the Planning of the Space Services Utilizing It.

Article 35 of the Convention is noteworthy for space station planners:

> All stations, whatever their purpose, must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other Members or of recognized private operating agencies, or of other duly authorized operating agencies which carry on radio service, and which operate in accordance with the provisions of the Radio Regulations.

Considering the fact that the nations participating in a space station are also legally bound by treaty commitments to the ITU Convention, it is apparent that the legal document establishing commitments of parties to the space station must take into consideration existing ITU regulations. The nations should also be aware of possible changes and new regulations resulting from the 1985 and 1988 WARC conferences. Questions likely to arise are:

1. Should the definition of the space station be identical with that adopted by the ITU? If not, in what ways should it be altered and how will the relationship with ITU be defined?

2. Is "space station" a popular rather than a legal term and, if so, would it be preferable to use the ITU definition for a "space system"?

3. What frequencies will be used by the space station: frequencies of one

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52. ITU, NINETEENTH REPORT BY THE INTERNATIONAL TELLECOMMUNICATION UNION ON TELECOMMUNICATION AND THE PEACEFUL USES OF OUTER SPACE, Booklet No. 27, 1980 (emphasis added).

53. ITU, GENERAL SECRETARIAT, INTERNATIONAL TELECOMMUNICATIONS CONVENTION, NAIROBI 1982, 23 § 154 (Geneva, 1982) (emphasis added).

nation, several nations, international, experimental or operational?

4. Space station procedures will undoubtedly conform to ITU regulations for preventing harmful interference with communications of other nations, but how will the station be represented if harmful interference is intentionally inflicted upon the space station and its activities?

International Intergovernmental Space Organizations Established Outside the United Nations

Although the space station would not be established by the participants as an international organization, some valuable lessons may be learned from an analysis of relevant provisions in multilateral agreements establishing such organizations as the International Telecommunications Satellite Organization (INTELSAT), the Convention on the International Maritime Satellite Organization (INMARSAT), and the Convention for the Establishment of a European Space Agency (ESA). The main point to note is that general guiding principles for international space cooperation by governments were formulated within the United Nations, primarily by the Committee on the Peaceful Uses of Outer Space and its Legal Subcommittee. When planning the management and operation of technical space facilities which combined governmental and private sector functions, including commercial activities, it became necessary to provide for jurisdiction and control outside the United Nations. A space station would require management and operation of a highly technical facility to accomplish missions, and in this respect has aspects comparable to those carried on by INTELSAT, INMARSAT, and ESA.

INTELSAT: Following interim arrangements for operating international satellite communications, the INTELSAT agreement entered into force on February 12, 1973.[54] Although it was formulated outside the United Nations to operate technical services, INTELSAT recognized some general UN principles by subscribing to General Assembly Resolution 1721 (XVI) calling for the availability of satellite communications to all nations as soon as practicable on a global and nondiscriminatory basis; and including in its preamble a reference to the 1967 Outer Space Treaty, particularly Article I which states that "outer space shall be used for the benefit and in the interests of all countries."

INTELSAT's significant contribution to management and operation of satellite communications involving 110 member States is the division of responsibility and management into two documents: the Agreement with Annexes and the Operating Agreement. This procedure permits the separation of general principles and structural elements from the management of space communications technology. These two functions are apt to require different types of representation and professional expertise. The structure of INTELSAT is established in four categories: Assembly of Parties, Meeting of Signatories,

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54. International Telecommunications Satellite Organization (INTELSAT). Agreement with Annexes, and Operating Agreement, February 12, 1973, 23 U.S.T. 3815, T.I.A.S. No. 7532.

Board of Governors, and an Executive Organ headed by a Director General. Their duties are naturally different from those of personnel handling the day-to-day operation of space and ground segments of the INTELSAT system.

The practice of dividing two kinds of management into separate legal documents has proved its effectiveness in integrating political and economic elements with scientific and technical factors. The method is worth considering even though the details for a space station would be different from those of an organization such as INTELSAT. The Operating Agreement for INTELSAT, for example, provides that the organization shall be the owner of the INTELSAT segment and all other acquired property; that INTELSAT can acquire certain rights in inventions and technical information and that investment shares are equal to the percentage of all use of the INTELSAT space segment by all its Signatories. Such details conform to INTELSAT's needs for successful operation of a global communications satellite system.

In working out requirements for a space station which plans some missions in space communications, it will be necessary to define relationships with INTELSAT, the ITU, and the United Nations,[55] because all the nations likely to participate in a space station are already parties to these multilateral conventions.

INMARSAT: The Convention on the International Maritime Satellite Organization (INMARSAT) and the Operating Agreement were signed in London on September 3, 1976, and entered into force on July 16, 1979.[56] There were 28 States Parties as of August 27, 1984.

INMARSAT is based on the recognition that world trade is highly dependent upon ships, that distress and safety systems require improvement, and that the most advanced suitable space technology should be made available for efficient, economic facilities "consistent with the most efficient and equitable use of the radio frequency spectrum and of satellite orbits." Following the model of INTELSAT, this organization accepted UN General Assembly Resolution 1721 (XVII) which provides that "communication by means of satellites should be available to the nations of the world as soon as practicable on a global and non-discriminatory basis." The relevant provisions in the 1967 Outer Space Treaty are also accepted, especially Article 1 which provides that "outer space shall be used for the benefit and in the interests of all countries."

Article 27 provides that INMARSAT shall cooperate with the United Na-

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55. Jasentuliyana, *Space Telecommunications: Issues and Policies: Role of the United Nations,* PROCEEDINGS OF THE 26TH COLLOQUIUM ON THE LAW OF OUTER SPACE 59-62 (1984). *See* Gorbiel, *Orbiting Inhabited Space Station: Selected International Legal Aspects,* 7 HASTINGS INT'L & COMP. L. REV. 509-19 (1984); Address by Delbert D. Smith, *International Legal Issues,* paper delivered at Conference on Space Technology and Opportunity in Geneva (May 28, 1985).

56. Convention on the International Maritime Satellite Organization (INMARSAT) and Operating Agreement, MARSAT, IMCO document CONF 35, September, 1976, 15 I.L.M. 1052 (1976), and IMCO Doc. 29, February 28, 1976, 15 I.L.M. 233 (1976).

tions, its bodies that deal with the peaceful uses of outer space and ocean areas, and specialized agencies. Relevant resolutions, recommendations and procedures of ITU organs are to be observed in "the design, development, construction and establishment of the INMARSAT space segment and in the procedures established for regulating the operation of the INMARSAT space segment and of earth stations. . ."[57] Cooperation is also prescribed with other international organizations on matters of common interest.

The activities of INMARSAT must be consistent with its Convention and the purposes and principles of the UN Charter, as well as any other treaty to which INMARSAT becomes bound. The depositary for the Convention is the Secretary General of the International Consultative Maritime Organization (IMCO). It is evident that the relationship between INMARSAT and the United Nations is closer than that between INTELSAT and the UN, thus affording another model of international relationships planned for specific purposes.

The management structure of INMARSAT is composed of an Assembly, Council, and Directorate headed by a Director General. Among the provisions that might be of significance to space station planning are the following: (1) applicable domestic law governs relations between the State and its designated entity which is termed a "signatory"; (2) financial interest is in proportion to investment share as determined by the Operating Agreement; (3) INMARSAT may own or lease the space segment; (4) access to the INMARSAT space segment is open for use by ships of all nations; (5) procedures shall ensure technical compatibility and avoidance of economic harm; (6) decisions should be unanimous but, if not, then other methods are provided; (7) detailed provisions have been worked out for procurement, contracts, charges for use, and rights in inventions and technical information, liability, privileges and immunities.[58] The separate Operating Agreement goes into greater detail concerning these and other activities necessary for the management of INMARSAT.

There are not many definitions as such, but the INMARSAT Convention expresses agreement on some definitions of relevance to conducting space activities. These activities are similar to those that might be undertaken by use of a space station. Under Article 1 of the Convention:

> (d) "Space segment" means the satellites, and the tracking, telemetry, command control, monitoring and related facilities and equipment required to support the operation of these satellites.
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> (e) "INMARSAT space segment" means the space segment owned or leased by INMARSAT.
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> (f) "Ship" means a vessel of any type operating in the marine envi-

57. *Id.* at Art. 27.

58. Böckstiegel, *The Law Applicable to Contracts on Space Activities*, PROCEEDINGS OF THE 25TH COLLOQUIUM ON THE LAW OF OUTER SPACE 20309 (1983).

ronment. It includes, inter alia, hydrofoil boats, air-cushion vehicles, submersibles, floating craft and platforms not permanently moored.

(g) "Property" means anything that can be the subject of a right of ownership including contractual rights.

Memoranda of Understanding Between NASA, ESA, Canada and Japan

A bilateral memorandum of understanding is required between States undertaking to cooperate on the space station because each State has unique capabilities to contribute to engineering and management requirements, and each State and international organization has different laws governing its relations with other States as well as with its own citizens. After political and economic commitments have been made, firm agreements must be concluded on institutional responsibilities, management procedures, development schedules, and numerous other details involved in the process of constructing a space station.

The space station memoranda of understanding cover the Phase B parallel detailed definition and preliminary design studies which are to take place over a period of twenty-one months from April 1985 to January 1987. The development of Phase C/D is scheduled to start in April 1987 with the space station entering the Initial Operating Capability (IOC) early in the 1990's.

The Memorandum of Understanding between NASA and the European Space Agency, June 3, 1985, is an agreement on Phase B and leads "toward further cooperation in the development, operation and utilization of a permanently manned space station." Recalling the successful SPACELAB program and early involvement in defining and studying the space station, ESA agreed to undertake the Columbus Preparatory Program, including potential cooperation as a partner in the space station system. In order that work by NASA and ESA can proceed with "timely harmonized decisions", the management, technical and operational interfaces necessary for coordination are worked out in the greatest detail. NASA and ESA identified subjects for cooperation following Phase B, including (1) responsibilities of each nation for the design, development, operation and use of the space station with "European responsibility for one or several identifiable element(s) of the system"; (2) principles that would govern equitable and nondiscriminatory access and use; (3) pricing; (4) equitable shared costs; (5) protection of intellectual property rights including commercial users; (6) appropriate technology transfer; (7) barter to offset costs; (8) European participation; and (9) legal commitments including registration of space station system elements.

ESA activities during the Phase B period will be concerned with such items as the pressurized module, payload carriers, resource modules, service vehicle, ground facilities and the data transmission system. The respective responsibilities of NASA and ESA are identified for management, reviews, liaison, use and operations, data exchange/rights, and financial arrangements. The

agreement concerning proprietary rights is of special significance:

> In the event the Parties determine that it is necessary to exchange data which is considered by the originating Party or its contractor to be proprietary and/or which is technical data subject to the licensing requirements set forth in any applicable national laws and regulations, the Parties agree to consult promptly and provide in a timely manner for appropriate protective conditions for its exchange and use within this cooperative program. Both Parties recognize the importance of exercising appropriate precautions to protect each other's proprietary information and to protect against dissemination of dual use technology from the Space Station system program.(Sec. 9.2.)

An inter-party waiver of liability was also entered into. Any disputes can be settled by the respective managers of the space station system, and if not, then by the NASA Administrator and ESA Director General.

The Memorandum of Understanding between NASA and the Canadian Ministry of State for Science and Technology (MOSST), April 16, 1985, recalls the successful cooperation in the U.S. Space Transportation System by means of the Canadian Remote Manipulator System and the Canadian Astronaut Program, among other joint endeavors, and expresses the interest of Canada in cooperating as an integral partner on the space station program in the Initial Operating Capability (IOC) stage.

The description of the program and scheduling are similar in the MOU's, but each is tailor-made in identifying specific tasks. There is provision, for example, for NASA and Canada to update their reference configurations, and for NASA to "establish a computer data system to be accessed by a compatible Canadian computer data link for the purpose of exchanging information under this MOU." The institutions designated to carry on cooperative efforts during Phase B have been given definite procedures by which coordination needed for all purposes can be worked out during the process of cooperation. These purposes include management, review, liaison, use and operations, the advanced development program, data exchange and rights, financial arrangements, information that might be released to the public, liability, customs clearance and visas, settlement of differences and any necessary modification of the MOU.

The Memorandum of Understanding between NASA and the Science and Technology Agency of Japan (STA), May 9, 1985, is for "the Cooperative Program Concerning Detailed Definition and Preliminary Design Activities of a Permanently Manned Space Station" and refers to the successful mission analysis and preliminary definition activities in which both NASA and STA cooperated for two years prior to the MOU. These studies were carried out on the basis of a previous agreement for cooperation signed on May 1, 1980.[59] The basic principles for cooperation include "involvement in the development, operation and utilization of the Space Station, access to and utilization of the

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59. Agreement on Cooperation in Research and Development in Science and Technology, 32 U.S.T. 1123 T.I.A.S. No. 9760 (entered into force May 1, 1980).

Space Station; and development and procedures to provide access to, and suitable protection for, technology and information." Agreement was reached on the manner in which Japan would deal with the technical and functional aspects of the experiment module, and thereafter Japan's option to maintain participation in the space station's initial operating capability.

The main elements in the ESA and Canadian agreements with NASA are also in the Japanese agreement, but there are additions which illustrate once again the necessity for bilateral agreements. For example, NASA has agreed to "make best efforts to accommodate STA's proposed requirements and flight schedules" for use of the space shuttle, spacelab or other facility, on a reimburseable basis, to support development of its space station use plan.

Another example is STA's inability, under Japanese law, to waive its right to make an administrative claim against NASA for damage to or loss of its own or its contractors' or subcontractors' property, and for other purposes. However, STA has agreed that it will not involve its own property in cooperative efforts under this MOU, and to take appropriate measures to protect NASA and NASA's Phase B contractors and subcontractors from liability or other claims for damage.

Conclusions

The planned space station has unique technical characteristics which distinguish it from past international space programs, and agreements for its establishment must take these features into account as well as existing applicable space law. To attain continuous operational efficiency, it will be necessary to make management adjustments to an unusual combination of factors: scientific research and commercial applications; governmental and nongovernmental operational activities; national and international concerns with problems of cooperation and competition; centralization and decentralization in handling problems of jurisdiction and control; criteria for selecting and managing personnel and missions; conditions for equitable access by other nations; existing commitments to international law and agreement on definitions for the future; adjustment to other relevant international organizations (including the United Nations) and relating national law to international cooperation, especially in situations involving taxation, contracts, procurement, liability for damage, and settlement of disputes.

