CHAPTER 8

# TECHNOLOGY, FOREIGN POLICY, AND INTERNATIONAL COOPERATION IN SPACE

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International cooperation has always been part of NASA's mission.[1] But why? Why is it in NASA's and America's interest to collaborate with foreign partners? The question is not as perverse as it sounds. In 1958, the United States was, and probably still remains, the single most important economic and military, but also scientific and technological, as well as industrial and managerial, power on Earth. Those to whom Eisenhower confided the civilian space program drew, though NACA, on a vast and expanding infrastructure of scientists, engineers, and managers, along with the facilities and the budget to match it, especially once President Kennedy committed the country to putting a person on the Moon before 1970. With some important exceptions—like the need for a global network of tracking stations, or sounding-rocket studies of the properties of the upper atmosphere in equatorial regions—there was no overriding scientific or technical (and certainly no financial) reason why NASA and the United States needed to collaborate with any other country in the conquest of space. Unlike small and medium-sized European states, America was rich enough in human and material resources to go it alone, and as such was the envy of all aspirant space powers (except perhaps the Soviet Union, who had to cripple its domestic economy to maintain its military and space capabilities at some sort of parity with those of the U.S.A.).

One classical argument for international collaboration was that it would improve relationships between the United States and the Soviet Union. The decision to establish NASA was, of course, just one of a number of measures taken by the Eisenhower administration to calm the nation in response to the engineered domestic crisis that ensued in the wake of the launch of the Sputniks by the Soviet Union in the fall of 1957. Superpower rivalry was at its height: by the end of the 1950s, each country knew that it could strike a

1. For a fine overview of NASA's international program, with supporting key documents, see John M. Logsdon, "The Development of International Space Cooperation," chap. 1 in *Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program*, ed. John M. Logsdon, with Dwayne A. Day and Roger D. Launius, vol. 2, *External Relationships* (Washington, DC: NASA SP-4407, 1996).

lethal blow at the other using nuclear-tipped missiles. This balance of terror provided one of the most frequent arguments at the time for international space cooperation. As Lyndon Baines Johnson, then the Majority Leader of the Senate, put it in 1959, "If . . . we proceed along the orderly course of full cooperation, we shall by that very fact of cooperation make the most substantial contribution yet made towards perfecting peace. Men who have worked together to reach the stars are not likely to descend together into the depths of war and desolation."[2] This claim, the conviction that international space cooperation with the Soviets would remove misunderstanding, project a positive image of the U.S. abroad, reduce tension, and advance the cause of world peace was a *leitmotif* of the early arguments for an international component to the space program. It was also used by Richard Nixon, who justified the expansion of U.S.-Soviet space collaboration in the early 1970s as creating "not just a climate for peace," but the "building blocks" for "an actual structure of peace and cooperation."[3]

This rhetoric did not carry much weight with some people, notably Arnold Frutkin. Frutkin, who was responsible for international affairs inside NASA for 20 years, beginning in 1959, was emphatic about this.[4] "Now, I hope it's come through," he said towards the end of a long interview conducted a few years ago, "that I am not soft-headed about dealing with other people—[like] if you knew your neighbor better you'd like him. I never believed that. If you knew your neighbor better," Frutkin went on, "you might conclude that he [was] a worse son of a bitch than you [suspected]."[5] Frutkin spoke from bitter experience: after many years of achieving little more than "arm's-length" cooperation with the Soviets—more may have been possible had Kennedy not been assassinated—he had finally been witness to the famous Apollo-Soyuz "hand shake in space" in July 1975.[6] For him, while international space

2. Quoted in Don E. Kash, *The Politics of Space Cooperation* (n.p.: Purdue University Studies, 1967), p. 10.

3. The words are those of Ron Ziegler, the President's press secretary, during a press conference at the White House on the "Agreement Concerning Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes," 24 May 1972, record no. 12594, Presidential Files, NASA Historical Reference Collection, Washington, DC.

4. Arnold W. Frutkin was deputy director of the U.S. National Committee for the International Geophysical Year in the National Academy of Sciences before he joined NASA in 1959 as director of international programs. His official title changed in 1963 to Assistant Administrator for International Affairs. In 1978, Frutkin became Associate Administrator for External Relations. He retired from federal service in 1979.

5. Arnold W. Frutkin interview, Washington, DC, by Rebecca Wright, 11 January 2002, NASA Historical Reference Collection, Washington, DC.

6. In the early years of his presidency, Kennedy made extensive overtures to the Soviets backed by behind-the-scenes negotiations that seemed to be making considerable headway. These were abruptly stopped after his death—see particularly National Security Action Memorandum 271, dated 12 November 1963 and reproduced in Logsdon, "International Space Cooperation," pp. 166–167.

cooperation was a widely endorsed scientific and political objective, it also was also victim of a multitude of "abstractions, moral imperatives, and contrived prescriptions."[7]

Contemporary analyses of the U.S.'s motives for collaborating in space combine a refreshing spirit of *realpolitik* when discussing how the U.S. *has* behaved in the past with a tendency to prescriptive injunctions about how NASA *should* behave in the future, which Frutkin would probably deplore. We shall treat each of these dimensions of this body of literature in turn.

There is something of a consensus that, for the first two or three decades of its existence, NASA, by virtue of America's immense scientific and technological advantage vis-à-vis its partners, could use its power to dictate the terms of any significant international space effort. American hegemony was implicit in the 1958 Space Act which established NASA and which defined the organization's primary objective as being "the preservation of the role of the United States as a leader in aeronautical and space science and technology and in the application thereof."[8] This concept of leadership, we were reminded in 1987 by a task force of the NASA Advisory Council (NAC), chaired by Herman Pollack, meant not simply achieving superior performance in all aspects of space. It also meant "the defining of goals and the establishment of direction that *others w[ould] be willing to make their own or follow*" (emphasis added).[9] To the U.S., according to another group of space activists, for the first two decades after Sputnik, "cooperation was a politically driven means of linking the space programmes of other countries to US goals and activities, rather than having them closely allied with Soviet aspirations in space."[10] Political scientist Joan Johnson-Freese makes a similar point: in the Cold War context of the '60s and '70s, the U.S. actively sought to collaborate with its Western bloc allies and countries that it wanted to attract to the Western alliance. And since it was "dominant in space, it could dictate terms of cooperation to other countries, which they were more than willing to accept in order to gain entrance to the space program."[11]

Scientific research was a privileged site for international collaboration, and Frutkin quickly defined a set of five criteria which guided NASA's policy in this domain and which embodied these precepts.[12] His criteria are well known

7. Arnold W. Frutkin, "International Cooperation in Space," *Science* 169 (24 July 1970): 333–339.

8. National Aeronautics and Space Act of 1958 (Unamended), Sec. 102 (c) (5), available online at *http://www.hq.nasa.gov/office/pao/History/spaceact.html* (accessed 27 January 2005).

