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Chapter 25

The Changing Purpose of the Space Station^{*}

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Introduction

NASA conducted its first formal studies of space stations and their applications soon after the agency was created. In the early 1970s, the Skylab program, using modified Apollo hardware, provided a brief look at the potential for an orbiting laboratory. But it wasn't until 1981 that the U.S. government set on a path to a major long-term effort to develop a permanently manned space station. When James Beggs and Hans Mark testified at their confirmation hearings for Administrator and Deputy Administrator of NASA, respectively, both pledged that a primary goal of their tenures would be initiation of a space station program.¹ The program they started three years later would last for decades and change in character many times, reflecting the changing political and economic environment.

The Fletcher Study Group

The Ronald Reagan U.S. presidential administration investigated possible hardware configurations and management structures for a space station program

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by forming a Space Station Task Force in 1982–1983. However, before that effort, a sole-source study contract was awarded to former (and future) NASA Administrator James Fletcher through the University of Pittsburgh. Among other tasks, the Fletcher study group was to “identify the key functions of a manned space station, establishing a set of priorities among them.”²

The study group delivered its report in September 1982, presenting four options for program architecture. Option 4, a “full-sized space station,” was the most ambitious of these, and closely resembles what was later proposed by NASA and the Reagan administration. However, the study group recommended that the administration choose either Option 2 (minimum manned platform) or Option 3 (intermediate manned platform) because of “the current severe restrictions on the federal budget.”

Fletcher’s group concluded that a manned station should be developed as soon as possible, stating: “The primary reason for urgency is the recent Soviet activity in space. A secondary reason is that development of the space shuttle is rapidly coming to completion and the space station is the next logical step toward a more permanent presence in space.” The notion of the space station as “the next logical step” would be emphasized frequently in the years to come by James Beggs and others. The phrase “a more permanent presence in space” would reappear also—in a space policy speech by President Reagan on 4 July 1982, which hinted at the future station but stopped short of proposing the program.³

The functions of a “full-sized space station,” as outlined by the Fletcher study group, were adopted by NASA and the Reagan administration to justify the program. As presented in a late-1985 NASA brochure,⁴ the space station would 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 node 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 and personnel, 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.

The NASA brochure also reflected the Cold War motivations expressed in the Fletcher group's report, stating that the station would also be:

- a striking example of Free World unity and capabilities; and
- a highly visible yet peaceful demonstration of U.S. leadership.

The First Major Redesign

The release of the request for proposals (RFP) for final design and full-scale development of NASA's "next logical step" was set for 3 February 1987. But just before that date, NASA Administrator James Fletcher's testimony to a Senate subcommittee would spark a major change to the program's plans. Fletcher stated that initial operations of the station would be pushed back from 1994 to 1996 and that the development cost had gone up from \$8 billion to \$13 billion. When the revised figures, with estimates as high as \$20 billion, were presented to the White House Office of Management and Budget (OMB), the release of the RFP was postponed until a cost review could be conducted by the White House. A new plan was issued two months later (3 April) that was a compromise among Fletcher, OMB Director James Miller, Science Advisor William Graham, and National Security Advisor (soon to be Secretary of Defense) Frank Carlucci. The space station would be developed in two phases, called the "Revised Baseline" and "Enhanced Capabilities" configurations, the latter being what NASA had intended to build in the first place.⁵

The RFP was finally released 24 April 1987 with industry responses due that July. But the space station had another hurdle to overcome as a result of the White House review. The National Research Council (NRC), the research arm of the National Academy of Sciences, was given the task of reviewing the design and development of the station and reporting back to the White House by September of that year. When the NRC report⁶ came out, it was a mixed blessing for NASA. For purposes of this discussion, the key conclusion of the NRC committee was that "on balance the mission priorities reflected in the Revised Baseline design are reasonable . . . The Revised Baseline would be a useful productive facility *even with the limitations noted and even if further evolution does not occur*" (emphasis added).

The "limitations noted" were that the Revised Baseline would have "only limited capabilities to accommodate attached payloads for Earth- and space-

directed observations. It has no capability for satellite servicing, construction of large space structures, or for staging manned missions to the moon or to the planets.” In other words, the Revised Baseline configuration, which would have had more capability than today’s “core complete” design, represented a reduction from eight major functions, as noted in NASA’s 1985 brochure, to just one—a national laboratory in space.

Regarding the Enhanced Capabilities configuration, also known as Block II, the NRC concluded that “a commitment to Block II at this time would be premature.” The reasons cited were that the station would be in the wrong orbit for Earth observations; astronomy and other space-directed observations would be better served by free-flying platforms; there was no strong requirement for satellite servicing; and future decisions to pursue other space goals and objectives might drive station requirements in different directions.