Basically, there must be a clear conception of what the engineers call the architecture of a space station which is designed to be manned and unmanned, to consist of a cluster of units (some attached and others free flying), and to operate in low Earth orbit on a permanent basis. Furthermore, the station will require space communications involving allocation of the radio spectrum in order to perform all missions. The station will have the capability of launching objects into other orbits including the geostationary orbit, to the Moon and other celestial bodies, and into deep space. It will be essential to have a dependable operational transportation system between Earth and space. This enterprise will be expensive, require the support of public opinion, and take some years for construction.

The scope of the enterprise must be defined. Even if every goal cannot be reached for many years, thinking and planning should not stop short at the end of each phase of technical development. Plans for using the geostationary orbit, for example, must be based on awareness of international and legal problems that have already emerged and are currently under discussion. Consideration must be given to the ways in which space station planning may be affected by the results of the 1985 and 1988 World Administrative Radio Conference (WARC).

If there are different plans for using asteroids from those foreseen for the Moon, then agreement should be reached on basic principles for realistic separation of "other celestial bodies" from the Moon. Any agreement on uses of the Moon must take account of existing relevant space law to which all prospective participants in the space station are already committed. Problems involving use of the Moon will not go away simply because some nations are not parties to the Moon Agreement, especially considering that they are already committed to Article IV of the 1967 Outer Space Treaty. Any scientific and engineering plan to build a space colony should include a legal analysis to fit foreseen circumstances. Every part of the entire scope of this project should be thought through even though some developments may not be reached until some time in the next century. The engineering calculation of adding modules over a period of time should be matched with legal provisions required for anticipated problems of jurisdiction and control. The space station will be a multidisciplinary effort with interacting elements. Foresight is needed to determine all the ways in which the Moon might be used; it is not merely a place for exploiting natural resources but a location for exploration where many beneficial activities could be undertaken to increase knowledge of the Universe.

Very little analysis has been made of celestial bodies other than the Moon; usually these objects have been included with provisions regulating use of the Moon and yet some are so different that it seems unlikely that all permitted and prohibited activities on the Moon could apply equally to Mars, asteroids, Jupiter and the Sun. Scientists and engineers should distinguish between these celestial bodies and explain plans and purposes for exploration and how the space station might become involved. There has been a tendency in the United Nations to discuss economic uses of the Moon to the neglect of exploration, two objectives that should be brought into better balance.

The space station is a new tool to use in pursuing many of the space applications that have developed during the past 28 years. The documents establishing international cooperation will necessarily be between the States concerned, formulated outside the United Nations but consistent with the general principles of established space law.

In figuring out the relationship between the space station and the United Nations, a distinction must be made between the UN General Assembly and the UN specialized agencies. The General Assembly, which may be compared to a legislative body, created the Committee on the Peaceful Uses of Outer Space (COPUOS) which has a Scientific and Technical Subcommittee as well as a Legal Subcommittee (assisted by the U.N. Office of Legal Affairs). The Outer Space Affairs Division serves as the secretariat for COPUOS which now

has members representing 53 nations. The general guiding principles of the space treaties were negotiated by consensus, a procedure which was effective in formulating the 1967 Outer Space Treaty and four additional agreements. It is not the kind of structure, however, which operates technical space facilities developed for services such as communications, navigation, and meteorology.

When such benefits became feasible by using satellites, they were organized for technical operation outside the United Nations framework, creating structural patterns specifically designed for efficient management, *e.g.*, INTELSAT, INMARSAT, and ESA. Their charters adhered to general guiding principles already established in space treaties, but added practical solutions to problems arising from the combination of governmental and private sector commercial activities: equitable representation, voting procedures, cost sharing, contracts, procurement, liability for damage, and settlement of disputes. By separating the operation of technical facilities from the UN General Assembly complex, it has been possible to avoid the kinds of legal discussion which developed in recent years in COPUOS' Legal Subcommittee on using the space environment for remote sensing, nuclear power sources, direct broadcast satellites and attempts to determine where outer space begins without adequate attention to the international aviation community on where airspace ends. Operational imperatives demanded establishment of specific organizational structures that could employ technical experts needed to handle complicated space hardware. These bodies have some basic interests in common with the UN specialized agencies, *e.g.*, with the ITU for communications, with the International Maritime Consultative Organization (IMCO) for navigation, and with the World Meteorological Organization (WMO) for weather observation.

The role of the UN Secretary General is a separate point. His responsibilities for outer space activities are largely in the form of receiving and disseminating information which is deemed to be of worldwide interest. He is not asked to manage and operate a technical space facility.

Although a fairly consistent and harmonious foundation of international space law and practice for peaceful purposes has been created and complied with during the first quarter century of the space age, it will be more difficult to maintain this situation in the future unless international agreement is reached on definitions which are universally understood. As time goes on, space applications will increase and diversify, and more people will enter these activities with the risk of not knowing basic concepts embodied in the foundation of law and experience. Even now there is need for clarifying definitions so that the same words do not have different meanings and thus create unnecessary difficulties. This comment has particular relevance to the space station, and agreements governing its management will make a contribution to the orderly progress of space exploration and use in defining guidelines for the conduct of space activities.

All the elements which make up the pattern of jurisdiction and control need to be examined in order to establish commonality of agreement on definitions. Those analyzed in this paper are: launching authority, objects launched into outer space, space objects, registration of space objects, component parts, relation of national space law to international space law, peaceful purposes,

weapons and the military role, harmful interference, exploration and use of the Moon, defining "other celestial bodies" separately from the Moon, relation to the United Nations Secretary General, relation to relevant United Nations specialized agencies (especially the International Telecommunication Union), and relation to other relevant international organizations.

It is recommended that all information required to solve problems of definition in an orderly manner, for the present and future, should be programmed into a computer so that we can examine basic space law and regulations to which most nations are already committed; membership lists of relevant treaties, agreements, conventions, etc., to which States are Parties; definitions of terms already adopted in multilateral conventions to determine whether there are any conflicts and whether a common term can be found to define such elements as space system, space station, ground station, launching authority, component parts, etc. Orderly progress cannot be expected if there are an increasing number of treaties for different subjects with a provision that the terms used in each are solely applicable to that particular document. The result of such a practice can only be an accumulation of identical words with different meanings.

Once all required information is in place for analysis of the multidisciplinary tasks confronting scientists, engineers, lawyers, economists, and politicians, they will have a basis for determining efficient management for space systems. The body of hard core facts can be consulted by future professional experts coming into varied space activities and rational building upon a central foundation of guiding principles can be ensured.

EVENTS OF INTEREST

A. Past Events

(a) *Reports*

1. U.S. Senate Hearings On Space Insurance, Nov. 7, 1985

The U.S. Senate Subcommittee on Science, Technology and Space held hearings November 7, 1985 on the issue of insurance capacity and its impact on commercial space activities. A major issue addressed was the role of government in providing space insurance or in being the insurer of last resort. This writer testified before the Subcommittee and provided the following perspective on the issue.

Owners, operators and users who are dependent upon space systems have found insurance to be a vital resource for their businesses. Essentially all commercial and non-U.S. government satellites launched into space are insured during at least the launch phase for physical loss or damage to the satellite and launch vehicle. Many are also insured during their on-orbit operational lifetimes. The extent of space insurance is reflected in the fact that, to date, the cumulative value of insured launches world-wide is approximately $5.7 billion.

At this time of dynamic growth in satellite usage and with increasing expectations for demand in on-orbit space industrial development, the insurance industry has been battered with large losses. The years 1984 and 1985 have produced space launch and in-orbit losses involving seven major satellites with combined insured values of approximately $600 million. The combined premium paid for the insurance covering these launches averaged less than ten percent of their values. This result has substantially degraded the accumulative loss ratio since 1978 to approximately $840 million in losses for $430 million paid in premiums. In terms of net premium to insurers, this represents about a $500 million net underwriting loss position.

The current status of the space insurance industry is reflected in its present capacity to insure. Two years ago space insurance capacity was $250 million to $300 million per launch, at a premium rate of 5 to 7 percent. Today, capacity is about $50 million to $75 million per launch, at premium rates in excess of 25 percent. However, space insurance, as with any form of insurance, is subject to market conditions and failure to manage risks effectively can severely restrict its availability. I believe that with appropriate corrective actions, within the next 12 months space insurance capacity will begin to recover and will return to the historical high in two to three years.

The situation in which we find ourselves today is the result of complex factors. Although there are no easy answers to the problem, we must seek solutions which enhance our ability to conduct commerce in space in a manner which permits the existence of a viable space insurance industry.

The current problem is the result of satellite and launch vehicle failures being coupled with accelerating space insurance values and, to some extent,

with the fact that space insurance underwriters have been charging premium rates below the historical failure rates of launch vehicles and satellites. Clearly, if higher premium rates were charged, there would be less underwriting deficit today. However, there was at the time (and let us all hope it continues) great expectation among insurers in the future of the space business. The matured launch systems were achieving impressive records, the manned Space Shuttle was coming on line, and relatively large premiums were being paid for launch coverage.

Optimism of space insures was further enhanced by the growing demand for premium dollars in the general property and casualty markets of which space insurance is one component. Underwriting losses in the insurance industry were being turned into net profit from high investment income earned on premiums. Unfortunately, investment income could not keep up with the underwriting losses in recent years, the result being that current space insurance problems are now compounded by that state of the overall insurance industry.

The nature of the insurance market is cyclic. Similar conditions will likely occur in the future. Past losses will be written off, the insurance markets will respond to periods of good fortune, attract capacity and underwrite at premium rates which reflect current conditions and competitive forces. For this to happen in the space insurance industry, however, it is necessary to show that the risks of space can be managed in a commercial sense which implies limitations on the magnitude of exposure as well as the frequency of failure.

To ensure adequate insurance capacity for future commercial satellite launches, it will be necessary to improve loss experience and regain underwriters' confidence in the repeatability of space technology and know-how. Underwriters must be convinced that they can make a business of space. I believe that this can be done and that actions by both government and private industry will contribute to achieving this objective.

During this period of recovery, more demanding underwriting requirements will be imposed with additional emphasis on parameters affecting exposure to failures and potential magnitude of casualty losses. Clearly, further efforts by private industry must be made to improve reliability and reduce risk by stringent adherence to quality and process control, maximum use of proven systems and procedures, and minimization of system complexities. I believe manufacturers and systems operators are keenly aware of the problem and will be making every effort to improve their products where reasonable to do so.

On the other hand, it may be that the nature of space systems is such that failures are sufficiently random and inevitable, and that risks should be spread over more events to minimize the consequences of failures. It has always been the concern of space insurers that insufficient actuarials existed to accurately assess loss potential. There just were not enough launches and satellites. Recent trends, however, have been to further reduce the number of launches by putting more transponders on a single communications satellite and launching two or three satellites per launch vehicle.

In the near term, satellite manufacturers and operators are confronted with existing space insurance market conditions. The higher premium rates offer some prospects for either attracting new commercial insurance capacity or

encouraging arrangements for mutually sharing risks through financial pooling.

Since we believe the situation is temporary, the government should not intervene into the marketplace or take any action which may chill the prospects for insurance market recovery. Such actions may leave little hope for a viable commercial market in the future, create an imbalance in the allocation of risks, and establish a reliance upon insurance not driven by commercial market conditions but by the availability of federal appropriations. It is worth noting that if a government pool had provided the insurance for all satellites launched on U.S. launch systems in 1984 and 1985, the appropriations necessary to pay claims above premiums collected would likely have exceeded $350 million, further adding to the federal budget deficit.

The government has been the catalyst for the advancements that have taken place in space commercialization. The government role will continue to be substantial in all aspects of space commercialization including systems development, operations, and regulations. I suggest that now may be an appropriate time to review the various government policies affecting commercial uses of space. The Space Shuttle has unique qualities for commercialization opportunities, and NASA is now developing the Space Station with still further advancements from which commerce can benefit.

Although the actual implementation of government policies can be quite complex involving domestic and international interactions, it may be possible to rebalance interests to better accommodate the needs of private enterprise. From the viewpoint of having adequate insurance available at a reasonable cost, this could manifest in less costly commercial space projects and less accumulation of values exposed to any one space risk. In this respect the FCC may wish, for example, to reassess policies on full spectral utilization or other requirements which may be forcing licensees to larger satellites. Less expensive space segments could also lessen the burden on new start companies trying to obtain financing which must make a giant step instead of incrementally phasing into the communications satellite business.

NASA also may be able to reassess its procedures for STS manifesting in order to further reduce the number of insured satellites launched at one time. The large cargo bay of the STS provides the capability to accumulate very large values of payload, although NASA has judiciously been able to limit the cargo to three insured satellites. Space Station architecture should also be carefully scrutinized to minimize conditions which could force the accumulation of unreasonable large commercial value. In more general areas, NASA might also be encouraged to expand its various space technology programs and direct activities toward the specific needs of commercial satellites. Possible areas include improving space systems' lifetimes, enhancing space materials' performance and quality assurance, and defining the parameters of space electrical discharge phenomena.

In addition, the Department of Transportation should be further encouraged to establish regulations and facilitate an operational environment conducive to private investment in commercial single launch systems. DOT has expressed the importance of these systems in alleviating some of the space insurance problems.

In conclusion, it is my belief that the great promise for substantial benefit on earth from space depends on the will and imagination of the private sector, with the cooperation and continued support of government. For commerce to expand in space, commercial conditions must exist with private investment exposed to minimum intervention and competition from government. Viable insurance coverages are necessary ingredients in the equation for commercial space. I believe that the space insurance market will respond to the need, although the industry must see opportunities to achieve profitable results in the future. The role of the government in space commercialization should not be that of insurer, but to foster an environment which accommodates the needs of private enterprise. Where government has control or substantial influence over these activities, it should recognize, consistent with national interests and objectives, that management of risks within commercial standards are necessary in order to allow space insurance to exist in form and capacity for the future.