9. Herman Pollack, "International Relations in Space. A US View," *Space Policy* 4, no. 1 (February 1988): 24–30.

10. Space Policy Institute and Association of Space Explorers, "International Cooperation in Space—New Opportunities, New Approaches," *Space Policy* 8, no. 3 (August 1992): 195–203.

11. Joan Johnson-Freese, *Changing Patterns of International Cooperation in Space* (Malabar, FL: Orbit, 1990), p. 5.

12. Arnold W. Frutkin, *International Collaboration in Space* (Englewood Cliffs, NJ: Prentice Hall, 1965).

and need not be rehearsed here. Suffice it to say that Frutkin's stress on the need for clean interfaces and no exchange of funds between the partners was inspired by the need to limit technological (and managerial) sharing between the U.S. and its partners to a minimum. Even the content of the program had to dovetail with U.S. interests. As Logsdon puts it, being the dominant partner in space science "often meant that NASA and U.S. scientists would define the objectives and content of a scientific mission and only then invite non-U.S. scientists to participate."[13] Even then, NASA sometimes pulled the plug on a well-defined joint international project to meet domestic pressures for budget cuts and the redefinition of priorities.[14]

Scientific collaboration was the most readily available and least controversial instrument of international collaboration, but it was not enough, particularly in dealing with major allies like Western Europe. The U.S. technological lead and the dynamism of American industry allowed the administration to think beyond the limits of scientific collaboration and to use its technological assets, including technological knowledge and skills, as an instrument of foreign policy to consolidate the Atlantic alliance. Put differently, if the U.S. pursued international collaboration, it was because it "sought the political benefits of leadership [while] its partners [sought] the technical and managerial benefits that come from working with the leader."[15] Here lies the soft underbelly of technological collaboration in the space sector. For if the benefit was in foreign policy, as the Pollack Task Force stressed, the cost lay in the risk that technological sharing would subvert U.S. leadership by helping allies to assert themselves, would endanger national security in a sector where almost all satellite and booster technology is "dual-use technology," and would endanger U.S. industry in a crucial high-tech sector.

Once we move beyond scientific collaboration to technological sharing, those who promote international cooperation will be on the defensive. They will have to overcome the opposition of counterforces that stress the threats to the U.S. that such collaboration entails. These critics will point out that if America's allies are willing to be dependent on the U.S. in the short term, it is with the long-term aim of being autonomous. That if those allies accept the hegemonic regime imposed by the U.S., it is in the hope that they will eventually be able to throw off its yoke. And that if they collaborate initially on terms which are not of their own choosing, it is in order later to compete better with the United States as equal partners, or even to become leaders in areas where America was previously supreme. In short, international col-

13. Logsdon, "International Space Cooperation," p. 4.

14. For an angry account of this by two ESA insiders, see Roger M. Bonnet and Vittorio Manno, *International Cooperation in Space: The Example of the European Space Agency* (Cambridge, MA: Harvard University Press, 1994).

15. Space Policy Institute and Association of Space Explorers, p. 200.

laboration in space is always a contested policy objective. It will always have to justify itself to critics who will ask, as I did at the start of this paper, "But why collaborate?" and who see little reason for risking national security and industrial competitiveness, which are essential for the long-term strength of the country, in return for the fragile and unpredictable foreign policy benefits that international collaboration putatively enshrines.

This domestic political context informs much of the literature on international cooperation and accounts for the prescriptive dimension alluded to above. It is dominated by activists, administrators, and political scientists who combine their sense of *realpolitik* with a wish to influence the way NASA and the United States behave in current international collaborative projects, notably the negotiations on foreign participation in the International Space Station. All are sensitive to the changed balance of power in the space sector: the collapse of the Soviet Union as a rival superpower (which forced a major reevaluation of one of NASA's original goals) and the technological and managerial maturity achieved by space programs in the U.S.'s traditional allies (notably Western Europe and Japan). All are also convinced that international collaboration is a worthwhile goal and that, to maintain American leadership in at least certain key areas, the U.S. will have to change its attitudes to meet the changed environment of the late 20th century. Thus Joan Johnson-Freese: "Because the United States began as the dominant space power concerning cooperative ventures, it has never had to learn to operate in any manner other than 'the U.S. way'. But things have changed," she goes on. "There are now an increasing number of space 'actors' with varying ranges of capabilities," including the Soviet Union, Japan, and Western Europe, and "the United States is no longer 'the only game in town' in space activities, although in some cases it is still trying to act as though it is."[16] So, too, the Task Force chaired by Pollack in 1987: "The USA will have to adopt [*sic*] its attitude, approach and politics on international cooperation and competition to a new set of realities."[17] And Ken Pederson, who was responsible for NASA's International Affairs Division in the 1980s and who gave some concrete examples of what that meant. "For NASA today," he wrote, "'power' is much more likely to mean the power to persuade than the power to prescribe." This entails 1) that NASA must accept that "leadership does not mean that it must or ought do it all"; 2) that even if it is the provider of major hardware, NASA "may sometimes have to accept the role of junior partner rather than managing partner" and understand that it can still benefit while doing so; and 3) that NASA must "learn to share direct management and operational control in projects where it is the largest hardware and financial contributor, especially when manned flight systems are involved."[18]

16. Johnson-Freese, p. 113.

17. Pollack, "International Relations in Space."

18. Ken Pedersen, "The Changing Face of International Space Cooperation. One View of NASA," *Space Policy* 2, no. 2 (May 1986): 120–137.

This stream of modal concepts, this prescriptive discourse is situated at the core of the struggle to define the U.S.'s role in space in the 21st century and intended to reshape its practices in the international domain. These advocates believe that space cooperation is a "good thing" for the United States, and they seek to lay down the ground rules, based on past experience, for what the U.S. "must do" if it wants to retain credibility and leadership as an international partner. And while commendable for their sensitivity to the points of friction which have traditionally irritated America's partners, their proposals also have an air of unreality. *It is indeed striking that, while all of these authors stress that the U.S. international space effort is driven by foreign policy and that technological collaboration is a substantive issue which shapes its physiognomy, none of them deal with foreign policy or technology except in the most generic way.* These are a taken-for-granted backdrop against which their prescriptions are made, a context which, precisely, cannot be taken for granted, for it is the always-contested framework in which stakeholders will decide whether to collaborate internationally at all, let alone on the terms, and respecting the "musts," that the advocates promote so skillfully.

Scientific and technological sharing, and foreign policy concerns, are the material substrates of international collaboration in space. Scientific and particularly technological sharing, both of hardware and of knowledge and skills, are the single most important means that the U.S. has to influence the space programs of other countries, so consolidating and legitimating its leadership and its hegemonic regime. Technological sharing is also the single greatest danger to national security and national industrial competitiveness in a crucial high-technology sector. The onus on those who promote international collaboration in space is to show how the sharing of specific technologies and the knowledge embedded in them will further America's leadership abroad in a particular historical conjuncture and why that objective will not unduly jeopardize national industry or undermine national security. To advance this debate, one cannot "black-box" technology and foreign policy: they are not the context in which international collaboration takes place; they are the stakes that define what is possible.