The NRC committee also pointed out that “The Department of Defense has not enunciated specific purposes for which it might want to use the space station.” Nonetheless, the Department of Defense chose this time to demonstrate its intent to keep its options open.

Military Interest in the Space Station

As NASA attempted to press ahead with negotiations for multinational participation in early 1987, the White House Senior Interagency Group for Space (SIG-Space) slowed down the process by drafting a “statement of U.S. position” to protect possible Department of Defense use of the space station.⁷

On 7 April 1987, Secretary of Defense Caspar Weinberger—who had said in 1983 that the station had no military utility—wrote a letter to Secretary of State George Schultz saying that the United States should pursue the space station program alone. Predictably, negotiations with international partners were delayed again, this time awaiting the results of a 16 April meeting of the National Security Council (NSC), where Weinberger stated his case. The other members of the NSC suggested that he would have to go to President Reagan and ask that he renege on the invitation he had extended to U.S. allies in his 1984 State of the Union address. At this point, Weinberger backed down—for the moment.⁸

Less than a month later, on 8 May, Weinberger wrote another letter, this time to the House Science and Technology Committee. It was delivered to the committee one day before the scheduled markup of NASA’s fiscal year (FY) 1988 authorization bill. In the letter, the defense secretary made thinly veiled attacks on particular members of the committee who were supporting an amendment to the bill that would prohibit any defense-related activity on the station. He

went so far as to accuse them of succumbing to “Soviet propaganda.”⁹ He later apologized to the committee for some of his remarks, having stimulated some strong reactions.¹⁰

This episode resulted in a statutory requirement for the Department of Defense to submit a report to the committee outlining any projects planned for the space station. Frank Carlucci, Weinberger’s successor, delivered a seven-page report in March 1988 that listed several hypothetical uses for the station (for example, various types of Earth and space observation, space debris management, and on-orbit servicing). However, the report clearly stated that “We cannot at this time describe definite characteristics of any one project or identify relative priorities . . . We have no current requirements for major payloads which would use or uniquely require the space station.”¹¹ This confirmed what many suspected: despite the intervention of both SIG-Space and Weinberger, the Pentagon had no plans for the station, but wanted to make sure that national security uses were not foreclosed by international agreements.¹²

National Policy on the Station

Presidential directives on national space policy provide some insight into the progressive lowering of expectations on space station capabilities. These directives are intended to be top-level policy, so they do not include comprehensive lists of space station applications. However, they do give an indication of the chief executive’s view of the program’s potential contributions to the national interest.

The Reagan administration’s first national space policy was released on 4 July 1982, well before the space station program was formally initiated. Support for such a program was only hinted at by one of the key civil space objectives: “continue to explore the requirements, operational concepts, and technology associated with permanent space facilities.”¹³ By the time Reagan’s second national space policy was issued at the beginning of 1988, the space station program was well underway. A stated objective of the new policy was the establishment of “a permanently manned presence in space.” The directive goes on to state that the space station will:

- contribute to U.S. preeminence in critical aspects of manned spaceflight;
- provide support and stability to scientific and technological investigations;
- provide early benefits, particularly in the materials and life sciences;
- promote private sector experimentation preparatory to independent commercial activity;

- allow evolution in keeping with the needs of station users and the long-term goals of the U.S.;
- provide opportunities for commercial sector participation; and
- contribute to the longer term goal of expanding human presence and activity beyond Earth orbit into the solar system.¹⁴

The above list is less specific and more limited in scope than the array of functions foreseen by the Fletcher study and NASA's initial design efforts. The space policy of the George H. W. Bush presidential administration, which appeared in November 1989, retained the same wording as the Reagan policy regarding the space station's purpose.¹⁵

The national space policy signed by President Bill Clinton in September 1996 continued the process of limiting the expectations of the space station program. Gone was any specific mention of benefits from materials and life sciences research or endorsement of private sector participation. The only discussion of the purpose of the space station in the Clinton policy directs NASA to:

Develop and operate the International Space Station to support activities requiring the unique attributes of humans in space and establish a permanent human presence in Earth orbit. The International Space Station will support future decisions on the feasibility and desirability of conducting further human exploration activities.¹⁶

Although not mentioned in his national space policy, President Clinton clearly had foreign policy goals in mind for the space station. During his first year in office, he invited Russia to be a full partner in the station to improve relations and keep Russian expertise from being diverted to entities unfriendly to the United States.¹⁷