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2. *"Strategic Arms Limitation: Treaty Obligations and the S.D.I." American Society of International Law Session, April 10, 1986*

There was a panel discussion during the annual meeting of the American Society of International law held on April 10, 1986 in Washington. D.C. The panel was chaired by *Professor John Norton Moore* of the University of Virginia and dealt with the legal interpretations of the Anti-Ballistic Missile ("ABM") Treaty of 1972 and the "legality" of the Strategic Defense Initiative ("SDI"). The panel was comprised of four speakers: *Chapman Cox*, former General Counsel for the Department of Defense; *Abram Chayes*, a Felix Frankfurter Professor of Law at Harvard University and former legal adviser to the Department of State; Judge *Abe Sofaer*, the present legal adviser in the Department of State; and *John Rhinelander*, a partner in the law firm Shaw, Pittman, Potts and Trowbridge, formerly deputy legal adviser in the Department of State and legal adviser to the SALT I delegation that negotiated the ABM Treaty.

The debate centered on three key provisions of the ABM Treaty: Article II, which defines a prohibited ABM system as a system to counter ballistic missiles or their elements in flight trajectory, currently consisting of: ABM "missiles," "launchers," and "radars"; Article V, which provides that neither side will "develop, test, or deploy ABM systems or components which are sea-based, air-based, space-based, or mobile land-based," although each side is permitted one fixed land-based system; and Agreed Statement D (a statement that accompanies the Treaty), which states that if ABM systems "based on other physical principles" are created that could substitute for missiles, launchers, and radars, limitations on "deployment" of those systems would be

subject to negotiation. The issues discussed by the panelists centered on: whether the provisions of the Treaty apply to post-'72 technology; which provisions of the Treaty apply to such technology; and whether limitations were placed on research, testing, development, and/or deployment.

Mr. Cox began the panel, by arguing that the definition set forth in Article II of ABM systems was a limited definition and therefore did not prohibit ABM systems developed or deployed using new technologies. He reasoned that: (1) the Treaty was never intended to be all-encompassing since none of the non-components of ABM systems had been included (*i.e.*, planes, satellites, communication systems, and computers); (2) if the definition in Article II were merely illustrative of the types of items comprising ABM systems, the language would have been clearer, prefacing the listing of types of items with phrases like, "for example," "such as," "including but not limited to"; and (3) Statement D has the meaning that systems based upon other physical principles, principles and technologies not known in 1972, could be developed in the future, subject to future negotiations which implies that the Treaty should be consistent.

He supported his interpretation of the ABM Treaty by citing the negotiating record. he noted that during negotiations, the U.S. tried to get the Soviets to agree to a ban on development of future technology, yet the Soviets refused. In other words, no agreement was reached on future technologies. The Soviets sought the limitations in the definition of ABM systems, and had Article II limit the definition of ABM systems to missiles, launchers, and radars. Apparently, the U.S. had convinced the Soviets to accept Statement D. Without Statement D, both parties could have deployed systems, as well as researched, tested, and developed systems based upon new technology. With Statement D, the U.S. planned to reinforce that notion that the deployment of ABM systems based on new technologies would require a new negotiating session. Therefore, according to *Mr. Cox*, the U.S. could develop and test systems based on other physical principles, but could not deploy systems based on "other physical principles" without further negotiations. Without Statement D both parties would be able to deploy systems based upon future technologies.

Mr. Cox concluded by noting that *President Reagan* had said that the more liberal, less restrictive interpretation (that we can develop systems based on other physical principles) was fully justified. However, he had said that while the correct interpretation was the permissive one, for purposes of actual policy, he would continue to impose the restrictive interpretation to the effect that development of ABM systems could only be made in the mode of fixed land-based systems. This interpretation, as a matter of policy, was the one that the Defense Department was now using in developing its SDI program.

Abram Chayes followed *Mr. Cox* and took a plain meaning of the text approach. He noted that ABM systems generically are systems to counter strategic ballistic missiles or their elements in flight trajectory. The usage of the term "ABM system" throughout the Treaty confirms the generic idea that it is not limited by Article II to certain components that shoot down ballistic missiles, but covers any system that can perform such duties. Article II only described what an ABM system "currently" (in 1972) was, but did not set a limi-

tation on what it could be. Article III and VI refer explicitly to ABM systems. Meanwhile, Statement D says that ABM systems employing other physical principles have to be agreed upon for future deployment, but it does not state that ABM systems, employing "new principles," need agreement. In other words, "other physical principles" is different from new technology or new principles.

The negotiating history confirms that the word "currently" in Article II was not meant as a limiting factor. In countering *Mr. Cox's* argument that if the Article II definition were illustrative, it would have been worded to clarify an illustration, *Mr. Chayes* noted that without the word "currently", ABM systems would appear to comprise only those listed systems. By inserting "currently", the U.S. planned to make absolutely clear that it was dealing with a functional definition applicable to any kind of system dispensed to counter strategic offensive weapons—not just those consisting of 1972—ABM missiles, launchers, and radars. The existence of the word "currently" closes any gap that may have existed in the coverage of the Treaty if "currently" had not been inserted.

Statement D does not include a new limitation, as *Mr. Cox* suggested, since that would make the Treaty nonsensical. Article III limits the deployment of ABM systems or their components and then lists limited circumstances for their existence. To include a major substantive limitation in Statement D would not be logical, when dealing with the subject matter in the Treaty. Statement D was designed because the U.S. had a fixed land-based, laser research and development program and wanted to protect it from the intent of the Treaty.

Mr. Chayes elaborated on his argument by stating that one has to think of the Treaty's purpose. The Treaty could have consisted of one sentence—a prohibition on the deployment of ABM systems. However, the entire Treaty after Article I was designed to deal with the break-off problem, by pushing back the area of permitted activity as far as the U.S. was capable of verifying that the activity was taking place.

In closing *Mr. Chayes* noted that the U.S. has made a series of official interpretations of the Treaty but has changed its position in October 1985 because of the belief that the U.S. would not be able to make an intelligent judgment about technology if it adhered to the old restrictions.

Judge Sofaer followed *Mr. Chayes*, but interpreted the provisions of the ABM Treaty in a completely different manner. he remarked that all that had to be done was to look at Article V and realize that it prohibited everything to do with space and sea-based systems and components, testing, development and deployment. Only the word "systems" needed defining and that was defined in Article II. There it was defined functionally, using the words "currently consisting of." It was not talking about unknown or future components, but three types of components that existed in 1972, or any versions of those components that existed thereafter. Only the Agreed Statement D was a new concept introduced: systems and components based on other physical principles, *i.e.*, items other than missiles, launchers, and radars.

Judge Sofaer noted that an examination of the negotiating history sup-

ported such an interpretation. There was no doubt that the U.S. had sought a ban on future devices which could substitute for a system or component. However, such a ban had never been achieved due to Soviet opposition, and therefore the words "currently consisting of" had been inserted in the Article II definition.

In essence, *Judge Sofaer* asserted that the only treaty provision applicable to future ABM systems is Statement D, and that nothing in the text of the statement suggests it applies only to fixed land-based systems.

This interpretation would allow development and testing of those key aspects of SDI based on post-1972 technology, such as particle beams and space-based lasers. Deployment of future technologies would have to be negotiated. In the absence of an agreement there could be no deployment unless the Treaty were abandoned.

The last panelist to speak was *Mr. Rhinelander*, who felt it was unrealistic to hope for a non-nuclear world or that one day we would be able to build a perfect defense against the threat of nuclear weapons. With respect to the so-called exotic systems, he pointed out that the Treaty has been understood by all administrations until October 1985 that with respect to fixed land-based systems, one could develop and test the exotics but one could not deploy them. The reason for this was that the U.S. had a classified laser program at the time and did not want to foreclose the R and D work, including any testing, on that program. While there have been some general Soviet statements reflecting the view that the ban on exotics starts at development and includes the testing phase, the Soviet position did not become crystal clear in public until after the dispute broke in this country. As to research, in 1972 the Soviets said in public that the treaty did not cover research and that has also been the U.S. position all along because the limits of the treaty only apply to that which is verifiable by national technical means.

Mr. Rhinelander then addressed some of the gray areas of compliance issues, noting that the Soviets are building a very large radar in Krasnoyarsk clearly in violation of the ABM Treaty, which explicitly limits large radars for early warning to the periphery of the country and oriented outwards so they could not serve any ABM battle management purpose. He also noted that the U.S. is building two radars, one in Georgia and one in Texas. While they have considerable back coverage, they are on the periphery pointing outwards. Our replacement of all the radars in Thule, Greenland, and in the U.K. with new phased-array radars raises an issue which is not clear from the Treaty, *i.e.*, whether you can replace old technology with new technology.

Referring to a defensive system against short-range offensive missiles which is permitted under the Treaty—as long as the short-range missiles do not have the capability to intercept the long-range missiles—*Mr. Rhinelander* noted that there has been no agreement on what capability means. The fact is that systems with significant capabilities against short-range missiles will also have "not insignificant" capabilities against long-range missiles. This is a most important problem which has never been resolved. The fundamental question is the interrelationship of offensive and defensive weapons in terms of their capabilities and attempts to limit one or both. A defensive system is not func-

tional and cannot work without severe limits on the offense.

Mr. Rhinelander expressed doubts about SDI technology-sharing because of security concerns. As to the future, the options are to have arms control or not to have it. If the option is for arms control, the ABM Treaty will have to be strengthened and a treaty concluded prohibiting the development, and testing of anti-satellite systems, keeping in mind the dual capabilities of anti-satellite systems and ABMs.

In concluding, *Mr. Rhinelander* noted that while technology has changed since 1972, the issues have not. Once technology takes a leap forward, it is difficult to reverse it. One could hope for very severe reductions on multi-warheads and reduce the large number of weapons available on both sides, but it is unrealistic to hope for an elimination of all nuclear weapons.

In commenting on the remarks of *Mr. Chayes*, *Mr. Cox* said that the loophole in Article II has not been plugged by inserting the word "currently" in the definition. All that was done was to state the "currently" (then) applicable restrictions and add that if new systems were created it would have to be determined at that time what the restrictions were in accordance with Statement D. *Mr. Cox* stressed that we should not impose limits on ourselves unless the Soviets are bound by the same limits.

In responding to *Mr. Rhinelander's* remarks, *Judge Sofaer* doubted that the negotiations were influenced by some secret laser program, since both the U.S. and the Soviet delegations realized that laser was a potential future program. *Judge Sofaer* stressed that at no time prior to the announcement of the authoritative U.S. interpretation adopted by the President did the Soviets ever make it clear that they regarded themselves bound by the restrictive view. As to the policy issue, *Judge Sofaer* pointed out that the purpose of the ABM Treaty was to limit defense so that the two nations would not go berserk in offense. It did not work; the Soviets MIRV-ed their missiles. They built enormously powerful missiles in great numbers, forcing the U.S. to look at the question and determine which is the best procedure, to build up offense exclusively or to turn to defense as well. As to the transfer of technology, *Judge Sofaer* stated that he had no doubt that the President would take whatever sharing measures were necessary to prevent any fear from arising in the minds of Soviet leaders that by the SDI we were just trying to position ourselves to be able to attack with impunity.

In responding to the comments, *Mr. Rhinelander* stressed again that the fundamental question was whether we want to limit the Soviets and accept limits on us or whether we want to go forward, unlimited.

As to sharing of technology, *Mr. Rhinelander* stressed intent and capability. While we may profess our intent is good, the Soviets look at our capability and the counter measures. The basic issue is whether we are both going to have systems or neither of us are going to have systems. We cannot have it both ways.

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3. *Report on the 25th Session of the Legal Sub-Committee of the UN Committee on the Peaceful Uses of Outer Space, 24 March — 11 April 1986**

The 25th Session of the Legal Sub-Committee of the UN Committee on the Peaceful Uses of Outer Space (COPUOS) took place in Geneva from 24 March to 11 April 1986. This silver anniversary session was one of the most productive and gave a needed boost to the international legislative efforts in the field of outer space law, which had been somewhat languishing since the consensus adoption of the 1979 Moon Treaty[1] and the set-back caused in 1982 by the General Assembly's approval by a vote of a hotly disputed resolution on Direct Broadcasting Satellites.[2]

As in several previous years, the Sub-Committee had three substantive items on its agenda: remote sensing; use of nuclear power sources in outer space; and definition and delimitation of outer space, and the geostationary orbit. As described below, distinct progress was made on the first item, some on the second, and very little on either branch of the double-headed third.

After considering the question of "The legal implications of remote sensing of the earth from space" at each of its sessions since 1974, the Sub-Committee noted "with great appreciation" the report of its Working Group on this subject, including a set of Draft Principles on Remote Sensing[3] on which the Working Group had recorded a consensus. This draft (reproduced in the Current Documents section of this Journal) is the so-called "Austrian text", which had evolved in the Working Group (under Austrian chairmanship) during the past years, was then submitted in a slightly revised form as an Austrian proposal to the 1985 session of COPUOS[4] (also under an Austrian Chairman) which almost adopted it, and was now submitted by the Austrian representative without any further change to the Sub-Committee.[5] The Draft Principles were then transmitted to COPUOS itself and, having been approved by the latter at its session this June, will be reported to the General Assembly at its 41st session this fall; if all goes well, the latter will consider these in its Special Political Committee and approve the Principles by means of a draft resolution. Thereupon, it may be expected that, as in the case of previous such declarations, the Legal Sub-Committee will in a few years convert the Principles into

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* The views expressed herein are those of the author and do not necessarily reflect those of the United Nations.

[1] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (adopted by General Assembly resolution 34/68 (1979)).

[2] General Assembly resolution 37/92 of 10 December 1982.

[3] Report of the Legal Sub-Committee [of COPUOS] on the Work of its Twenty-fifth Session (A/AC.105/370) (the "Report"), para. 29 and Annex I.

[4] UN document A/40/20, Annex V.

[5] UN document A/AC.105/L.158.

the text of a Convention on Remote Sensing, to be approved in turn by COPUOS and the Assembly.

The 15 Principles refer directly or indirectly to several of the five earlier space treaties.[6] In particular, they require a state carrying out a programme of remote sensing to inform the UN Secretary-General thereof, and also to provide any other relevant information to any other state, in particular to developing countries affected by the programme. Sensing states must also, *inter alia*, provide available information about natural disasters, give sensed states access to both primary and processed data "on a non-discriminating basis and on reasonable cost terms", and enter into consultations with such states to make available opportunities for participation and to enhance mutual benefits. Though these obligations fall far short of the original demands of certain states for a veto over the dissemination of any data about their natural resources or to more or less exclusive rights to such data, they do establish the basis on which sensed states are to receive some important rights — without, however, significantly interfering with satellite sensing activities or the use of the resulting data.