This paper aims to contribute to our understanding of international collaboration by using an illustrative historical case study to open the black box of technology and of foreign policy.[19] At the risk of oversimplifying an extremely complex debate, I will explain briefly why the Johnson administration decided in the mid-1960s that it was imperative to collaborate with Western Europe in developing a civilian satellite launcher and discuss the kind

19. The case study presented here is based on a small subset of a huge number of documents retrieved from the archives preserved in the NASA Historical Reference Collection in Washington, DC, and at the Lyndon Baines Johnson Library in Austin, TX (hereafter LBJ Library). Additional material was acquired from the National Archives and Records Administration in College Park, MD. I would like to thank the archivists for their invaluable help and support.

of technological sharing that some people thought might be used to achieve the President's foreign policy objectives.[20] What I want to emphasize above all is the strong coupling between technology and foreign policy. I also want to insist that, to understand the possibilities of international collaboration in space, it is crucial to focus on what *specific* technologies might be available for sharing in the pursuit of *specific* foreign policy objectives, rather than—as so often happens—to simply lump technology and foreign policy into an undifferentiated whole. Those in the administration who are engaged in working out what can be done with a foreign partner fight over the boundary between what technologies can be shared and what cannot. The advocates of a more open approach are driven by the conviction that the maintenance of American "leadership" and its ability to control the form and content of the space programs of other nations are best achieved by relaxing restrictions in particular areas. Sometimes they win; sometimes, as in the case to be described here, they lose, both because the forces arraigned against them are formidable and because the foreign policy context is never stable and calls forth a different response to changed circumstances. I am convinced that only if historians study international collaboration at this fine-grained level can they help avoid what Frutkin bemoaned over 30 years ago, namely, analyses replete with the "usual quota of abstractions, moral imperatives, and contrived prescriptions."

## THE JOHNSON ADMINISTRATION AND THE ELDO CRISIS

On 29 July 1966, Walt W. Rostow, one of LBJ's two national security advisers, signed off on National Security Action Memorandum 354.[21] NSAM 354 was a response to a request from the Department of State that the U.S. "clarify and define" its policy concerning collaboration with the "present and future programs" of ELDO, the European Launcher Development Organisation. The document affirmed that it was "in the U.S. interest to encourage the continued development of ELDO through U.S. cooperation." It referred to the results of an ad hoc working group, established by the State Department and chaired by Herman Pollack, that had prepared a statement "defining the nature and extent of U.S. cooperation with ELDO which the U.S. government is now prepared to extend." This statement was to be "continually reviewed by the responsible agencies," above all, the Department of

20. The reactions in the United States to the ELDO crisis in 1966 have received little scholarly attention. For the best analysis, see Lorenza Sebesta, *Alleati Competitivi. Origini e sviluppo della cooperazione spaziale fra Europa e Stati Uniti* (Bologna, Italy: Laterza, 2003), chap. 3. The issue is also described in a project Sebesta worked on with John M. Logsdon. I thank John Logsdon for making a copy of their unpublished manuscript available to me.

21. NSAM 354, "U.S. Cooperation with the European Launcher Development Organization," 29 July 1974, available online at *http://www.lbjlib.utexas.edu* (accessed on 9 March 2005).

Defense and the State Department, along with NASA, "to ensure that it is current and responsive in terms of developing strategies."

The help that the working group proposed was extensive. It was divided into three categories: general, and short-range and long-range assistance.[22] The first contained some standard items—training in technical management, facilitating export licenses, use of NASA test facilities—but also suggested that a technical office be established within NASA "specifically to serve in an expediting and assisting role for ELDO." Short-range help included "technical advice and assistance" in items like vehicle integration, stage separation, and synchronous orbit injection techniques, as well as the provision of unclassified flight hardware, notably a strapped-down "guidance" package used on the Scout launcher which had already been exported to Japan. Long-range assistance was focused on helping with a high-energy cryogenic upper stage of the rocket, currently being considered in ELDO. It was proposed that Europeans be given access to technological documentation and experience available in the Atlas-Centaur systems, that ELDO technical personnel "have intimate touch with the problems of systems design, integration, and program management of a high-energy upper [*sic*] such as the Centaur," and even that the U.S. consider "joint use of a high-energy upper stage developed in Europe."[23] In short, in mid-1966, the U.S. was considering making a substantial effort to help ELDO develop a powerful launcher with geosynchronous orbit capability by sharing state-of-the-art knowledge and experience and by facilitating the export of hardware which—it should be added—would not normally be available on a bilateral basis to European national launcher programs.

NSAM 354 was catalyzed by a crisis in ELDO in February 1966 and deep concerns in the Johnson administration about the future of the collaborative European effort. ELDO, it must be said, had been a fragile organization from its very inception in 1960–61.[24] It was born of the need by the British government to find a new role for its Blue Streak missile. The liquid-fueled rocket was rendered obsolete by the long time required to prepare it for launch and

22. This paragraph is derived from "Policy Concerning US Cooperation with the European Launcher Development Organization (ELDO)," attached to U. Alexis Johnson's "Memorandum," 10 June 1966, folder 15707, International Cooperation and Foreign Countries, NASA Historical Reference Collection, Washington, DC.

23. In summer 1965, ELDO had asked for help from NASA on "designing, testing and launching liquid hydrogen/liquid oxygen upper stages" (Frutkin to Robert N. Margrave, Director, Office of Munitions Control, Department of State, 6 June 1965, record no. 14465, International Cooperation and Foreign Countries, International Cooperation, folder International Policy Manual Material from Code I, NASA Historical Reference Collection, Washington, DC).

24. I describe the launch of ELDO in detail in J. Krige and A. Russo, *A History of the European Space Agency, 1958–1987*, vol. 1, *The Story of ESRO and ELDO, 1958–1973* (Noordwijk, Netherlands: ESA SP-1235, April 2000), chap. 3. See also Michelangelo De Maria and John Krige, "Early European Attempts in Launcher Technology," in *Choosing Big Technologies*, ed. John Krige (Chur, Switzerland: Harwood Academic Publishers, 1993), pp. 109–137.

by the cost, which spiraled to new heights as the expenditures on reinforced concrete silos were factored into the budget. Hence the idea to recycle Blue Streak, stripped of its military characteristics, as the first stage of a multistage civilian satellite launcher, built together with partners in continental Europe. This would save face at home, it would ensure that the money already spent on development was not completely wasted, it would preserve the engineering teams and their skills intact, it would please British industry, and—and this was crucial—it would serve as a gesture of solidarity and good will to the emerging European Common Market, which Britain had previously boycotted, nay, tried to sabotage. Indeed, shortly after the British proposed this joint venture to their continental partners, Prime Minister Harold Macmillan made an official application for his country to join the European Community. Long, drawn-out negotiations ensued before Blue Streak was given a new lease on life. The French would build the second stage atop the British rocket, the Germans would build the third stage, and the Italians would build a test satellite. Clean interfaces were retained to limit technology transfer between firms in different countries to protect competitive advantage and national security (especially in Britain and France, which were both developing independent nuclear deterrents). The ELDO staff had little authority over the separate national authorities and, above all, no power to integrate the three independently built stages of the rocket or to ensure compatibility between the various systems and subsystems built in different countries or in different firms in the same country.[25] By 1966, as many had predicted, ELDO faced the first of many crises that led to its eventual demise in 1972.[26] Development costs had increased from the initial estimate of about $200 million to over $400 million, and no end to the upward spiral was in sight. Blue Streak had been successfully commissioned, while the French and German stages were still under development. What is more, in January 1963, French President de Gaulle had vetoed Britain's application to join the Common Market. For Britain, who was paying almost 39 percent of the ELDO budget, the original technological, industrial, and political rationale for launching the organization had evaporated. In February 1966, her Minister circulated an aide-mémoire to his homologues in the ELDO member states suggesting that it was unlikely that the organization would produce any worthwhile result and that the United Kingdom saw little interest to continue in the program and to contribute financially to it.