The recent refocusing of space station program goals by the George W. Bush presidential administration endorses only the last item on the Reagan-era list: research toward expanded human presence and activity beyond Earth orbit. In addition to a commitment to complete the station and honor U.S. obligations to international partners, the January 2004 presidential directive on U.S. Space Exploration Policy declares that U.S. research and use of the station will focus on "supporting space exploration goals, with emphasis on understanding how the space environment affects astronaut health and capabilities and developing countermeasures."¹⁸

The View from Capitol Hill

Faced with an administration request for startup funding for the space station in FY 1985, the U.S. Congress asked questions such as, “How much will the program cost?” and “Is it a good value for the taxpayer?” As part of the search for answers, the Congress turned to its Office of Technology Assessment (OTA) for recommendations on how to respond to the administration’s request. Based on a review of NASA’s early space station proposal (discussed above), the OTA concluded:

... there is no compelling, objective, external case either for obtaining *all* of the particular array of elements that NASA now describes under the rubric of “the space station,” or for obtaining this or any other array in the general manner that NASA is now expected to pursue, nor for paying the particular public cost that it now estimates is required to do so.¹⁹

Further, the OTA recommended that before making a commitment to orbiting infrastructure elements, the administration and Congress should revisit the substance of the nation’s space goals and objectives.

Such a set of goals and objectives would allow a clear determination of the basic characteristics of the infrastructure elements actually needed, and of the means and rate whereby these elements should be acquired. **In the absence of such goals and objectives, and with the great uncertainties in the estimate of any infrastructure cost to the public, OTA concludes that it is impossible to judge, objectively, whether or not most of the infrastructure elements proposed to date—and, in particular, many of the set currently proposed by NASA—are truly appropriate and worth their substantial cost²⁰** (emphasis in original).

The OTA’s lack of enthusiasm was shared by many members of Congress. The space station program experienced a roller-coaster ride in its annual budget deliberations during its first several years. Sharp disagreements between the House and Senate, unwillingness to grant the President’s budget request in some years, and annual attempts by certain members to kill the program were characteristic of congressional treatment of the station from its inception through the mid-1990s.

Previously, the author has investigated the relative influence of various factors on congressional voting behavior in key space issues.²¹ Statistical analysis of 13 key House and Senate votes during the first decade of the station program demonstrated that party affiliation and geography were the most important influences on votes related to the station. Party affiliation was the strongest and most consistent indicator of whether a member would vote for or against NASA’s interests.

Congressional control over the station's budget has not been accompanied by leadership in defining the strategic goals or research objectives of the program. Confronted by technical challenges, competing scientific priorities, and a changing political environment (particularly the end of Cold War competition), Congress focused on cost and schedule problems while leaving the task of defining the station's purpose to NASA and the administration.

As the Cold War waned, civil space projects were no longer perceived as essential for superpower competition. From FY 1985, when the station first became a line item in NASA's budget, through FY 1994, there was an apparent shift of attention toward the distributive (that is, pork-barrel) aspects of the space station program. The shift seems to have been enabled by changes in the political environment that occurred during this period. First, the last remnants of Cold War space competition disappeared in the wake of the fall of the Berlin Wall, the toppling of communist regimes in Eastern Europe, and breakup of the Soviet Union. Second, the annual budget for the station more than doubled from 1989 to 1991, from \$900 million to \$1.9 billion. Congressional support began reflecting state-by-state distribution of NASA funding at precisely this time,²² indicating that organizational interests (that is, state voting blocs) coalesced around what had become a public works program to many members.²³

Despite potential distributive benefits to members' districts, Congress remains cautious in its support for large human spaceflight projects. In the wake of President Bush's recent space exploration announcement, Congress—including the Republican leadership—is reluctant to give NASA the 5.5 percent increase the President has requested for FY 2005,²⁴ and as before, looks to the administration to provide the rationale for this investment of public funds.

Missed Opportunities

Technical challenges, funding limits, and political pressures have driven the International Space Station (ISS) to look different, cost more, and take longer than envisioned two decades ago. Along the way, there were missed opportunities to solidify the program's rationale and refine its requirements that may have prevented the questioning of the space station's value that later became so common. Instead, reassessments that did take place took the form of multiple redesigns prompted by budget and schedule shortfalls.

As the program began, the approach taken by NASA and proponents in the Reagan administration was that the station should be a large facility that would be all things to all people. The lesson had not yet been learned from the space shuttle program that this is not necessarily a practical approach when multiple

conflicting projects are planned (for example, microgravity research on the same space platform as life sciences using treadmills and centrifuges).