The "Question of the use of nuclear power sources in outer space" was originally placed on the agenda in 1980 at the request of Canada, which in 1978 had suffered the impact of debris from a Soviet nuclear satellite. At the recent session, Canada once more presented a working paper containing a complete set of five principles.[7] Of these the Sub-Committee and a Working Group considered and very tentatively approved two principles, respectively concerning notification prior to re-entry and assistance to states, on which drafts had been elaborated at previous sessions as well as in part at the 1986 session of the Technical Sub-Committee of COPUOS.[8] The other proposed principles, relating to: safety assessment and post-launch notification; guidelines and criteria for safe use; and responsibility and liability of states, were left for future consideration.

With reference to the "Definition and delimitation of outer space", no new proposals were submitted, though in the relevant debate two former (1979 and 1983) Soviet proposals were referred to.[9] Indeed, the discussion again revolved principally around the liminal issue of whether or not there was any reason for and basis on which to make any definition or delimitation. Those in favor of so

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[6] Set out in *The United Nations Treaties on Outer Space* (UN Publication Sales No. E.84.I.10, New York, 1984).

[7] UN document A/AC.105/C.2/L.154, reproduced in the Report, Annex IV.A.1.

[8] Report, Annex II, para. 5.

[9] A/AC.105/L.112 and A/AC.105/L.139, reproduced in the Report, Annex IV.B.6 and 4. Both proposals suggest that the commencement of outer space be established at an altitude not exceeding 110 kms., and that innocent passage be allowed at lower altitudes through the airspace of other states while the space object ascends to orbit or descends to earth.

doing argued both utility and urgency, or at least timeliness, while the opponents expressed not only doubts as to these but even concern that a premature definition while the technology was still fluid might create unintended obstacles to further development.[10]

As to "The character and utilization of the geostationary orbit, including consideration of ways and means to ensure the rational and equitable use of the geostationary orbit without prejudice to the role of the International Telecommunication Union", working papers were presented respectively by the German Democratic Republic[11] and by Kenya;[12] in addition, a communication was received from ITU on the First session of the World Administrative Radio Conference on the Use of the Geostationary Satellite Orbit and the Planning of the Space Services Utilizing it.[13] While most participants conceded that the geostationary orbit was a unique and limited natural resource, they differed as widely as ever on the question whether the equatorial states should be granted any special rights and responsibilities with respect to that orbit or whether it should be considered as fully subject to the general principle that no part of outer space can be subject to any national appropriation or claim of sovereignty.[14] The Kenyan working paper was based on the former approach, and the GDR one, which proposed a set of eight draft principles, was based on the latter. On this subject too there appeared to be no reason for expecting any early rapprochement and certainly no expectation of any substantive solution adopted on a consensus basis.

During the "general exchange of views", which continued at formal meetings of the Sub-Committee throughout the session, the Socialist states repeatedly expressed their concern over the growing danger of extending an arms race into outer space. The Western states, and in particular the United States, objected that this topic was outside the terms of reference of the Sub-Committee and fell solely within the competence of the UN's Conference on Disarmament, which had a relevant item on its agenda. This persistent disagreement was almost the only one tending to mar the overall non-adversary spirit by introducing a purely political element into a generally constructive session.

As to the future work of the Sub-Committee, no decisions were taken. Informally, consideration is being given to some new topics, such as the "commercialization" of space, i.e., the regulation of the commercial uses of outer space.[15] Also mentioned, but only in the corridors were: the protection of the space "environment", with particular reference to space debris; the question of

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[10] Report, Annex III, paras. 10-13.

[11] A/AC.105/C.2/L.153, reproduced in the Report, Annex IV.B.1.

[12] A/AC.105/C.2/L.155, reproduced in the Report, Annex IV.B.2.

[13] A/AC.105/360, reproduced in the Report, Annex IV.B.3.

[14] Report, Annex III, paras. 14-22.

[15] Report, para. 14.

the law to be applied to space stations; and possibly an eventual resumption of the aborted consideration of direct broadcasting satellites.

Some informal proposals were also made relating to the procedures of the Committee, with a view to shortening its regular 3-week annual sessions, or putting these sessions on a biennial basis, or possibly combining the sessions of the two Sub-Committees with those of the main Committee. Other economies were also considered that might become necessary in the light of the financial crisis of the United Nations. In particular, it has been suggested that savings might be achieved by somehow compressing the luxurious quadruple annual consideration of each item by the Legal Sub-Committee: twice on the record in the Sub-Committee itself, first during the general exchange of views (during which all sorts of other issues can also be muted) and then in the specific discussion of the item; thereupon off-the-record, in the plenary Working Group established for that item and finally and most constructively in more intimate informal consultations (with a team of interpreters standing idly by). Any small consensus thus achieved then wends its way back to the Working Group, then to the Sub-Committee, then on to COPUOS itself, and finally to the Special Political Committee of the General Assembly. No doubt, all this ensures thorough consideration and a more-than-complete record, but the total costs of this comfortable legislative process may be more than the world community is at present willing to bear.

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4. *"Treaty Law and Outer Space: Is the United Nations Playing an Effective Role?" American Society of International Law Session, April 12, 1986*

The American Society of International Law (ASIL), its Interest Group on Space Law, and the Association of U.S. Members of the International Institute of Space Law cosponsored a panel discussion on "Treaty Law and Outer Space: Can the United Nations Play an Effective Role?" on April 12, 1986, in the Mayflower Hotel in Washington, D.C.

The meeting was chaired by *Professor Stephen Gorove,* of the University of Mississippi Law Center, and participating panelists included Paul G. Dembling, partner-in-charge of the Washington office of Schnader, Harrison, Segal & Lewis, and former General Counsel of NASA, and the General Accounting Office; *Nandasiri Jasentuliyana,* Deputy Chief of the U. N. Outer Space Affairs Division; *John E. O'Brien,* General Counsel of NASA; *Professor Oscar Schachter* of Columbia University. *Professor Ved P. Nanda,* of the University of Denver and *Paul C. Szasz,* Director of the General Legal Division of the U. N. Secretariat, were the commentators.

In his introduction, *Professor Gorove* recalled the earlier meetings of the Society dealing with international space law issues and alluded briefly to some of the remarkable accomplishments and recent setbacks, expressing the belief

that the United States as a leading nation in space and also mankind as a whole were committed to an irreversible course toward the exploration and use of outer space. He pointed out that law has tried to keep abreast of the scientific and technological developments both at the national and the international levels. He noted that the global aspects of this lawmaking process have taken place in the United Nations where the Committee on the Peaceful Uses of Outer Space has served as the main instrument of treaty making. He also noted that even a perfunctory glance at the topic may have raised some questions in the reader's mind, such as: are we talking about treaty law in the strict sense of the word or in a general sense to include U.N. resolutions, declarations and other instruments which may have relevance to a state's behavior but are not legally binding; are we looking at treaty law from the viewpoint of the various phases of the treaty making process, including ongoing negotiations, or are we looking only at the final product; are we focusing exclusively on the main organization of the U.N. or are we including the specialized agencies?

Professor Gorove also observed that people may have different perceptions as to what constitutes effective role and whether the number of treaties entered into under U.N. auspices is a correct indicator of the U.N.'s effectiveness. He said it was possible to look at these and many other issues and the panelists may approach the subject historically in terms of past and current trends, as well as future expectations, or topically with particular attention to a subject area such as remote sensing, telecommunications, and so on. Panelists may wish to analyze the reasons for the state of affairs, may indicate their perceptions of trends and suggest alternatives for improvement so as to enable the U.N. to play a more effective role with respect to treaty making, if that is a preferred or posited goal.

Following *Professor Gorove's* opening statements *Mr. Jasentuliyana* recalled the early developments that had taken place in the United Nations with respect to the development of international space law and elaborated on the treaty drafting process and the U.N. record and accomplishments to date. It was unlikely that a legal framework for space activities could have been established so expeditiously without the assistance of the United Nations and the participation of outstanding individuals. To be sure, there has been criticism of both the process and the quality of the drafted treaties more recently. This may be a problem of representation. Therefore, in the future every effort should be made to keep the level of participation high with a balance of generalist diplomats on the one hand, and technical and legal experts on the other.

The consensus method used by the Outer Space Committee has been credited with part of the success, since it has actually encouraged compromise. Of major consequence to the future of space law making in the United Nations is the implicit threat of a challenge to the consensus principle on the ground that it is contrary to the explicit wishes of a majority of countries, principally of the Third World. One possible way of avoiding confrontation between those who favor the consensus method and those who do not, may be the use of qualified consensus rule whereby voting is undertaken as a last resort in cases where the dissenters from consensus are considered to constitute an unreasonable and isolated minority. One possible mechanism for such a qualified con-

sensus would require a two-thirds majority of all countries, with the condition that the majority also represents a two-thirds majority based on GNP and on population.

Mr. Jasentuliyana noted that the international legal principles in the space treaties contributed to the maintenance of international peace and security and the promotion of international cooperation and understanding, though there remain many unresolved issues. In his view, space law will have to be reassessed and revised to reflect new political developments and technological progress.

As to poorly drafted provisions, or provisions which are open to varying interpretations, he stated that such problems were more often rooted in political factors rather than carelessness or incompetence. In the future, it will be necessary to continue to find the right balance between political requirements and possibilities and the need for precise legal wording.

Finally, *Mr. Jasentuliyana* expressed his belief that the legal principles of remote sensing would be adopted this year and noted that there had been some progress toward establishing legal principles on the use of nuclear power forces. Other topics on the U.N. agenda, the definition and delimitation of outer space and space activities, including the geostationary orbit, the review of the Registration Convention, and the likely new subject, the commercialization of space activities, will require long negotiations. Possibly emerging subjects include space debris, safety of space activities and the protection of the space environment. As to the militarization of outer space, progress in the United Nations may only be possible, while space weapons are still at the stage of development and susceptible to multilateral negotiations. Once the systems are tested and deployed, the United Nations will become a less appropriate forum for negotiation of detailed agreements.

Professor Schachter traced what he called the "prehistoric" times of space law and referred to a symposium in which he and others, including *W. Ley, Werner von Braun* and *John C. Cooper* participated. *Professor Cooper* advanced the view that state territory extends as far as science permits that state to control that space. For his part, *Professor Schachter* took the high seas as a motto and projected the concept of *res communis* and used the expression, "common heritage of humanity." The common heritage notion became a part of the later literature on the subject and became the basis of claims being made by states other than space powers. His idea was to project the free use of space rather than territorial dominion or sovereignty. And this of course did in fact later come about, although at the time it was highly controversial.

The other issue which concerned people in the earlier period, and came up when Sputnik and its successors took place, was the delimitation issue. At that time, *Professor Schachter* suggested that instead of trying to draw an imaginary line between atmosphere and outer space, the way of delimiting should be on the basis of the instrumentality, the space object. While this was not accepted, the notion that a space object ought to have its own legal regime tended to dominate. If one develops the regime on the basis of the instrumentality rather than delimitation of the other kind that result can be achieved. The delimitation issue has come up following the Bogota Declaration of equa-

torial countries in which they advanced claims to segments of the geostationary orbit above their territories. These claims have pretty much disappeared and the equatorial states no longer assert sovereignty over segments of the geostationary orbit, but limit themselves to claims of access and sharing in the benefits of geostationary satellites.

Finally, *Professor Schachter* noted that he saw surveillance as a positive feature of future space development and thought of it mainly as a means of observation and control of military activity and during that idealistic period he naturally called for an international agency. The important thing was, even in 1951, to see outer space as playing a role in disarmament. This eventually did happen, perhaps not as optimistically as envisioned, but by necessity through the big powers exercising the kind of surveillance, monitoring, that is so essential to the security system that we have today.

While *Professor Schachter* did not speak of direct broadcast satellites in 1951, at present his expectation was that in the field of direct broadcasting, as in the field of remote sensing, the solution will not be a negotiated treaty or a declaration in the United Nations in the vaguest sense, but the weight of practice and power in the sense that the space powers and broadcasters probably will go ahead without very much concern about the legal rights of prior consent by reception areas. Possibly on a diplomatic basis there would be some way to regulate direct broadcast satellites. Direct broadcasting and the problem of cultural penetration, the propaganda problem as against the freedom of information, is one of the most troublesome problems.

As to arms control, the great challenge, the critical issue is whether space will be used for weapons of defense which are capable of becoming weapons of mass destruction. This item is the highest on the agenda of the international community, although it will have to be left, perhaps regrettably, to the superpowers.

The next speaker, *Mr. Dembling,* pointed out that when Sputnik was launched there was no request for consent and no consent was given and nobody made a fuss about it. This was the first legal decision when the operational program started. Prior to 1958 there were several international organizations concerned with aspects of the peaceful uses of outer space. These included UNESCO, ITU, the World Meteorological Organization, and the International Civil Aviation Organization. He recalled some of the early U.N. resolutions establishing the *ad hoc* committee and the present Committee on the Peaceful Uses of Outer Space. He highlighted the Declaration of Legal Principles and the major international space treaties which followed. He noted that there were more treaties in this area than in any other field. In *Mr. Dembling's* view the treaties have been very effective. Some of the deficiencies arose out of compromises which had to be made to get a firm, hard treaty into being. The United Nations can also play an effective role without a treaty, as was the case with the Declaration of Legal Principles. Also, the discussions and dialogues relative to principles governing direct satellite broadcasting and principles relating to remote sensing of the earth from space should be noted.

As to stumbling blocks to effectiveness, *Mr. Dembling* pointed out that lack of knowledge on the part of representatives is due to the fact that many of

them have many jobs and are ambassadors with many hats and that they cannot give the time that some of the early members of the United Nations were able to devote to outer space matters. He expressed the hope that preoccupation with other matters will not spill over to the work of the Committee on the Peaceful Uses of Outer Space, and if it does not, then we will see more successes of the United Nations in this field.

In his opening remarks, *Mr. O'Brien* answered the question raised by the title of the discussion as: "yes, no, maybe, probably, perhaps, could be in the eye of the beholder and not known at this address." Departing from his prepared text, he referred briefly to the Challenger disaster and stressed that contrary to the general impression that some people may have gathered from news accounts, there was no disarray and NASA professionals reacted responsibly under very difficult circumstances. Pain and suffering is an overall part of technological advancements, which in turn open the benefits to humankind and outweigh the pain and suffering. As a civilization, we must move ahead with space exploration, and we shall do so.