This move perturbed the Johnson administration immensely. At the most general level, the U.S. saw ELDO as a technological embodiment of European

25. For a fine description of the failure of management in ELDO, see Stephen B. Johnson, *The Secret of Apollo: Systems Management in American and European Space Programs* (Baltimore: Johns Hopkins, 2002), chap. 6.

26. On the crisis, see Krige and Russo, *A History*, vol. 1, chap. 4, sect. 4.3.2.

multilateralism. The withdrawal of the United Kingdom would send a signal that Britain was still not enthusiastic about participating in European integration, which the United States had always regretted. It would also strike a major blow to the gradual movement towards European unity on the continent. This was in a very brittle state at the time. There was a crisis in the European Economic Community (EEC), precipitated by the French, who had begun to boycott the EEC's decision-making machinery so as to liberate the country from its "subordination" to Community institutions and the dilution of sovereignty that that entailed.[27] There was a similar crisis in NATO. The French were not against the Alliance as such but believed that NATO needed reforming. Western European nations were no longer prostrate, as they had been in 1949, and they needed to be prepared to meet a Soviet nuclear threat in Europe with their own independent deterrents (would Washington be prepared to risk New York to defend Paris? it used to be said). "The French have emphasized their dissatisfaction by becoming increasingly an obstructionist force in NATO," one task force wrote, "equating" integration with subordination.[28] In this inauspicious climate, everything possible had to be done to sustain the momentum for European unity. As Under Secretary of State George Ball emphasized, "The United States has a direct interest in the continuation of European integration. It is the most realistic means of achieving European political unity with all that that implies for our relations with Eastern Europe and the Soviet Union . . . and is the precondition for a Europe able to carry its proper share of responsibility for our common defense."[29] While ELDO was not central to European integration, its collapse would provide additional encouragement for those who were increasingly hostile to supranational ventures in Europe.

Saving a European launcher was justified by a second foreign policy concern pressing on the Johnson administration at the time: it would help close the so-called "technological gap" that had opened between the two sides of the Atlantic. Beginning in summer 1965, there were increasingly strident complaints in France, and to some extent Germany, that American business was invading Europe and dominating key sectors of European industry.[30] The U.S. could not

27. Ted Van Dyk to the Vice President, 7 July 1965, folder Germany Erhard Visit [12/65], 12/19–21/65, box 192, National Security Files, Country File Europe and USSR, Germany, LBJ Library.

28. "France and NATO," position paper, 25 September 1965, folder Germany Erhard Visit [12/65] 12/19–21/65, box 192, National Security File, Country File Europe and USSR, Germany, LBJ Library.

29. Department of State to Amembassy Bonn 1209, outgoing telegram, 18 November 1965, signed [George] Ball, folder Germany Erhard Visit [12/65], 12/19–21/65, box 192, National Security File, Country File Europe and USSR, Germany, LBJ Library.

30. SC No. 00666/65B, "US Investments in Europe," CIA Special Report, 16 April 1965, folder Memos [2 of 2], Vol. II, 7/64–7/66, box 163, National Security File, Country File, Europe, LBJ Library. Jean-Jacques Servan-Schreiber's *The American Challenge* (New York: Atheneaum, 1968; translation of *Le Défi américain*) is, of course, the *locus classicus* of this argument.

easily dismiss their concerns. As Frutkin explained, Western Europe's progress in space was "a contribution to the strength of the Free World. An increasing technological gap between us (and them) can only lead to political and economic strains and to weakness."[31] Indeed, the President took this matter so seriously that in November 1966, Johnson personally signed NSAM 357, instructing his science adviser, Donald Hornig, to set up an interdepartmental committee to look into "the increasing concern in Western Europe over possible disparities in advanced technology between the United States and Europe."[32] In its preliminary report, the committee concluded that "the Technological Gap [was] mainly a political and psychological problem" but that it did have "some basis in actual disparities." These included "the demonstrated American superiority in sophisticated electronics, military technology and space systems." Particularly important were "the 'very high technology industries' (particularly computers, space communications, and aircraft) which provide a much greater military capability, are nationally prestigious, and are believed to be far-reaching in their economic, political and social implications."[33] The U.S., Herman Pollack told Sir Solly Zuckerman, Britain's Chief Scientific Adviser, was "seeking new and different ways of expanding cooperation in space because we consider that there is a close connection between [*sic*] technological gap and the development of space technology."[34]

There was a third, even more fundamental argument for supporting the development of a launcher in the ELDO framework. This was, in fact, the single most important reason why Pollock's ad hoc working group of the NASC was asked to look again at the possibilities of sharing booster technology with foreign nations. It also led directly to the release of NSAM 354, expressing American interest in helping ELDO. The argument, in the words of NASA Administrator James Webb, was that enhanced international collaboration in space would be "a means whereby foreign nations might be increasingly involved in space technology and diverted from the technology of nuclear weapons delivery."[35] More precisely, it was by encouraging multilateral

31. Quoted in *Space Business Daily* 25, no. 35 (18 April 1966): 286.

32. NSAM 357, "The Technological Gap," 25 November 1966, available online at *http://www.lbjlib.utexas.edu/johnson/archives.hom/NSAMs/nsam357.gif* (accessed on 9 March 2005). Hornig's official title was the Special Assistant to the President for Science and Technology.

33. "Preliminary Report on the Technological Gap Between U.S. and Europe," attached to David Hornig's letter to the President, 31 January 1967, folder Technological Gap [1 of 2], box 46, Subject File, National Security File, LBJ Library.

34. "Memorandum for the Files. Cooperation with ELDO," 6 May 1966, folder Cooperation in Space—Working Group on Expanded International Cooperation in Space ELDO #1 [2 of 2], box 14, National Security Files, Charles Johnson File, LBJ Library.

