SPACE STATION: RISKS AND VISION

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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."