As to international cooperation, this can be expected to expand geometrically. In talking about the U.N. role, the question to ask is, what role is the U.N. expected to play, when and how and to what extent. When the U.N. Committee on the Peaceful Uses of Outer Space was smaller, and the broad issues of space exploration were more pronounced and not as well understood, there was more success in achieving international agreement on the issues. Under those circumstances, the United Nations played a very effective role. What about today? Do we see the same scholarly, technical and legal analysis of the issues that face us today as was the case in the 60s. Is it the same today as it was then? If it is not, why not. Should the Committee be declared obsolete, but nevertheless useful while it existed, or should new life be breathed into the Committee? If so, how?

If we intend to have the Committee as an international debating society, then we should continue with it as it is. On the other hand, if we intend the Committee to resume its natural past, then we should initiate the notion of international productivity as it might apply to the Committee's activities. This notion of international productivity has several essential elements which may not be palatable to all Committee members. The Committee's limited time should not be spent on posturing for whatever parochial, political, economic interests at the moment might exist. What this leads to is inevitably a rule of germaineness, *i.e.*, whatever is postulated before the Committee or the Subcommittee must be germaine to the central purpose of the Committee. For instance, the time-honored opening exchange of views should be omitted in the overall interest of productivity as it relates to the time available for meaningful deliberations. While this may border on international heresy, it would be better to skip the rhetoric and get on with the substantive business. Additionally, international productivity requires that the subject matter presented to the Committee or Subcommittee be limited to that which is germaine to the jurisdiction of the Committee or Subcommittee. Unilateral *ad hoc* attempts to table a subject matter which is not germaine, should be quickly ruled out of order by the leadership so as not to confuse or contaminate the meaningful

debate. The international community should be receptive to the concept of international productivity as it relates to the activities of the Committee. If not, one may have to worry about motivations. Our civilization is on the threshold of some interesting choices. It behooves the international community to get its act together and plan the future before we express surprise, if not dismay, that it arrived too soon.

Finally, *Mr. O'Brien* admonished legal colleagues that the world's scientists and engineers are moving very rapidly and that it was incumbent upon lawyers to devise ways not only to keep abreast but to anticipate what is likely to happen so that the generation which follows will be as comfortable as we have been and also secure in the fact that what we did in preparing the way made it infinitely better for them.

In commenting, *Professor Nanda* noted that there has been a definite slowing down in the U.N.'s effectiveness with respect to space matters and there are several reasons for it. As commercialization and industrialization activities take place, we find a certain reluctance on the part of the United States and other developing countries to have the rules governing them crystalized.

As to the militarization of outer space, unless the United States and the Soviet Union can agree, not just on principles but beyond that on their own conduct, on where the lines are going to be drawn regarding legitimate activities and impermissibility of state conduct, the Committee activities are obviously going to slow down.

Referring to the 1985 WARC, *Professor Nanda* noted that while the developing nations wanted equitable access to the GSO, and the space services utilizing it, the net result of the conference was somewhat of a mixed bag in terms of outcome. The first desirable step was probably taken when there was a compromise giving both the developed and developing nations pause, and if it made both of them unhappy, then there was probably something right about it. Both of them have reservations at the present time, and efforts to find some kind of compromise will have to be made.

As to arms control, the United Nations is not utilized by the United States and the Soviet Union, and it does not seem that it will.

Finally, *Professor Nanda* noted that the stumbling block to the effectiveness of the U.N. may not be just the Committee structure, the consensus method, the lack of efficiency in productivity, but the issues surrounding equitable access to resources and uses and the ideas behind it.

The last commentator, *Mr. Szasz*, referring to the ongoing meeting of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space noted that the principles on remote sensing had been approved for transmission to the main committee. While the principles do not have a great deal of positive content, they are perhaps more important for what they do not say, *i.e.*, that they do not give any right of objection to sensed states, either about the sensing itself or about the distribution of the resulting information. However, they do give those states a right to be consulted about the program of sensing, and a certain priority in receiving any resulting information, as well as some assurance against harm being done to them by the dissemination of such information.

As to nuclear power sources, the Committee worked on two of a set of five draft principles and made some slight progress. There was little done on the definition and delimitation of outer space and the character and utilization of the geostationary orbit apart from the usual extensive debate. Potential subjects to be discussed in the future included the commercialization of outer space, the question of the law to be applied to space stations, the question of the space environment and space debris, and possibly a resumption of the consideration of direct broadcasting satellites.

In conclusion, *Mr. Szasz* noted that some thought is being given to the question of improving the work of the Subcommittee, especially in view of the financial constraints in the U.N. Thought has been given to shortening the annual sessions, perhaps combining the session of the two Subcommittees with those of the main Committee. Proposals have also been made from time to time to eliminate the general discussion, but quite a few participants consider this to be an important feature of the meetings and to constitute one of the few opportunities many states have to be heard on a subject otherwise dominated by the superpowers and a few other satellite-launching states and organizations.

Following the presentations by the panelists and commentators, several of those in attendance, including *Professors Okolie, Wiessner, Impallomeni* and *Christol* commented at length. *Professor Okolie* observed with reference to the notion of international productivity that no one has the right to tell a congressman how long he could speak so long as he had a constituency which he represented and the same principle applied in the U.N. With respect to direct broadcast satellites, he noted that there was consensus on the right to receive and impart information, but the question of a sovereign right of a state becomes very important. In his view, in the Bogota Declaration, the equatorial countries wanted to give a signal calling for equitable sharing and participation.

Professor Wiessner noted that the common heritage notion was already mentioned in a 1909 North Carolina case involving solar rights. With respect to the geostationary orbit he suggested that we look at it from the viewpoint not of *res communis* but of *res publica internationalis,* which would include a system of international administration.

Mr. Kenneth Finch drew attention to the ABM Treaty and noted the opposing views which were presented in an earlier panel discussion of the Society. *Professor Impallomeni* raised the issue of new technologies in relation to the space treaties. Finally, *Professor Christol* expressed the hope that the quality of international agreements will be improved in the future. As to arms control, the question was whether we should go the route of the United Nations, and this matter was open for consideration. The provisions on arms control in the Outer Space Treaty came about as a result of an agreement between the United States and the Soviet Union to come together on those issues, and on that ground it would be again necessary for the United States and the Soviet Union to get together on basic issues of arms control with respect to anti-satellites and ballistic missiles. Whether this will result in a treaty is open to question. It is important not to involve ourselves in international legislation until

we have confidence that we have means of verification and that the strategic stability of the two countries is to be advantaged, then possibly the need for a bilateral agreement and eventual United Nations action may ultimately arise.

Stephen Gorove
Chair, Session on "Treaty Law
and Outer Space,"
ASIL 1986 Annual Meeting

5. *"The Shuttle Disaster and Issues of Liability," Mississippi State Bar Convention, Biloxi, June 6, 1986*

Issues of liability arising out of the recent Shuttle disaster was the topic of *Professor Stephen Gorove's* presentation during the annual meeting of the Mississippi State Bar in Biloxi on June 6, 1986.

In his address, *Professor Gorove* emphasized that the law which regulates human activity has tried to keep abreast of the scientific and technological developments both at the national and international levels and, as a part of that effort, also attempted to deal with issues of liability that may arise out of such developments. He noted that the area of liability can present complex situations in view of the applicability of international law, domestic law and foreign law in a given case. Tragic as it was, the accident could have been much worse if the Challenger had fallen on a French ocean liner or if there had been some foreign involvement that would have triggered the application of provisions in the Outer Space Treaty of 1967 or the Liability Convention of 1972 which deal with international responsibility for national activities and international liability for damage caused by space objects.

Recalling briefly the Challenger disaster, *Professor Gorove* noted that seven people, including three NASA employees, two military personnel and two space flight participants, were killed following an explosion in the air aboard the Shuttle shortly after takeoff from the Kennedy Space Center. The explosion was allegedly caused by the burnout of a seal in the right solid rocket booster which then blowtorched the External Liquid Fuel Tank, and the issue that the investigation had to determine was whether the cold weather, assembly problems, the way the joints flex when the rocket ignites, or something else caused the burnout.

Turning to the specific legal issues, *Professor Gorove* noted that the applicable law differs in relation to the three categories of people on the Shuttle. NASA employees are governed by the Federal Employees Compensation Act under which suits against the United States under a federal liability statute, like the Federal Tort Claims Act, are barred. However, the families of such employees could bring claims against NASA through administrative channels. The NASA Administrator has the discretion to settle claims up to $25,000 or more with the Attorney General's approval. In meritorious cases a higher amount may be awarded with Congressional approval.

As to the military personnel, the Federal Tort Claims Act does not apply to the "combatant" activities of the military which under judicial interpreta-

tion basically means activities arising out of or in the course of military duty. However, there is compensation available under the law dealing with the death or injury of servicemen. As in the case of NASA employees, the families of military personnel could bring a claim against NASA through administrative channels.

As to the third category of people, the space flight participants—*i.e.*, the people whose presence on the Shuttle is authorized—they are required under NASA regulations to enter into an agreement with NASA regarding pre-flight, flight and post-flight activities. Such agreement is to govern responsibilities and authorities of the parties, compensation where appropriate, insurance and liability. While the insurance coverage provided by her school for *Crista McAuliffe*, was not in effect during her Shuttle flight, there was a separate insurance amounting to one million dollars bought for her by a Washington firm. However, there were no waivers of liability and the families of space flight participants could bring a claim against NASA under the Federal Tort Claims Act after exhausting the remedies available through administrative channels.

Under the Federal Tort Claims Act, the families would have to show negligence on the part of the government employee acting within the scope of employment, damage and proximate causation. As interpreted by the courts, they must also show that the negligent act was not a discretionary (or planning level) decision but a decision at the operational level. For instance, time scheduling of flights may be regarded as a planning level decision but the decision to launch at a specific time may be classified as an operational decision which, if negligent, would not bar suits under the Federal Tort Claims Act.

The families of all astronauts could bring an action against the manufacturer. For liability to lie, the courts may require proof of negligence, as in a Mississippi case where action by landowners whose property was damaged when a rocket exploded at the Mississippi test facility was dismissed for lack of proof of negligence. However, in other jurisdictions there may be strict liability. Also, it should be kept in mind that the government contractor defense may be available in suits brought by a serviceman if (a) the government is immune from suit: (b) if the government established or approved the design, (c) the product was manufactured in accordance with the design, and (d) the manufacturer warned the government about patent defects in the design.

If the government contractor defense is not available, the contractor may sue the government for indemnity or the contractor may have an indemnification agreement with the government, in which case the government could end up paying any liability judgment against the contractor. There was no indemnification agreement with the manufacturer of the solid rocket booster.

As to any Shuttle user's property loss, as a rule there are inter-party waivers and cross-waivers of liability between the Shuttle users and NASA included in the launch services agreement.

In conclusion, *Professor Gorove* expressed his belief that it was likely that there would be no suits brought against NASA by families of the Shuttle participants but their claims, if any, would be settled out of court. There was also

a fair chance that any suit brought against the manufacturer would also be settled out of court much like the suit arising out of the Apollo capsule fire.

Stephen Gorove
Chairman, Ed. Board
JOURNAL OF SPACE LAW

(b) *Short Accounts*

6. *Establishment of the International Institute of Air and Space Law at the State University of Leyden*

The historical commitment to and the keen interest of the Faculty of Law at the State University of Leyden in the development of international law and, as part of it, air and space law has prompted the establishment of the International Institute of Air and Space Law.

An old and venerable institution, the State University of Leyden was founded in 1575 and among others, *Hugo Grotius,* the father of international law, studied at its Faculty of Law. *Professor Goedhuis* occupied the first professional chair of air law, and since 1977 *Professor Henri A. Wassenbergh* has been occupying the chair, which has been extended to space law.

According to its recent brochure, the Institute's objectives are: to conduct and promote research in the field of air and space law; to issue publications on air and space law; to contribute to the development of air and space law; to create a center of up-to-date information on developments in air and space law; to teach air and space law to all interested parties; and to actually assist in the safe and economic conduct of international air transport services and space activities. The Institute intends to reach its objectives by: collecting and analyzing literature from the subject; organizing courses, seminars, symposia and conferences; entering into and maintaining contacts with persons and institutions committed to the objectives of the Institute; and realizing projects related to air and space law, both on a national and international scale.

The Institute has a distinguished board of directors. *Professor Wassenbergh* serves as its chairman; *Professors I.H.Ph. Diederiks-Verschoor* and *Peter H. Kooijmans* as its vice-chairmen. Among the Institute's members are Professors *Bin Cheng, Karl-H. Böckstiegel, Jacqueline Duteilh de la Rochere* and *Peter P.C. Haanappel.* The head of the Institute's Secretariat is *H. Peter van Fenema.*

The Institute has been established in an era characterized by man's increasing air and space activities. The formulation of laws and regulations governing air and space activities and dealing with problems of both public and private law has become an overriding necessity. The Institute intends to be an international center that would contribute to the development of new air and space laws and to the solution of the associated problems. Viewed in this light, the establishment of the Institute is a most welcome addition to existing institutes in other countries.

Stephen Gorove
Chairman, Editorial Board
JOURNAL OF SPACE LAW

7. *International Space Law Panel, 1986 Annual Meeting of the International Studies Association, Anaheim, California*

On March 27, 1986 a panel of the international law section considered "Arms Control and Disarmament: The U.S. Soviet Dialogue." Organized by *Professor Carl Q. Christol* of the University of Southern California the participants focused on research devoted to analysis of the international legal ramifications of current and planned space technology.

Professor Christol's paper was entitled "The Pros and cons of the Strategic Defense Initiative in the Context of the 1985-1986 Geneva Negotiations." *Professor Davis S. Myers* of the University of West Florida presented a paper on "Meaning and Faults of Recent Soviet Proposals to the United Nations on the Militarization of Space." *Professor Colleen Driscoll Sullivan* of Villanova University considered "Beyond National Technical Means: Removing Verification from the Superpower Struggle, a Role for Third States."

Joining the panel, which was co-sponsored with the American-Soviet Relations section of the Association, were *Professor Siegfried Wiessner* of the law faculty of St. Thomas University and *Dr. Sergey M. Rogov,* First Secretary of the Soviet Embassy in Washington.