35. Webb to Robert McNamara, 28 April 1966, record no. 14459, International Cooperation, International Cooperation and Foreign Countries, folder Miscellaneous Correspondence from CODE I—International Relations 1958–1967, NASA Historical Reference Collection, Washington, DC.

organizations that the nonproliferation of missile technology at the national level could be controlled. A position paper prepared for the very first meeting of Pollack's working group in May 1966 stressed this. Multilateral programs should be encouraged, it asserted, since

> [i]n such a framework rocket programs tend to be more open, serve peaceful uses and are subject to international control and absorb manpower and financial resources that might otherwise be diverted to purely national programs. National rocket programs tend to concentrate on militarily significant solid and storable liquid fueled systems, are less open, and less responsive to international controls. Any break up of ELDO might lead to strengthening national programs tending in the latter direction.[36]

Put differently, since European nations had limited resources to devote to their military and civilian space programs and had to make hard choices about priorities, the U.S. could use the carrot of technological sharing with ELDO to divert human and material resources away from national programs which were more difficult to control and which might see the proliferation of weapons delivery systems.

It was the French national program which particularly bothered the U.S. On 26 November 1965, France had become the third space power by launching its own satellite with its own launcher, Diamant-A, from Hammaguir in Algeria. The feat was repeated in February 1966. This three-stage launcher combined "militarily significant solid and storable liquid fueled systems"—just the kind of technology the U.S. did not want it to develop—in a highly successful vehicle derived from the national missile program.[37] In the light of these achievements and de Gaulle's growing determination to affirm his independence of the EEC and the Atlantic alliance, "The US is concerned that, if ELDO were to be dissolved, France might devote more of its resources to a national, military-related program or that it might establish undesirable bilateral relationships for the construction of satellite launch vehicles"[38]—meaning that unless Britain and America boosted the organization, "the Soviets would

36. T. H. E. Nesbitt, "Meeting No. 1, Committee on Expanded International Cooperation in Space Activities. Subject: Cooperation Involving Launchers and Launching Technology," 17 May 1966, folder Cooperation in Space—Working Group on Expanded International Cooperation in Space. ELDO #1 [2 of 2], box 14, National Security Files, Charles Johnson File, LBJ Library.

37. Diamant-A used a mixture of $N_2O_4$/UDMH (storable liquid fuels) in its first stage and solid fuel in the second and third stages.

38. "US Cooperation with ELDO," position paper, 21 July 1966, folder Cooperation in Space—Working Group on Expanded International Cooperation in Space. ELDO #1 [2 of 2], box 14, National Security Files, Charles Johnson File, LBJ Library.

move into the vacuum if ELDO collapsed."[39] The U.S. had to contain this threat and to ensure that European institutions emerged "from the present crisis with their prestige, power and potential for building a united Europe as little impaired as possible."[40] Developing advanced space technology in Europe and assisting ELDO to develop its launcher, in particular, were some of the many measures considered by the Johnson administration to achieve that objective in 1966.

## THE OBSTACLES TO THE SUPPORT FOR ELDO

Two major obstacles stood in the way of these initiatives. Both were enshrined in National Security Action Memoranda. There was NSAM 294 of 20 April 1964, which dealt with "U.S. Nuclear and Strategic Delivery System Assistance to France." The second was NSAM 338 of 15 September 1965, defining "Policy Concerning U.S. Assistance in the Development of Foreign Communications Satellite Capability."[41]

NSAM 294 stated that since the administration opposed the development of a nuclear force outside the framework of NATO and that since France was doing all it could to evade the constraints of the Alliance, nothing should be done to help its nuclear weapons system (France first successfully tested its A-bomb in the Sahara in February 1960), including the "French national strategic nuclear delivery capability." This included "exchanges of information and technology between the governments, sale of equipment, joint research and development activities, and exchanges between industrial and commercial organizations." This obviously made collaboration with ELDO difficult since how could one be sure that technology that was shared with the organization would not leak through to the French military program?[42]

NSAM 338 was less specific, referring instead to the policy guidelines established by General J. D. O'Connell, the President's Special Assistant for Telecommunications, in a memorandum of 25 August 1965. These guidelines effectively extended the military constraints on the transfer of booster technology to cover specific commercial concerns. O'Connell's memo stipulated

39. Anonymous, "Memorandum for the Files, Cooperation with ELDO," meeting with Zuckerman, 6 May 1966, folder Cooperation in Space—Working Group on Expanded International Cooperation in Space. ELDO #1 [2 of 2], box 14, National Security Files, Charles Johnson File, LBJ Library.

40. Department of State to Amembassy Bonn 1209, outgoing telegram, 18 November 1965, signed [George] Ball, folder Germany Erhard Visit [12/65], 12/19–21/65, box 192, National Security File, Country File Europe and USSR, Germany, LBJ Library.

41. NSAM 294, "U.S. Nuclear and Strategic Delivery System Assistance to France," 20 April 1964, and NSAM 338, "Policy Concerning U.S. Assistance in the Development of Foreign Communications Satellite Capability," 15 September 1965, both available online at *http://www.lbjlib.utexas.edu* (accessed 9 March 2005).

42. NSAM 294, "U.S. Nuclear and Strategic Delivery System."

that if the U.S. was to help other countries develop a comsat (communications satellite) capability, it had to have guarantees that the foreign program was integrated into the single global system enshrined in the INTELSAT agreements of 1964. INTELSAT was the international consortium that owned and operated the international comsat system. It had 56 member nations in 1967 (though neither China nor the Soviet Union were members). American interests were represented by COMSAT, a private corporation, 50 percent of whose stock was owned by communications carriers (like AT&T). Voting was weighted according to use, which made it "an unusually attractive international vehicle for the U.S."[43] since it had veto power inside INTELSAT at the time (its voice counted for 54 percent). What is more, the 1964 INTELSAT agreements (due to be renegotiated in 1969 to take account of the expected expansion in the use of comsat technology by other nations) stipulated that the U.S. weight could never drop below 50 percent: "in other words, we control."[44] With this power in its pocket, the "core" of NSAM 338, as McGeorge Bundy explained to LBJ, was "to use our technological superiority to discourage commercial competition with COMSAT and/or wasteful investment in several duplicative Free World defense-related systems" (emphasis in the original).[45] To this end, the U.S. should "withhold provision of assistance to any foreign nation in the field of communications satellites which could significantly promote, stimulate or encourage proliferation of communications satellite systems" outside the INTELSAT framework, *including* "the provision of launching services or launch vehicles for communications satellites."[46]

The significance of NSAM 338 for our story is that it extended the provisions of NSAM 294 beyond national security and foreign policy objectives to protect also U.S. business interests.[47] By defining launchers as a component of the "communications satellite *system*," it included delivery systems inside the

43. Charles Johnson to Walt Rostow, 13 July 1967, folder NSAM 338, box 7, National Security Files, LBJ Library.

44. Ibid.

45. McGeorge Bundy to the President, "Helping Others to Use Communications Satellites," 13 September 1965, folder NSAM 338, box 7, National Security Files, LBJ Library.

46. "Policy Concerning U.S. Assistance in the Development of Foreign Communications Satellite Capabilities," position paper, unsigned, 23 August 1965, folder NSAM 338, box 7, National Security Files, LBJ Library.