Alternative approaches were available to the planners and decision makers of the early 1980s. One option for addressing the multiple-mission problem would have been to build a series of stations, perhaps based on shuttle external tank components, each one optimized for a set of related tasks. For example, there could have been a human-tended microgravity laboratory, a human-tended spacecraft assembly and repair station, and a permanently manned variable gravity facility to provide zero-g, lunar gravity, and Mars gravity environments for human physiology research. This would have allowed research and operational capabilities surpassing those of today's station to come online gradually, possibly reducing budget and schedule risk. Of course, this approach also would have given OMB and congressional budget cutters three targets to shoot down one by one.

Before approving the space station program, President Reagan ordered an interagency study "to establish the basis for an administration decision on whether or not to proceed with the NASA development of a permanently based, manned Space Station."²⁵ Foremost among the policy issues to be studied were the station's contribution "to the maintenance of U.S. space leadership and to the other goals contained in our National Space Policy" and how the station would "best fulfill national and international requirements versus other means of satisfying them." An opportunity to lay out a relevant, broadly accepted, long-term plan for the program was missed when the interagency working group failed to reach consensus and the study was never completed.

Another opportunity to link the space station to overarching national space policy goals and do a sanity check on its architecture came in 1985–1986, when President Reagan appointed the congressionally mandated National Commission on Space to outline a vision for the U.S. civil space program for the next 50 years.²⁶ The station, then still in its preliminary design phase, was expected to be a key element of the space infrastructure for most of those 50 years. As a result, the Commission members expected that an assessment of the station's architecture and goals, and how they would contribute to the proposed vision, would be an important part of their task. Instead, NASA (which was paying the commission's expenses out of its budget) firmly emphasized that the space station was not part of the Commission's mandate—its capabilities, as foreseen at that time, simply were to be assumed. The Commission members complied, but were not happy about the restriction.²⁷

Five years after the National Commission on Space issued its report, another presidential commission intentionally left the space station out of the criti-

cal path for its proposals. The Synthesis Group, reporting to President George H. W. Bush's National Space Council, presented options for human missions to the Moon and Mars.²⁸ The space station received only cursory mention in these scenarios. Before release of the Synthesis Group's report in May 1991, some observers suspected the Space Council withheld the long-awaited report so that its lack of enthusiasm for the station wouldn't hinder that year's budget deliberations.²⁹

The Station's Unsettled Policy Image

It is apparent that U.S. politicians, bureaucrats, and members of presidential commissions have not been able to agree on an ambitious, compelling, and consistent rationale for the space station. Fluctuating goals and objectives and an inability to stay on message make it difficult to win support for the program from non-aerospace components of the private sector and from the American public.

Public investment in an expensive and highly visible civil space project, such as the space station (or any large science or technology project) may or may not yield quantifiable benefits adequate to justify the cost. If it does, those benefits are likely to be far in the future, widely dispersed, disassociated from their origin, and impossible to measure. Such a situation provides little incentive for political actors to invest their own resources in fighting for these projects, and the taxpayers' resources in paying for them.

Intangible benefits such as national pride, the spirit of adventure, the quest for knowledge, and the inspiration of youth, which have been common justifications for civil space projects of various types, can yield only a limited amount of political mileage in the current environment. Decisions are made, and legislation enacted, based on tangible benefits in an overwhelming majority of cases. Typically, the tangible benefits being considered in domestic programs are the direct creation of jobs and a general stimulus to the economy. The problem for the space station is that it must compete in this environment for a limited pool of public resources. Despite numerous efforts during the past 20 years, NASA has failed to stimulate large-scale interest and investment in space station research and infrastructure from nongovernment organizations, particularly those outside the aerospace sector.

The station's unsettled policy image has been an ever-present threat to programmatic and budgetary stability. "Policy image" is the way in which a policy is understood and discussed by both political elites and the public.³⁰ The tone of the civil space program's policy image, including that of the space station, has displayed a negative shift since the Apollo years. In that early period, space activi-

ties were viewed as high-priority, high-tempo contributors to national strategic efforts. During the space shuttle era that followed, the dominant policy image changed to one focused on developing practical applications at a moderate pace. By the mid-1980s and the advent of the space station, the space program came to be viewed from a number of policy perspectives, none of which have claimed lasting dominance: source of scientific knowledge, creator of technological spin-offs, high-tech jobs program, foreign policy tool, servant of the military, competitor for scarce federal resources. It remains to be seen whether this confusion about policy image is resolved in the wake of the renewed push for deep-space exploration.

The fact that the civil space program has no single dominant policy image creates a dilemma for attempts to define the purpose of the space station. Current plans to refocus the station's research efforts on space exploration requirements may or may not resolve this muddled situation. Such efforts may serve to define the ISS, in the minds of U.S. policy makers and the public, as a limited-use facility, which is viable only through the middle of the next decade, and which has an even shorter useful life if the space exploration initiative fails to gain sufficient momentum.