Professor Christol expressed the view that in the world's search for strategic stability the outlooks of the United States and of the Soviet Union were of critical importance. He pointed to the fact that the two countries had a unity of interest in three areas: (1) where life threatening activities might occur, (2) where the non-use of force would benefit them, and (3) in the need for stabilized space relations. He provided examples of treaties to which the two countries were parties in which such interests were being advanced. He examined in some detail the relationships between the two countries before and after the March 23, 1983 SDI proposal. He identified the political aspects of the SDI and suggested that the SDI played a role in inducing the Soviet Union to agree in 1985 to meet with the United States to consider space weapons and both intermediate range and strategic ballistic missiles as well as to participate in the November 1985 Summit.

Professor Myers examined the militarization of space and made the distinction between militarization and weaponization. His paper examined the draft treaties submitted by the Soviet Union to the United Nations in 1983 and in 1984 and also the Soviet proposed resolutions of 1984 and 1985. He noted the general lack of support for the draft treaties. He also pointed to resolutions adopted by the General Assembly that took into account general concerns about the militarization of space. In his view strategic stability would be advanced by the entry into force of a convention banning the development and deployment of weapons in space, particularly if the agreement received very wide-ranging support and if it were adhered to strictly by the parties.

Professor Sullivan urged that the interests of humanity required that

world space policy be suitably influenced by the views of all countries, not just the United States and the Soviet Union. These other States were now challenging the military and commercial monopolies of the two space powers. In particular European countries were seeking an independent approach to both military and commercial activities. The example of SPOT, the European sensing satellite, was cited to demonstrate a superior photographic resolution. In her view greater attention should be given to the French proposal for an international satellite monitoring agency (ISMA), as well as to efforts in Europe to create a regional body. The world, in her view, should accept the challenges of the space and its natural resources for peaceful purposes.

Professor Wiessner considered that bilateral efforts on the part of the United States and the Soviet Union to achieve a strategic stability suitable to them might put Europe into a precarious position, particularly if the nuclear umbrella over Europe were to be replaced by defense policy based on land, air, and naval forces, where the Soviet Union might be superior. He was not critical of the concept of strategic stability. Rather, he wondered how the doctrine might affect the security of European countries. *Professor Wiessner* also asked whether an operational SDI might, as a result of its long-time occupancy of orbital position, violate Article II of the 1967 Principles Treaty which prohibits the exercise of exclusive rights to outer space, including orbital positions.

Dr. Rogov challenged *Professor Christol's* perception of the failure of the United States and the Soviet Union to meet in Vienna in September, 1984 to consider the future role of ASATs. He denied, as *Professor Christol* asserted, that the United States had accepted the Soviet invitation to meet without putting forward any "preconditions." *Dr. Rogov* also viewed the research efforts in the United States on the SDI to be a stumbling block in the way of effective negotiations between the United States and the Soviet Union relating to space weapons, intermediate range and strategic ballistic missiles. He called particular attention to the conciliatory position with respect to the armament of outer space advanced by the Soviet General Secretary in his January 15, 1986 proposal and in his remarks on February 26, 1986 at the 27th Party Congress of the Communist Party of the Soviet Union. In *Dr. Rogov's* view outer space would be best reserved for peaceful uses if a ban prior to deployment of weapons could be achieved.

Dr. Rogov noted that the Russian language does not contain the word "weaponization," and that "militarization" would have to suffice. In response to *Dr. Sullivan's* reliance on verification by an international intergovernmental body, he thought that there should also be bilateral procedures. The Soviet Union recognizes the importance of on-site inspections of nuclear testing, but even this kind of verification is not perfect.

Carl Q. Christol
Professor of International Law
and Political Science
University of Southern California

8. *Other Events*

"An International Business in Space", conference was held on January 15-17, 1986, in Washington, DC. It dealt with international participation in the space station program, commercial applications in satellite technology, materials processing and manufacturing, remote sensing, shuttle uses, risk financing and insurance matters.

"Challenges and Opportunities in Satellite Communications" was the theme of a conference presented by the Phillips Publishing Company on April 3-4, 1986, in Washington, DC. The sessions were devoted to a discussion of issues of insurance and financing, the role of satellites in broadcasting, recent developments affecting INTELSAT, regulatory and international matters and a prognosis for the future.

Military Space sponsored a conference on the "SDI: Critical Issues for Space Deployment" on April 21, 1986, in Arlington, Virginia.

EUROSPACE held its US-European conference on "Cooperation in the International Space Station System" in Venice, April 22-24, 1986.

The AIAA Technical Committee on Legal Aspects of Aeronautics and Astronautics held a group discussion on issues of space commercialization during the Annual Meeting of the AIAA on May 1, 1986, in Arlington, Virginia.

The Office of Technology Assessment organized a workshop on "Space Stations and the Law" on May 2, 1986, in Washington, DC.

The second Columbus Workshop, held on June 9-11, 1986, in Hanover, Federal Republic of Germany, dealt with COLUMBUS system definition and utilization concepts as well as the political, commercial and industrial aspects of International Space Station Cooperation.

The Institute of Air and Space Law of the University of Cologne, The German Society for Aeronautics and Astronautics, The Aerospace Industries Association, in co-operation with the Federal Ministry for Research and Technology of the Federal Republic of Germany co-sponsored an international colloquium on "Commercial Use of Space Stations—the Legal Framework of Transatlantic Cooperation" on June 12-13, 1986, in Hanover.

9. *Brief News*

FCC grants permission for the operation of FINANSAT, an international satellite system that will compete with INTELSAT. . . . The first communications satellite system is to be established in Ireland. . . . Superbowl XX was shown aboard the Queen Elizabeth II in the first live television transmission via satellite to the high seas. . . . Canada redesigns its proposed space station servicing facility. . . . *Voyager* sends back detailed images of Uranian moons. . . . The Soviet Union advocates international effort toward a manned mission to Mars. . . . The National Commission on Space proposes Human Settlements on the Moon by 2017 and on Mars by 2027. . . . China enters the international commercial launch market. . . . NASA approaches final decision about the US/International Space Station Configuration. . . . The federal deficit reduction legislation may limit U.S. space research for many years. . . .

The Soviets embark on an all-encompasing space exploration program and declare that their "MIR" space station puts the U.S. way behind in the space race. . . . Hungary is the first country in Eastern Europe to receive western TV programs via satellite. . . . The U.K.'s National Space Center which was set up last year centrally to coordinate space policy is preparing a 10-year development plan. . . . Korea is to receive telecommunications equipment for the summer olympics. . . . A French astronaut may fly to the Soviet space station. . . . Commercial distribution of data from the French remote sensing satellite system, Spot, was started.

B. *Forthcoming Events*

The second NASA symposium on the Space Station—Preliminary Design and Program Status is scheduled to be held on August 18-20 1986, in Washington, DC.

The University of North Dakota is planning a conference on "Law and Life in Space", on September 11-13, 1986.

As reported in our previous issue, the 1986 Colloquium on the Law of Outer Space will be held in Innsbruck, Austria, from October 5 to October 11, 1986. The topics for discussion include: I. Legal Aspects of Maintaining Outer Space for Peaceful Purposes; II. Legal Aspects of Space Communications, including the Geostationary Orbit and the Services Utilizing It; III. Commercialization of Space Activities; and IV. the Teaching of Space Law and History.

The American Branch of the International Law Association, the Association of the Bar of the City of New York, the American Foreign Law Association, and the American Society of International Law are planning a discussion of international telecommunications issues during the 1986 International Law Weekend, on October 31-November 1, 1986, in New York City.

U.S. Congress, Office of Technology Assessment, *International Cooperation and Competition in Civilian Space Activities; Remote Sensing and the Private Sector: Issues for Discussion; UNISPACE '82: A Context for International Cooperation and Competition; Anti-Satellite Weapons, Countermeasures, and Arms Control; Ballistic Missile Defense Technologies; Arms Control in Space—Workshop Proceedings.* (Washington, D.C., 1983-85).

The Office of Technology Assessment (OTA) was created in 1972 to help Congress anticipate and manage the physical and social consequences of technology development. The basic function of the OTA is to supply information to congressional committees in the form of published reports.

Since 1980, the OTA has produced twelve reports dealing with civilian and military space issues. Some of these reports focused on issues of technology and U.S. public policy; others focused on international relations, trade, and the strategic balance. International and domestic legal issues, although often not the primary focus of the reports, were considered to some degree in many of the reports. The following material briefly describes those OTA reports that considered in some meaningful way issues of space law.

In *International Cooperation and Competition in Civilian Space Activities* (OTA-ISC-239, July 1985), the OTA noted that Europe, Japan, and Canada have developed substantial space programs and are now building space systems that compete commercially with U.S. space technology. At the same time, these countries have also become more capable partners for cooperative ventures in space science and space applications. This report examines the consequences of increased competition and cooperation for the U.S. Government and for the U.S. private sector. The report discusses current domestic legal issues in satellite communications, such as the extent to which private U.S. companies should be allowed to compete with INTELSAT and COMSAT, and discusses international issues such as recent calls for assured access to the geostationary orbit and the radiofrequency spectrum. The report describes the U.S. domestic policy issues and the environment that led to the writing of the "Commercial Space Launch Act" (Public Law 98-575) and the "Land Remote-Sensing Act" (Public Law 98-365).

Remote Sensing and the Private Sector: Issues for Discussion (OTA-TM-ISC-20, March 1984), was prepared to help Congress understand the issues raised by the transfer of the Government's Land Remote Sensing Systems (Landsat) to the private sector. The report examines issues such as the cost of transferring the system, the potential international repercussions of such a transfer, the size of the private remote sensing market, and the effect on national security. This report provides a unique background for understanding the congressional concerns expressed in the "Land Remote-Sensing Act of 1984" (Public Law 98-365).

In August 1982, delegates from 94 countries and several specialized agencies met in Vienna, Austria to discuss the state of space technology, its potential, and the political issues that derive from using such technology. *UNISPACE '82: A Context for International Cooperation and Competition* (OTA-TM-STI-19, March 1983), another technical memorandum, describes the international attitudes (in particular, the attitudes of the developing countries) with respect to the militarization of space, direct broadcast by satellite, remote sensing, the geostationary orbit, and technology transfer. The memorandum assesses the manner in which the United States Government prepares for international conferences and the role the private sector can play in such preparation.

In *Anti-Satellite Weapons, Countermeasures, and Arms Control* (OTA-ISC-281, Sept. 1985), the OTA analyzes the military utility of space systems, describes the technical characteristics and military value of anti-satellite (ASAT) weapons, and discusses the effectiveness of a number of satellite defenses and technical countermeasures. In addition, the report examines how various levels of ASAT arms control might contribute to U.S. national security when combined with various survivability measures and various levels of ASAT development and deployment. This report contains a detailed history of attempts at ASAT arms control and describes how treaties and international agreements in force constrain ASAT development.

A report entitled *Ballistic Missile Defense Technologies* (OTA-ISC-254, Sept. 1985) examines the potential roles of various levels of ballistic missile defense (BMD) deployments in U.S. national defense strategy and the potential implications of BMD for strategic stability and arms control. The report explains and assesses the status of the new technologies applicable to BMD and describes the character and implications of a range of alternative research programs Congress may wish to consider. The report contains two appendices, one of which examines the effect of the ABM Treaty on the current U.S. BMD program and the other of which examines the effect of BMD deployment on other existing arms control treaties.

In 1983, the OTA convened a meeting of experts in space technology, international diplomacy, and defense strategy to discuss not only the new generation of space weapons being considered but also potential arms control measures to limit such weapons. *Arms Control in Space—Workshop Proceedings* (OTA-TM-ISC-26, March 1983), portrays the concerns, the agreements and disagreements, and the insights gathered during the workshop.

A complete list of OTA reports on space, information on the nature and status of ongoing assessments, or a list of other available publications may be obtained by writing or calling: Congressional and Public Affairs, Office of Technology Assessment, U.S. Congress, Washington, D.C. 20510, (202) 226-2115.

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Space Stations—Legal Aspects of Scientific and Commercial Use in a Framework of Transatlantic Cooperation, edited by Karl-Heinz Böckstiegel (Carl Heymanns Verlag, Köln, 1985), pp. 253.

This publication presents the proceedings of an international Colloquium held in Hamburg, West Germany, on October 3 and 4, 1984, which brought together leading authorities from North America and Western Europe to discuss the legal aspects of space stations. Of the fifteen presentations made at the Colloquium, three were given in German and are so printed in the book. However, each of these German texts is summarized in English. The sheer number of presentations prevents more than a brief treatment of the message that some of the speakers conveyed.

Eilene Galloway's presentation entitled "The Relevance of General Multilateral Space Conventions to Space Stations" substantiates the limited applicability of existing multilateral treaties to the space station theater. She points out the need for more information on proposed/planned activities to be carried out on space stations and information on their design in order for space law scholars to come to a consensus on legal issues and their solutions. *Mrs. Galloway* emphasizes that in order to encourage extremely desirable international cooperation in space station enterprises, there is a great need for certainty in contracting which can only be achieved if there is common understanding of terminology. In order to accomplish this end, she suggests computerized analysis of existing multilateral agreements so as to identify and resolve conflicts in the meaning of the terminology.

"Agreements Between States and With International Organizations" was the paper presented to the Colloquium by *Dr. Michel G. Bourély*. His purpose was to look at past and current cooperative ventures in outer space in order to anticipate what types of future agreements between states for construction, transport, assembly, and operation of space stations should be forthcoming. *Dr. Bourély* discusses the cooperative efforts of the United States and the European Space Agency which built the Space Lab for NASA's Space Shuttle as an example of a relevant precedent. President Reagan's current space station program for international cooperation and the agreements of the European Space Agency (EPA) are illustrative cases in point. *Dr. Bourély* finds that future agreements between states for projects such as space stations should, from an operational standpoint at least, address the following concerns: ownership of hardware, use and access rights, jurisdiction over personnel and property, registration, international liability, and intellectual property rights.

In his presentation, "The Space Station—Past, Present, and Future with Some Thoughts that Need to be Addressed", *S. Neil Hosenball*, then General Counsel of NASA, identified some of the many legal questions which have thus far been posed regarding space stations. He points out that Congress has recently been concerned with extending tax and patent laws to the Space Shuttle and the Space Station. Due to the long stay time aboard the Space Station there is also a need to extend application of tort law within its confines where the Liability Convention is without effect.

Professor *Stephen Gorove* of the University of Mississippi Law Center

presented information on the topic of "Legal Aspects of Stations in Space." He first discusses the issue of whether a space station is a space object within the meaning of existing treaties and agreements wherein their provisions would apply to its operation. The second issue discussed by Professor *Gorove* is references to space stations under existing space treaties. He identifies four categories of space stations under current international law to each of which different rules apply. Professor *Gorove* also touched upon a myriad of other issues which must be addressed in order for the international law to prepare for the emergence of space stations as realities.