47. It should be stressed that NSAM 338 was not restricted to protecting commercial interests, though it included them. As the memo from McGeorge Bundy that I cited earlier makes clear, there were also national security concerns involved. The United States, he noted, would set up a separate national defense comsat system "where security demands" and would encourage "selected allies" (actually Britain and Canada) to "buy time" on this system for their security needs. Otherwise, he wanted everyone to use the single global system for all purposes. The United States thus wanted to discourage the proliferation of regional comsat systems both to limit international competition for a potentially lucrative market and to limit the spread of parallel regional comsat systems for defense (McGeorge Bundy to the President, "Helping Others to Use Communications Satellites").

policies being defended by COMSAT on behalf of the U.S. in INTELSAT. The sale of launch vehicles and launch services *and* technological assistance with the development of an indigenous launch capability were now conditional on the foreign clients' guaranteeing that such launchers would not be used to subvert a single worldwide commercial satellite communications system then under U.S. control. As one senior administrator put it, "It is difficult to maintain international cooperation on this basis."[48]

## FINDING A WAY AROUND THE OBSTACLES

To overcome these obstacles to technology transfer, NASA and the State Department insisted that to promote U.S. foreign policy and business interests, one had to *distinguish between different types of technology* and *the specific foreign policy options* that America wanted to promote. They were convinced that American leadership, and its ability to restrict the proliferation of weapons systems and comsats, was best achieved by treating technology transfer on a case-by-case basis and by "building high walls around small fields," as it is sometimes called today, rather than by blanket restrictions which treated both technology and foreign policy as seamless wholes.

To achieve this, a number of crucial distinctions had to be made. Current U.S. policy was dominated by the "dual-use" aspect of boosters as both ballistic missiles and as stages of satellite launchers. This was too simple, Webb pointed out: "If we could focus our controls on the weapons themselves, we might even hope to free vehicle technology for maximum stimulus of space activity abroad."[49] Consider the constraints on booster technology imposed by NSAM 294. As Webb pointed out to Defense Secretary McNamara, although high-energy, cryogenic, or nonstorable upper stages might conceivably be employed for military purposes, in practice they would probably not be deployed in that way. "Even in the case of France," Webb stressed, "it seems likely that encouragement to proceed with upper stage hydrogen/oxygen systems now under development might divert money and people from a nuclear delivery program rather than contribute to that which is already under way using quite different technology."[50] Guidance and control technology was another gray area. An American company had recently been refused a license to assist France with

48. Charles Johnson to Walt Rostow, 13 July 1967.

49. Webb to Johnson, 26 April 1966, record no. 14459, International Cooperation and Foreign Countries, folder Miscellaneous Correspondence from CODE I—International Relations 1958–1967, International Cooperation, NASA Historical Reference Collection, Washington, DC.

50. Webb to McNamara, 28 April 1966, and reply, Bob [McNamara] to Jim [Webb], 14 May 1966, record no. 14459, International Cooperation and Foreign Countries, International Cooperation, folder Miscellaneous Correspondence from CODE I—International Relations 1958–1967, NASA Historical Reference Collection, Washington, DC.

the development of gyro technology. But as Richard Barnes, the Director of Frutkin's Cooperative Projects Division, pointed out to the chair of the NSAM 294 review group, gyros of comparable weight and performance were already available in France. The release of inertial guidance technology to Germany had been officially sanctioned in July 1964 on condition that it was not employed "for ballistic missile use or development."[51] And, as we mentioned earlier, a strapped-down "guidance" package used on the Scout launcher had already been exported to Japan. Here, and in general, wrote Webb to McNamara, rather than a blanket restriction, "we might be better off were we to concentrate on a few very essential restrictions, such as *advanced* guidance and reentry systems" (my emphasis). In a supportive reply to Jim, Bob reassured the NASA Administrator that he strongly supported international cooperation in space and that he had directed his Department of Defense staff "to be as liberal as possible regarding the release of space technology for payloads and other support items."[52]

One important consideration shaping the argument for a revision in policy was that restrictions on the export of some items were now redundant since European booster technology was advancing rapidly without external help. It was also counterproductive to deny a nation a technology if it could easily and quickly be obtained from a source other than the United States: this would not simply be to the detriment of American business, but also to U.S. foreign policy, particularly if that source was the Soviet Union. Thus Barnes suggested (and Webb concurred) that the interpretation of NSAM 294 on the export of booster technology needed to be more specific. The guidelines should deny to a foreign power "only those few critical items which are clearly intended for use in a national program, would significantly and directly benefit that program in terms of time and quality or cost, and are unavailable in comparable substitute form elsewhere than the US" (emphasis in the original). The guidelines should also explicitly recognize that it was in America's interest to promote European space collaboration, so that technology transfer intended for multinational programs like ELDO (and ESRO—the European Space Research Organisation) would "normally be approved" so long as the items were "of only marginal benefit to the national program" or "were available elsewhere than the US without undue difficulty or delay."[53] In short, requests for technology transfer were to be treated on a case-by-case basis and should take into account the kind of technology at issue, its likely uses in practice, the global state of the market for the technology,

51. NSAM 312, "National Policy on Release of Inertial Guidance Technology to Germany," 10 July 1964, available online at *http://www.lbjlib.utexas.edu* (accessed 9 March 2005).

52. Webb to McNamara, 28 April 1966, and reply, Bob [McNamara] to Jim [Webb], 14 May 1966.

53. Richard Barnes to Scott George, Chairman, NSAM 294 Review Group, Department of State, 15 April 1966, record no. 14459, International Cooperation and Foreign Countries, International Cooperation, folder Miscellaneous Correspondence from CODE I—International Relations 1958–1967, NASA Historical Reference Collection, Washington, DC.

and the importance of collaboration from a foreign policy perspective. The last, along with U.S. business interests, was not to be sacrificed on the altar of an overcautious, generalized reluctance to share technology just because it *might* encourage programs which sections of the U.S. administration disapproved of.

Frutkin was also keen to relax the constraints on the sharing of comsat technology that were embodied in NSAM 338. Europeans, he wrote, were persuaded that the United States was "seeking by all means, fair or foul, to maintain political and technical control of Intelsat."[54] He was convinced that, to allay their suspicions, the U.S. had to be prepared to provide launch services on a reimbursable basis for (experimental) foreign communication satellites. This would "extend the market for American vehicles, remove some incentive for independent foreign development of boosters, and assure that we could continue to exercise critical leverage in foreign comsat activities rather than lose such leverage." Frutkin also favored the removal of restrictions on the export of satellite technology as such, including the kick-stage and propulsion technology needed to place a communications satellite in geosynchronous orbit.