Notes

- ¹ Hans Mark, *The Space Station: A Personal Journey* (Durham, North Carolina: Duke University Press, 1987).
- ² *Final Report: Study Group on Space Station* (Washington, DC: National Aeronautics and Space Administration or NASA, 13 September 1982).
- ³ Mark, *The Space Station*, 1987.
- ⁴ Philip E. Culbertson and Robert F. Freitag, *The Partnership: Space Shuttle, Space Science, and Space Station* (Washington, DC: NASA, no date).
- ⁵ Andrew Lawler and James A. Vedda, *Space Station Directory* (Arlington, Virginia: Pasha Publications, 1987).
- ⁶ *Report of the Committee on the Space Station of the National Research Council* (Washington, DC: National Academy Press, September 1987).
- ⁷ "DoD Worries Halt Station Talks," *Space Business News* (12 January 1987): pp. 6–7.
- ⁸ "DoD Says It Won't Relent on Station Policy," *Space Business News* (4 May 1987): pp. 3–4.
- ⁹ "DoD Letter Nixes House Compromise," *Space Business News* (18 May 1987): p. 1.
- ¹⁰ "DoD Study to Outline Station Uses," *Space Business News* (1 June 1987): pp. 3–4.
- ¹¹ Frank Carlucci, *A Report to the Committees on Armed Services of the Senate and House of Representatives on Potential Department of Defense Use of the Permanently Manned Space Station* (Washington, DC: Office of the Secretary of Defense, 1 March 1988).

- ¹² The U.S. national security community's access to the station was affirmed in a 26 January 1998 exchange of letters between the U.S. State Department and the heads of the space station delegations of Canada, the European Space Agency, Japan, and Russia. The United States affirmed its right to use its station elements and allocated resources for national security purposes with no requirement to obtain concurrence from the partners.
- ¹³ National Security Decision Directive 42, "Fact Sheet: National Space Policy," White House Office of the Press Secretary, 4 July 1982.
- ¹⁴ National Security Decision Directive 293, "Fact Sheet: Presidential Directive on National Space Policy," White House Office of the Press Secretary, 11 February 1988.
- ¹⁵ National Security Directive 30 / National Space Policy Directive 1, "Fact Sheet: U.S. National Space Policy," White House Office of the Press Secretary, 2 November 1989.
- ¹⁶ Presidential Decision Directive / National Security Council 49, "Fact Sheet: National Space Policy," White House National Science and Technology Council, 19 September 1996.
- ¹⁷ United States–Russian Joint Commission on Energy and Space, "Joint Statement on Cooperation in Space," White House Office of the Vice President, 2 September 1993.
- ¹⁸ National Security Presidential Directive 31, "U.S. Space Exploration Policy," White House National Security Council, 14 January 2004.
- ¹⁹ U.S. Congress, Office of Technology Assessment, *Civilian Space Stations and the U.S. Future in Space*, OTA-STI-241, Washington, DC, November 1984.
- ²⁰ U.S. Congress, Office of Technology Assessment, *Civilian Space Stations*, 1984.
- ²¹ James A. Vedda, "The U.S. Congress and the Post-Apollo Civilian Space Program, The First Twenty-Five Years," in C. Galbraith, editor, *Strategies and Organizations in Transition*, Volume 3 (Elsevier Science, Ltd., 2002), pp. 287–313.
- ²² Vedda, "The U.S. Congress," 2002.
- ²³ M. K. Macauley, "The Economic Value of Space Exploration," *Resources* (Winter 1995): pp. 15–18.
- ²⁴ Brian Berger, "Bush Space Exploration Vision Faces Hostility in House," *Space News* (26 April 2004): p. 6.
- ²⁵ National Security Study Directive 5-83, "Space Station," 11 April 1983.
- ²⁶ National Commission on Space, *Pioneering the Space Frontier* (New York: Bantam Books, 1986).
- ²⁷ Personal communication with Dr. David C. Webb, member of the National Commission on Space.
- ²⁸ Synthesis Group, *America at the Threshold: Report of the Synthesis Group on America's Space Exploration Initiative* (Washington, DC: Government Printing Office, 1991).
- ²⁹ James R. Asker, "Synthesis Group to Add Asteroids to Moon/Mars Exploration Plans," *Aviation Week and Space Technology*, Vol. 134, No. 23 (10 June 1991): pp. 22–24.
- ³⁰ F. R. Baumgartner and B. D. Jones, *Agendas and Instability in American Politics* (Chicago: University of Chicago Press, 1993).