Other papers, dealing with future space stations, contained in the book deal with such topics as models for future space agreements, construction, transport, and assembly in space, contracts law and dispute settlement, insurance, state supervision and registration, exploitation of data and products, aspects of law and practice, and experiences of the European Space Agency.

This publication is a comprehensive work on what may still be characterized as the forefront of the subject of legal issues concerning space stations. But the book does well to portray an air of restrained urgency in the field, based upon realization that international law pertaining to space stations should not be formulated without a sufficient data base upon which to build.

The INTELSAT Global Satellite System, edited by Joel Alper and Joseph N. Pelton (American Institute of Aeronautics and Astronautics, Progress in Astronautics and Aeronautics, vol. 93, 1984), pp. 425.

The INTELSAT Global Satellite System was published during INTELSAT's 20th anniversary year. The editors of this book, *Joel Alper* and *Joseph N. Pelton*, in view of INTELSAT's 20th birthday, have put together an interesting array of articles from various persons who have played important roles throughout the years in the development of INTELSAT. In this singular volume, INTELSAT's past is recounted, its present is set fourth, and its future is examined. As stated by the editors, "This book is at once a history, a description of INTELSAT's current technological and operational features, an analysis of the policy issues that face the organization in an increasingly complex international telecommunications environment, and a long-range look ahead."

The contributors to this book examine many facets of INTELSAT. *Arthur Clarke* discusses the birth of the communications satellite while *Santiago Astrain* gives a succinct yet comprehensive overview of satellite communications through the years, with particular emphasis placed on the development of INTELSAT. *F.C. Durant, III*, travels back to the middle ages and from there traces the evolution of the thought processes that eventually led to the feasibility of space flight. *Burton Edelson* discusses the many years prior to the proliferation of communications satellites when technological concepts were hammered out and satellite communications endured an experimental period that provided the technology with which INTELSAT was eventually created. Expanding on *Astrain's* article, *Richard Colino* gives a detailed overview of INTELSAT's organizational setup with careful analysis of much of the INTELSAT Agreement and also discusses challenges and policy issues presently

facing INTELSAT.

One interesting article by *D. Withers* and *H. Weiss* addresses the ramifications of INTELSAT's operations in light of the activities of the International Telecommunications Union. A few of the authors address in some detail INTELSAT satellites (*E. Podraczky, J. Pelton*), INTELSAT's practical operations (*H. W. Wood*), and new INTELSAT services (*M. Perras*). Technical aspects of INTELSAT are well covered in a wide range of articles on topics such as the Earth segment (*K. Nosaka*), transmission techniques (*G. Quaglione*), INTELSAT system planning (*W. R. Schmicke*), and research and development (*D. K. Sachdey*). The last two articles in the book discuss the future of INTELSAT in the postinformation society (*J. Pelton, J. Alper*) as well as INTELSAT's role in the emerging world of the telecommunications system (*J. V. Charyk, I. Goldstein*).

With such a wide array of articles, any reader is assured of gaining valuable insight into the past, present, and future workings of the INTELSAT global satellite system.

Communication Satellites: Power Politics in Space, by Larry Martinez (Artech House, Inc., 1985), pp. 186.

Various technological innovations around the world have greatly altered the many ways in which people "create, store, process, and use information." In *Communication Satellites: Power Politics in Space, Mr. Martinez* examines the complicated political questions that surround satellite communications, one type of information technology. For instance, he asks, "How do information technologies change the military, economic and political relationships between countries in the international system?." Does technology follow political direction or is the reverse true?

Also pointed out are the ways that information technologies affect the individual countries and the ways that these effects are ultimately interpreted in the international realm. It is asserted, for example, that national power may become more and more based on a nation's "information competence," i.e., the nation's ability to process and communicate information.

In going into some detail to explain the connection among communications, information competence, and national power, *Mr. Martinez* points out the importance of not only access to communications technology but also the ability to use such technologies. To use laymen's terms, this book examines the process of figuring out "who gets what," since the outer space resources involved—the geostationary satellite orbit and the radio frequency spectrum—are limited. As correctly pointed out by the author, "While the problems of satellite congestion appear technical, the universe of possible solutions is ultimately funneled by politics—the power interests of States."

For those interested in understanding the international concerns surrounding the growing area of satellite communications, this book suggests itself as a good starting point.

Outer Space—New Challenge to Law and Policy, by J. E. S. Fawcett (Clarendon Press, Oxford 1984), pp. 159.

This concise work provides considerable technical and scientific information interspersed with international law on various topics at the forefront of controversy concerning use of outer space. Professor *Fawcett* has divided his book into nine chapters each of which merits brief independent attention here.

The initial chapter, "The Province of Mankind," excerpts several provisions of various international treaties concerning the utilization of space and makes comparisons to the Law of the Sea Treaty. Chapter Two, "Uses of Outer Space," introduces the technical aspect of the publication. It provides general information on present and anticipated future uses of space with emphasis on the liability of nations for space activities. The uses and liabilities for satellites receive particular attention. The third chapter, "Space Operations," deals mainly with the controversy surrounding increasing activity in space by private enterprise. Also briefly described are regional agencies such as Intersputnik, ESA, and Arabsat. Telecommunications is the topic of chapter four, which can be considered the heart of the book. The discussion of this subject is an effective blend of historic, technical, and legal information of satellite reflected telecommunications. Present regulations in the form of international agreements and cooperative efforts and the need for future management of the orbiting satellite "resource" are aptly detailed.

Chapters five and six deal briefly with the subjects of remote sensing from outer space and space stations, respectively. Of particular interest here is the discussion of uses of space stations as energy plants, factories, and processing plants. The seventh chapter, "Astronomical Observation," is an interesting brief on the subjects of astronomy and cosmology which are distinguished and elaborated upon in concise technical detail. The main thrust of the section is the historical yet increasing conflict between the pure science of astronomical observation and competing economic and military objectives. Military uses are the concern of chapter eight, "Strategic Uses of Outer Space," which deals with weaponry, surveillance, and briefly with counteraction against satellites. The final chapter, entitled "A General View," is a summary of reasons for past and present conflict among nations concerning outer space and why such conflict will probably increase in intensity. Appendices include a list of principal events in the exploration of outer space and treaties and conventions concerning its use.

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I.

Report of the Presidential Commission on the Space Shuttle Challenger Accident (June 6, 1986) (Excerpts)

Chapter IV

The Cause of the Accident

The consensus of the Commission and participating investigative agencies is that the loss of the Space Shuttle Challenger was caused by a failure in the joint between the two lower segments of the right Solid Rocket Motor. The specific failure was the destruction of the seals that are intended to prevent hot gases from leaking through the joint during the propellant burn of the rocket motor. The evidence assembled by the Commission indicates that no other element of the Space Shuttle system contributed to this failure.

In arriving at this conclusion, the Commission reviewed in detail all available data, reports and records; directed and supervised numerous tests, analyses, and experiments by NASA, civilian contractors and various government agencies; and then developed specific failure scenarios and the range of most probable causative factors. The sections that follow discuss the results of the investigation. . . .

Chapter V

The Contributing Cause of the Accident

The decision to launch the Challenger was flawed. Those who made that decision were unaware of the recent history of problems concerning the O-rings and the joint and were unaware of the initial written recommendation of the contractor advising against the launch at temperatures below 53 degrees Fahrenheit and the continuing opposition of the engineers at Thiokol after the management reversed its position. They did not have a clear understanding of Rockwell's concern that it was not safe to launch because of ice on the pad. If the decisionmakers had known all of the facts, it is highly unlikely that they would have decided to launch 51-L on January 28, 1986. . . .

II.

RESOLUTION ADOPTED BY THE GENERAL ASSEMBLY *

[on the report of the First Committee (A/40/964)]

40/87. Prevention of an arms race in outer space

The General Assembly,

Inspired by the great prospects opening up before mankind as a result of man's entry into outer space,

Recognizing the common interest of all mankind in the exploration and use of outer space for peaceful purposes,

Reaffirming that the exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind,

Reaffirming further the will of all States that the exploration and use of outer space, including the Moon and other celestial bodies, shall be for peaceful purposes,

Recalling that the States parties to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1/ have undertaken, in article III, to carry on activities in the exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law and the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international co-operation and understanding,

Reaffirming, in particular, article IV of the above-mentioned Treaty, whic.. stipulates that States parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies or station such weapons in outer space in any other manner,

Reaffirming also paragraph 80 of the Final Document of the Tenth Special Session of the General Assembly, 2/ the first special session devoted to disarmament, in which it is stated that, in order to prevent an arms race in outer space, further measures should be taken and appropriate international negotiations held in accordance with the spirit of the Treaty,

Recalling its resolutions 36/97 C and 36/99 of 9 December 1981, as well as resolutions 37/83 of 9 December 1982, 37/99 D of 13 December 1982, 38/70 of 15 December 1983 and 39/59 of 12 December 1984,

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1/ Resolution 2222 (XXI), annex.

2/ Resolution S-10/2.

* Taken from A/RES/40/87, 14 January 1986.

Gravely concerned at the danger posed to all mankind by an arms race in outer space and in particular by the impending threat of exacerbating the current state of insecurity by developments that could further undermine international peace and security, retard the pursuit of general and complete disarmament, and risk creating obstacles to the development of international co-operation in the peaceful uses of outer space,

Mindful of the widespread interest expressed by Member States in the course of the negotiations on and following the adoption of the above-mentioned Treaty in ensuring that the exploration and use of outer space should be for peaceful purposes, and taking note of proposals submitted to the General Assembly at its tenth special session and at its regular sessions and to the Conference on Disarmament,

Noting the grave concern expressed by the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space over the extension of an arms race into outer space and the recommendations made to the competent organs of the United Nations, in particular, the General Assembly, and also to the Committee on Disarmament, 3/

Convinced that further measures are needed for the prevention of an arms race in outer space,

Recognizing that, in the context of multilateral negotiations for preventing an arms race in outer space, bilateral negotiations between the Union of Soviet Socialist Republics and the United States of America could make a significant contribution to such an objective, in accordance with paragraph 27 of the Final Document of the Tenth Special Session,

Noting with satisfaction that bilateral negotiations between the Union of Soviet Socialist Republics and the United States of America have begun in 1985, on a complex of questions concerning space and nuclear arms, both strategic and intermediate-range, and in their interrelationship, with the declared objective of working out effective agreements aimed, inter alia, at preventing an arms race in outer space,

Anxious that concrete results should emerge from these negotiations as soon as possible, as was urged in resolution 39/59,

Taking note of the section of the report of the Conference on Disarmament relating to this question, 4/

Welcoming the establishment of an Ad Hoc Committee on the prevention of an arms race in outer space during the 1985 session of the Conference on Disarmament, in the exercise of the negotiating responsibilities of this sole multilateral negotiating body on disarmament, to examine, as a first step at this stage, issues relevant to the prevention of an arms race in outer space,

Mindful that consensus had not yet been reached in the Conference on Disarmament on concrete proposals for re-establishing the ad hoc committee on this question during the 1986 session of the Conference on Disarmament,

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3/ See Report of the Second United Nations Conference on the Exploration and Peaceful Use of Outer Space, Vienna, 9-21 August 1982 (A/CONF.101/10 and Corr. 1 and 2), paras. 13, 14 and 426. The Committee on Disarmament was redesignated the Conference on Disarmament as from 7 February 1984.

1. Recalls the obligation of all States to refrain from the threat or use of force in their space activities;

2. Reaffirms that general and complete disarmament under effective international control warrants that outer space shall be used exclusively for peaceful purposes and that it shall not become an arena for an arms race;

3. Emphasizes that further measures with appropriate and effective provisions for verification to prevent an arms race in outer space should be adopted by the international community;

4. Calls upon all States, in particular those with major space capabilities, to contribute actively to the objective of the peaceful use of outer space and to take immediate measures to prevent an arms race in outer space in the interest of maintaining international peace and security and promoting international co-operation and understanding;

5. Requests the Secretary-General to invite Member States to submit their views on the possibility of enhancing international co-operation in the field of preventing an arms race in outer space and the peaceful uses of outer space, including the desirability of establishing relevant machinery for that purpose, and to submit a report to the General Assembly at its forty-first session;

6. Reiterates that the Conference on Disarmament, as the single multilateral disarmament negotiating forum, has the primary role in the negotiation of a multilateral agreement or agreements, as appropriate, on the prevention of an arms race in outer space in all its aspects;

7. Requests the Conference on Disarmament to consider as a matter of priority the question of preventing an arms race in outer space;

8. Also requests the Conference on Disarmament to intensify its consideration of the question of the prevention of an arms race in outer space in all its aspects, taking into account all relevant proposals including those presented in the ad hoc committee on the prevention of an arms race in outer space at its 1985 session and at the fortieth session of the General Assembly;

9. Further requests the Conference on Disarmament to re-establish an ad hoc committee with an adequate mandate at the beginning of its session in 1986, with a view to undertaking negotiations for the conclusion of an agreement or agreements, as appropriate, to prevent an arms race in outer space in all its aspects;

10. Urges the Union of Soviet Socialist Republics and the United States of America to pursue intensively their bilateral negotiations in a constructive spirit aimed at reaching early agreement for preventing an arms race in outer space, and to advise the Conference on Disarmament periodically of the progress of their bilateral sessions so as to facilitate its work;

11. Calls upon all States especially those with major space capabilities, to refrain, in their activities relating to outer space, from actions contrary to the observance of the relevant existing treaties or to the objective of preventing an arms race in outer space;

12. Invites Member States to transmit to the Secretary-General, not later than 1 April 1986, their views on the scope and content of the study being undertaken by the United Nations Institute for Disarmament Research 5/ on disarmament problems relating to outer space and the consequences of extending the arms race into outer space, and requests the Secretary-General to

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4/ Official Records of the General Assembly, Fortieth Session, Supplement No. 27 (A/40/27 and Corr. 1), sect. III.E.

5/ See A/40/725, paras. 47-54.

convey the views of the Member States to the Advisory Board on Disarmament Studies for consideration in order to enable it, in its capacity of Board of Trustees of the Institute, to give the Institute such possible guidance with respect to the elaboration of its study as it may derive from those views;

III.