An anonymous internal memorandum argued that technological sharing was the best way to enroll foreign firms and their governments in American comsat policy. By allowing "United States firms to enter cooperative arrangements with the communications and electronics manufacturing industry in other countries," notably in Western Europe, industries in these countries would develop the technical know-how needed for them "to compete effectively for contracts for the space segment of the global communications system." This would "remove a current irritant, primarily expressed by the French but also shared by the British, Italians and Germans, about their inability to supply hardware for the INTELSAT space segment." And even if such technological sharing did not irreversibly lock these European countries into the single global system favored by the U.S., one could expect them to have a "greater incentive" to collaborate with America in developing that global system. One might also expect them to be more cooperative and sympathetic to the U.S. position during the renegotiation of the INTELSAT agreements scheduled for 1969. Anyway, if the U.S. did nothing to help these nations, they would eventually develop the technology on their own, without American help, and would be quite capable of establishing separate, regional communications satellite systems in due course.[55] As Frutkin explained, "(a) We do need to

54. A. W. Frutkin to Mr. Hilburn, "Memorandum for Mr. Hilburn—AAD, Policies Relevant to '69 Revision of Intelsat Agreement," 11 April 1966, record no. 14459, International Cooperation and Foreign Countries, International Cooperation, folder Miscellaneous Correspondence from CODE I—International Relations 1958–1967, NASA Historical Reference Collection, Washington, DC.

55. "Communications Satellite Technology," undated and unsigned memorandum, but obviously written around April 1966, folder Cooperation in Space—Working Group on Expanded International Cooperation in Space, ELDO #1 [2 of 2], box 14, National Security Files, Charles Johnson Files, LBJ Library.

improve our situation in Intelsat with specific reference to the 1969 negotiations. (b) We already have a strong technical lead in the comsat field. (c) We already have an adequate voting majority in Intelsat. (d) We can rely upon our technical, moral and financial strength to assure continuing leadership—without seeking to deny technology to our partners in Intelsat."[56] Rather, then, use technological sharing as an instrument to divert foreign firms and governments into working with U.S. industry within the framework of a single global system where the U.S. was the dominant partner than have them defiantly develop an independent national or regional comsat capability over which the U.S. had no control and which could be used to bargain for a major revision of the INTELSAT agreements against U.S. interests.

I have stressed the pressure which foreign policy concerns played in arguing for technological sharing with ELDO. Implicit in my account is another dimension of the issue: the need to promote and channel the interests of American industry. Indeed, NASA officials like Frutkin mediated between firms who wanted to export technology abroad and the Office of Munitions Control in the State Department, which authorized them to do so. As Frutkin explained to Margrave, who directed the Office, American firms were putting NASA, the Department of Defense, and the State Department under extreme pressure to export nonmilitary vehicle technology to individual national firms in Europe.[57] By releasing export controls on the transfer of this technology to ELDO, one could at once satisfy their demands and divert them from the national to the multilateral level in line with U.S. foreign policy. We see, then, that arguments for relaxing constraints on booster technology were intended not simply to advance multinationalism in Europe and to help ELDO, but also to satisfy pressure for access to the launcher construction market from U.S. business. This stakeholder in international space collaboration is almost always ignored; it should not be.

## DENOUEMENT

Those administrators who were for, and those were against, relaxing constraints on technology transfer to ELDO shared a concern for nonproliferation. They differed on how best to achieve this. NASA and the State Department argued that by sharing high-energy nonstorable liquid-fuel launcher technology with ELDO, they could divert resources away from national military programs for which such fuels were obsolete. Similarly, they argued that by letting U.S. firms help European industry to build up its comsat capability,

56. Frutkin to Hilburn, "Memorandum for Mr. Hilburn."

57. Frutkin to Margrave, 1 April 1965, record no. 14465, International Cooperation and Foreign Countries, International Cooperation, folder International Policy Manual Material from Code I, NASA Historical Reference Collection, Washington, DC.

they could more easily engage European governments in the single global system promoted and controlled by Washington at the expense of a proliferation of competing regional communications satellite systems which could serve independent commercial and military needs. The defenders of NSAM 338 were adamant, however, that the U.S. should do nothing to help other countries develop comsats, or the powerful launchers needed to place them in geostationary orbit, without cast-iron guarantees that these would only be used in the INTELSAT framework. For them, technological assistance in either of these domains could only hasten proliferation, not contain it. By summer 1967, it was clear that the latter had won the day.

The reasons for this are complex and will be dealt with very briefly here. Developments in Europe played a role. ELDO (temporarily) survived its crisis and, by September 1966, had reoriented its program unambiguously in favor of developing a launcher called Europa II that achieved geostationary capability by adding a fourth, French-built solid-fuel stage to the previous ELDO-A rocket. In parallel, France and Germany decided to fuse their national comsat projects in a joint experimental telecommunications satellite called Symphonie to be launched by Europa II from the new French base in Guyana.[58] ELDO had moved from an artificial political construct to an organization with a well-defined technical mission and was far less vulnerable to offers of American help.

From the American point of view, to channel this "European fixation on comsats and launch vehicles," as Richard Barnes put it, the U.S. had to make an unambiguous offer for technological assistance in domains which satisfied the interests of both parties.[59] With cryogenic fuels no longer being considered and with France responsible for the kick-stage into geostationary orbit, this was going to be *very* difficult. Divisions within the administration on how best to interpret the requirements of NSAM 338 made it virtually impossible. Frutkin described the state of play in August 1966 to Webb, just before the NASA Administrator was to leave on a crucial European tour to discuss possible collaborative projects. While the "general atmosphere for space cooperation with the United States may have improved slightly," thanks to the initiatives by NASA and the State Department which we have described in this paper, they had done little more than "clear the air somewhat." The Europeans, Frutkin told Webb, "know of no progress in easing US restrictions upon communications satellite technology," and "it may be sometime" before the progress that had been made in Washington could be divulged to them. Webb was therefore to repeat the standard answer to the usual request for comsat launch assistance: "that we could certainly give consideration to such a proposition on the assumption that

58. The official agreement between the two governments was signed on 6 June 1967.

59. RJHB to AWF, "The 'Webb Commission,'" 5 May 1967, record no. 14459, International Cooperation and Foreign Countries, International Cooperation, folder Miscellaneous Correspondence from CODE I—International Relations 1958–1967, NASA Historical Reference Collection, Washington, DC.

the European countries take their INTELSAT commitment to a single global system as seriously as we do."[60] By virtue of this approach, there was, to quote Barnes again, a "deterioration of 'climate for cooperation' caused by (1) US policies and actions within the Intelsat, and (2) US export policies in support of the 'single global system.'" This led to "European reaction of suspicion and distrust to US offer to escalate cooperation."[61]

As Barnes remarked, the breakdown in trust between the two sides of the Atlantic was fueled by a very public, high-level offer to "escalate" space collaboration with West Germany and other European allies, which had gained momentum throughout 1966.[62] In an exchange of toasts between President Johnson and Chancellor Ludwig Erhard at a state banquet on 20 December 1965, LBJ suggested that existing scientific cooperation should be extended to embrace "an even more ambitious plan to permit us to do together what we cannot do alone." The President gave two examples of "demanding" and "quite complex" collaborative projects which would "contribute vastly to our mutual knowledge and to our mutual skills": a solar probe and a Jupiter probe. He also announced that NASA Administrator Webb would be traveling to Europe shortly to discuss these ideas in Germany and with other European governments.[63]

The target and timing of Johnson's offer were not coincidental. Erhard was a convinced and reliable American ally and was deeply hostile to de Gaulle's attempts to undermine the existing structures of both NATO and the EEC. As Secretary of State Dean Rusk stressed to James Webb, with the Chancellor boldly resisting this attack on European institutions, "it [was] politically important for the United States to cooperate as closely as possible with Germany." Increasing "the vigor and scope of space cooperation" with the country would be tangible, "positive evidence of constructive American interest in Germany," and it would encourage Erhard to take the lead in advancing U.S. policies in the region.[64]

The fanfare surrounding this offer for expanded scientific cooperation contrasts sharply with the reluctance to disclose publicly the possibility for technological collaboration with ELDO. And it was counterproductive in many respects. The American attempt to isolate de Gaulle was evident for all to see; indeed, Erhard was forced to relinquish his post in November 1966, accused of

60. Frutkin to Webb, "Memorandum for Mr. Webb," 11 August 1966, record no. 14618, folder Germany (West), 1956–1990, Foreign Countries, International Cooperation and Foreign Countries, NASA Historical Reference Collection, Washington, DC.

61. RJHB to AWF, "The 'Webb Commission.'"

62. This initiative is worthy of a separate paper; I give only the barest outline here.

63. "Exchange of Toasts Between President Lyndon B. Johnson and Chancellor Ludwig Erhard of the Federal Republic of Germany (In the State Dining Room)," 20 December 1965, folder Germany Erhard Visit [12/65], 12/19–21/65, box 192, National Security Files, Country File Europe and the USSR, Germany, LBJ Library.

64. Dean Rusk to James Webb, 29 August 1966, record no. 14618, folder Germany (West), Foreign Countries, International Cooperation and Foreign Countries, NASA Historical Reference Collection, Washington, DC.

mismanaging the economy and of being too pro-American and anti-French. The cost of the kind of projects discussed (about $100 million) was deemed to be excessive, given the resources available for space science and European priorities (although eventually Germany did embark on a bilateral venture with the U.S., the $100-million Helios project to send two major spacecraft within 45 million miles of the Sun).[65] Finally, with the U.S. publicly insisting on the need to respect the INTELSAT agreements, the American offer was also interpreted by some as a strategy to divert scarce European resources into science and away from applications, notably telecommunications. "All in all," wrote Frutkin to Webb in August 1966, "we must say the President's proposal got off to a poor start due to misunderstandings which are inevitable when a proposition of this sort is made in the headlines without preparation of the ground."[66] Barnes put it pithily: because of European "suspicion and distrust," aggravated by President Johnson's spectacular overtures to Chancellor Erhard, there was "no prospect for escalating cooperation with Europe unless (1) US is willing to modify its present export control policies, and (2) we could offer other possibilities for cooperation in areas of interest to them (i.e., comsats and vehicles)."[67] This was not to be.

## CONCLUSION

The defeat of those inside NASA and the State Department who considered sharing communications satellite and booster technology with Europe in mid-1960s was simply the first of a series of setbacks for those in the administration who believed that technological sharing could be used to unite Europeans around projects which were at once useful to them and compatible with the maintenance of U.S. leadership in strategic areas. Indeed, the battle was repeated just a few years later with the same result. European hopes to be integrally engaged at the technological level in the post-Apollo program, sparked by NASA Administrator Tom Paine in the late 1960s, were soon dashed. The compromise that ensued left Germany taking the lead in building a shirtsleeve-environment scientific laboratory that could fit in the Space Shuttle's cargo bay and that, crucially, preserved the basic principles of clean interfaces and no exchange of funds more or less intact. Indeed, Europe's ongoing struggle to be a genuine partner at the level of technological and managerial sharing with NASA and the U.S. might suggest that, when the chips are down, the need by powerful forces in the U.S. to protect national industry and national security will always prevail over foreign policy considerations. For them, American leadership is best preserved by denying sensitive technology, not by finding ways to use technological sharing to orient a partner's program in line with U.S. interests.

65. The project is discussed in Frutkin, "International Cooperation in Space."
66. Frutkin, "Memorandum for Mr. Webb."
67. RJHB to AWF, "The 'Webb Commission.'"

The negotiations over the ISS, particularly with Russia, show that this is not always so.[68] Indeed, it is striking that here, NASA *has* departed from past practice in accepting critical-path contributions from Canada and Italy and, more significantly, in accepting that there be a joint U.S.-Russian core and infrastructure as the foundation of the program. Sadeh has enumerated the foreign policy motivations for this move. Some were purely symbolic, e.g., to signal an end to the Cold War and Russia's entry into the club of advanced Western industrial states. Others were fully in line with the use of technology as an instrument of foreign policy as we have described it here. In particular, in these negotiations, as in the debates over the help to ELDO 30 years earlier, technological sharing was an instrument to steer Russia's civilian and military high-tech sectors along paths in line with American interests. Thus, integrating Russia into the core of the Space Station "enhances U.S. efforts to strengthen Russia's commitment to adhere to guidelines of international non-proliferation standards regarding ballistic missiles and nuclear technology, lends support to U.S. efforts to privatize and demilitarize the high-technology sector in Russia . . . and encourages Russian scientists and engineers to work on 'peaceful' projects rather than selling their talents to other, possibly hostile, states."[69] It also, of course, diverts scarce Russian resources away from projects of which the U.S. might not approve. In short, the *kinds of* arguments for technological sharing with ELDO in 1966 were still being used when dealing with Russia in 1996. The difference is that ELDO had nothing to offer at the technical level, while Russia could use its extensive experience in human spaceflight as a bargaining chip to win some key concessions. The lesson is clear: if we want to make sense of international collaboration in space from a U.S. perspective, we need focus carefully not only on what technology the U.S. has to offer, but what its potential partner has to give. In any event, as I have stressed, we simply cannot grasp the dynamics of international cooperation in space if we do not situate the scientific and technological *content* of the collaborative venture at the core of our analysis and relate it to strategies to maintain American "leadership" and some measure of control over the space programs of her partners.

I should like to thank Roger Launius for helpful comments on a previous draft of this paper.

68. Two important studies of policy regarding the Space Station are John M. Logsdon's *Together in Orbit: The Origins of International Participation in the Space Station* (Washington, DC: Monographs in Aerospace History, No. 11, November 1998) and Howard E. McCurdy's *The Space Station Decision: Incremental Politics and Technological Choice* (Baltimore: Johns Hopkins, 1990).

69. Eligar Sadeh, "Technical, Organizational, and Political Dynamics of the International Space Station Program," *Space Policy* 20, no. 3 (August 2004): 171–188. Sadeh makes no systematic distinction between the dimensions of the collaboration which were, indeed, symbolic and the far more substantive, material items that I have quoted here. Indeed, quite mistakenly in my view, he reduces *all* these policy considerations to the symbolic level. This evades the question of how the United States uses technology to steer the space and high-tech programs of its partners in particular directions.