RESOLUTION ADOPTED BY THE GENERAL ASSEMBLY *

[on the report of the Special Political Committee (A/40/1023)]

40/162. International co-operation in the peaceful uses of outer space

The General Assembly,

Recalling its resolution 39/96 of 14 December 1984,

Deeply convinced of the common interest of mankind in promoting the exploration and use of outer space for peaceful purposes and in continuing efforts to extend to all States the benefits derived therefrom, and of the importance of international co-operation in this field, for which the United Nations should continue to provide a focal point,

Reaffirming the importance of international co-operation in developing the rule of law, including the relevant norms of space law, for the advancement and preservation of the exploration and peaceful uses of outer space,

Gravely concerned at the extension of an arms race into outer space,

Recognizing that all States, in particular those with major space capabilities, should contribute actively to the goal of preventing an arms race in outer space as an essential condition for the promotion of international co-operation in the exploration and uses of outer space for peaceful purposes,

Aware of the need to increase the benefits of space technology and its applications and to contribute to an orderly growth of space activities favourable to the socio-economic advancement of mankind, in particular the peoples of developing countries,

Taking note of the progress achieved in the further development of peaceful space exploration and application as well as in various national and co-operative space projects, which contribute to international co-operation in this field,

Taking note also of the report of the Secretary-General 1/ on the implementation of the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, 2/

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* Taken from A/RES/40/162, 7 February 1986

1/ A/40/621 and Corr.1.

2/ See Report of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 9-21 August 1982 (A/CONF.101/10 and Corr.1 and 2).

Having considered the report of the Committee on the Peaceful Uses of Outer Space on the work of its twenty-eighth session, 3/

1. Endorses the report of the Committee on the Peaceful Uses of Outer Space;

2. Invites States that have not yet become parties to the international treaties governing the uses of outer space 4/ to give consideration to ratifying or acceding to those treaties;

3. Notes that the Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space at its twenty-fourth session, in its working groups, continued:

(a) Its detailed consideration of the legal implications of remote sensing of the Earth from space, with the aim of formulating draft principles relating to remote sensing;

(b) Its consideration of the possibility of supplementing the norms of international law relevant to the use of nuclear power sources in outer space;

(c) Its consideration of matters relating to the definition and delimitation of outer space and to the character and utilization of the geostationary orbit, including consideration of ways and means to ensure the rational and equitable use of the geostationary orbit without prejudice to the role of the International Telecommunication Union;

4. Endorses the recommendation of the Committee on the Peaceful Uses of Outer Space that the Legal Sub-Committee at its twenty-fifth session should, taking into account the concerns of all countries, particularly those of developing countries, in its working groups:

(a) Continue its detailed consideration of the legal implications of remote sensing of the Earth from space, with the aim of finalizing the draft set of principles;

(b) Undertake the elaboration of draft principles relevant to the use of nuclear power sources in outer space;

(c) Continue its consideration of matters relating to the definition and delimitation of outer space and to the character and utilization of the geostationary orbit, including consideration of ways and means to ensure the rational and equitable use of the geostationary orbit without prejudice to the role of the International Telecommunication Union;

5. Notes that the Scientific and Technical Sub-Committee on the Peaceful Uses of Outer Space at its twenty-second session continued:

(a) Its consideration of the following items on a priority basis:

(i) United Nations Programme on Space Applications and the co-ordination of space activities within the United Nations system;

3/ Official Records of the General Assembly, Fortieth Session, Supplement No. 20 (A/40/20 and Corr.1).

4/ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (resolution 2222 (XXI), annex); Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (resolution 2345 (XXII), annex); Convention on International Liability for Damage Caused by Space Objects (resolution 2777 (XXVI), annex); Convention on Registration of Objects Launched into Outer Space (resolution 3235 (XXIX), annex); Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (resolution 34/68, annex).

(ii) Implementation of the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space;

In this context, it was noted that it was particularly urgent to implement the following recommendations:

a. All countries should have the opportunity to use the techniques resulting from medical studies in space;

b. Data banks at the national and regional levels should be strengthened and expanded and an international space information service should be established to function as a centre of co-ordination;

c. The United Nations should support the creation of adequate training centres at the regional level, linked, whenever possible, to institutions implementing space programmes; necessary funding for the development of such centres should be made available through financial institutions;

(iii) Questions relating to remote sensing of the Earth by satellites;

(iv) Use of nuclear power sources in outer space;

(b) Its consideration of the following items:

(i) Questions relating to space transportation systems and their implications for future activities in space;

(ii) Examination of the physical nature and technical attributes of the geostationary orbit;

6. Endorses the recommendation of the Committee on the Peaceful Uses of Outer Space that the Scientific and Technical Sub-Committee at its twenty-third session, taking into account the concerns of all countries, particularly those of developing countries, should:

(a) Consider the following items on a priority basis:

(i) United Nations Programme on Space Applications and the co-ordination of space activities within the United Nations system;

(ii) Implementation of the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space;

In this context, it is particularly urgent to implement the following recommendations:

a. All countries should have the opportunity to use the techniques resulting from medical studies in space;

b. Data banks at the national and regional levels should be strengthened and expanded and an international space information service should be established to function as a centre of co-ordination;

c. The United Nations should support the creation of adequate training centres at the regional level, linked, whenever possible, to institutions implementing space programmes; necessary funding for the development of such centres should be made available through financial institutions;

d. The United Nations should organize a fellowship programme through which selected graduates or post-graduates from developing countries

should get in-depth, long-term exposure to space technology or applications; it is also desirable to encourage the availability of opportunities for such exposures on other bilateral and multilateral bases outside the United Nations system;

(iii) Questions relating to remote sensing of the Earth by satellites;

(iv) Use of nuclear power sources in outer space;

(b) Consider the following items:

(i) Questions relating to space transportation systems and their implications for future activities in space;

(ii) Examination of the physical nature and technical attributes of the geostationary orbit;

7. Endorses also the recommendations of the Committee on the Peaceful Uses of Outer Space:

(a) That there should be a continued consideration in the Scientific and Technical Sub-Committee of the item relating to life sciences, including space medicine;

(b) That, for the twenty-third session of the Scientific and Technical Sub-Committee, the Committee on Space Research and the International Astronautical Federation should be invited to submit reports and arrange a special presentation on progress in the geosphere-biosphere programme;

(c) That the Scientific and Technical Sub-Committee should, at its twenty-third session, give special attention to the theme "Remote sensing for developing countries" selected in accordance with the procedure recommended by the Sub-Committee at its twenty-second session and that the Committee on Space Research and the International Astronautical Federation should be invited to make presentations in accordance with this theme;

8. Endorses the United Nations Programme on Space Applications for 1986, as proposed to the Committee on the Peaceful Uses of Outer Space by the Expert on Space Applications; 5/

9. Emphasizes the urgency and importance of implementing fully the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space as early as possible;

10. Reaffirms its approval of the recommendation of the Conference regarding the establishment and strengthening of regional mechanisms of co-operation and their promotion and creation through the United Nations system;

11. Expresses its appreciation to all Governments that made or expressed their intention to make contributions towards carrying out the recommendations of the Conference;

5/ See A/AC.105/348, para. 39.

12. Invites all Governments to take effective action for the implementation of the recommendations of the Conference;

13. Urges all States, in particular those with major space capabilities, to contribute actively to the goal of preventing an arms race in outer space as an essential condition for the promotion of international co-operation in the exploration and uses of outer space for peaceful purposes;

14. Takes note of the views expressed and documents circulated during the twenty-eighth session of the Committee on the Peaceful Uses of Outer Space and during the fortieth session of the General Assembly concerning ways and means of maintaining outer space for peaceful purposes;

15. Requests the Committee on the Peaceful Uses of Outer Space to continue to consider, as a matter of priority, ways and means of maintaining outer space for peaceful purposes and to report thereon to the General Assembly at its forty-first session;

16. Endorses the recommendation of the Committee on the Peaceful Uses of Outer Space that the following three studies proposed by the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space should, together with the comments made thereon during the twenty-second session of the Scientific and Technical Sub-Committee, be called to the attention of Governments of all Member States, specialized agencies and other organizations of the United Nations system:

(a) Assistance to countries in studying their remote-sensing needs and assessing appropriate systems for meeting such needs;

(b) The feasibility of using direct broadcasting satellites for educational purposes and of internationally or regionally owned space segments;

(c) The feasibility of obtaining closer spacing of satellites in the geostationary orbit and their satisfactory coexistence, including a closer examination of techno-economic implications, particularly for developing countries, in order to ensure the most effective utilization of this orbit in the interest of all countries;

17. Also endorses the recommendation of the Committee on the Peaceful Uses of Outer Space with regard to possible further studies as set out in paragraph 48 of the report of the Committee, bearing in mind in particular the needs of the developing countries;

18. Endorses the decision of the Committee on the Peaceful Uses of Outer Space to grant, at their request, permanent observer status to the International Telecommunications Satellite Organization (INTELSAT) and to the International System and Organization of Space Communications (INTERSPUTNIK);

19. Affirms that the interference that satellite systems to be newly established may cause to systems already registered with the International Telecommunication Union shall not exceed the limits specified in the relevant provision of the International Telecommunication Union Radio Regulations applicable to space services;

20. Requests all organs, organizations and bodies of the United Nations system and other intergovernmental organizations working in the field of outer space or on space-related matters to co-operate in the implementation of the recommendations of the Conference;

21. Requests the Secretary-General to report to the General Assembly at its forty-first session on the implementation of the recommendations of the Conference;

22. Requests the specialized agencies and other international organizations to continue and, where appropriate, enhance their co-operation with the Committee on the Peaceful Uses of Outer Space and to provide it with progress reports on their work relating to the peaceful uses of outer space;

23. Requests the Committee on the Peaceful Uses of Outer Space to continue its work, in accordance with the present resolution, to consider, as appropriate, new projects in outer space activities and to submit a report to the General Assembly at its forty-first session, including its views on which subjects should be studied in the future.

118th plenary meeting
16 December 1985

IV.

Draft Principles on Remote Sensing *

Principle I

For the purposes of these principles with respect to remote sensing activities:

(a) The term "remote sensing" means the sensing of the Earth's surface from space by making use of the properties of electromagnetic waves emitted, reflected or diffracted by the sensed objects, for the purpose of improving natural resources management, land use and the protection of the environment;

(b) The term "primary data" means those raw data that are acquired by remote sensors borne by a space object and that are transmitted or delivered to the ground from space by telemetry in the form of electromagnetic signals, by photographic film, magnetic tape or any other means;

(c) The term "processed data" means the products resulting from the processing of the primary data, needed in order to make such data usable;

(d) The term "analysed information" means the information resulting from the interpretation of processed data, inputs of data and knowledge from other sources;

(e) The term "remote sensing activities" means the operation of remote sensing space systems, primary data collection and storage stations, and activities in processing, interpreting and disseminating the processed data.

Principle II

Remote sensing activities shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic, social or scientific and technological development, and taking into particular consideration the needs of the developing countries.

Principle III

Remote sensing activities shall be conducted in accordance with international law, including the Charter of the United Nations, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, and the relevant instruments of the International Telecommunication Union.

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* Taken from A/AC.105/370,pp.12-15 (1986)

Principle IV

Remote sensing activities shall be conducted in accordance with the principles contained in article I of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, which, in particular provides that the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and stipulates the principle of freedom of exploration and use of outer space on a basis of equality. These activities shall be conducted on the basis of respect for the principle of full and permanent sovereignty of all States and peoples over their own wealth and natural resources, with due regard to the rights and interests, in accordance with international law, of other States and entities under their jurisdiction. Such activities shall not be conducted in a manner detrimental to the legitimate rights and interests of the sensed State.

Principle V

States carrying out remote sensing activities shall promote international co-operation in these activities. To this end, they shall make available to other States opportunities for participation therein. Such participation shall be based in each case on equitable and mutually acceptable terms.

Principle VI

In order to maximize the availability of benefits from remote sensing activities, States are encouraged through agreements or other arrangements to provide for the establishment and operation of data collecting and storage stations and processing and interpretation facilities, in particular within the framework of regional agreements or arrangements wherever feasible.

Principle VII

States participating in remote sensing activities shall make available technical assistance to other interested States on mutually agreed terms.

Principle VIII

The United Nations and the relevant agencies within the United Nations system shall promote international co-operation, including technical assistance and co-ordination in the area of remote sensing.

Principle IX

In accordance with article IV of the Convention on Registration of Objects Launched into Outer Space and article XI of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, a State carrying out a programme of remote sensing shall inform the Secretary-General of the United Nations. It shall, moreover, make available any other relevant information to the greatest extent feasible and practicable to any other State, particularly any developing country that is affected by the programme, at its request.

Principle X

Remote sensing shall promote the protection of the Earth's natural environment.

To this end, States participating in remote sensing activities that have identified information in their possession that is capable of averting any phenomenon harmful to the Earth's natural environment shall disclose such information to States concerned.

Principle XI

Remote sensing shall promote the protection of mankind from natural disasters.

To this end, States participating in remote sensing activities that have identified processed data and analysed information in their possession that may be useful to States affected by natural disasters, or likely to be affected by impending natural disasters, shall transmit such data and information to States concerned as promptly as possible.

Principle XII

As soon as the primary data and the processed data concerning the territory under its jurisdiction are produced, the sensed State shall have access to them on a non-discriminatory basis and on reasonable cost terms. The sensed State shall also have access to the available analysed information concerning the territory under its jurisdiction in the possession of any State participating in remote sensing activities on the same basis and terms, taking particularly into account the needs and interests of the developing countries.

Principle XIII

To promote and intensify international co-operation, especially with regard to the needs of developing countries, a State carrying out remote sensing of the Earth from outer space shall, upon request, enter into consultations with a State whose territory is sensed in order to make available opportunities for participation and enhance the mutual benefits to be derived therefrom.

Principle XIV

In compliance with article VI of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, States operating remote sensing satellites shall bear international responsibility for their activities and assure that such activities are conducted in accordance with these principles and the norms of international law, irrespective of whether such activities are carried out by governmental or non-governmental entities or through international organizations to which such States are parties. This principle is without prejudice to the applicability of the norms of international law on State responsibility for remote sensing activities.

Principle XV

Any dispute resulting from the application of these principles shall be resolved through the established procedures for the peaceful settlement of disputes.

7. The Working Group held its final meeting on 11 April 1986, when it considered and approved the present report.