Appendix B

NASA's Approach to International Cooperation*

Since the space program of United States began, the National Aeronautics and Space Administration (NASA) has pursued a vigorous and successful' program of international cooperation, grounded in the National Aeronautics and Space Act of 1958.** One possible reason for NASA's success derives from a key feature of its cooperative efforts: while NASA has international programs, it does not fund *an* international program. There is no "international" line item in the NASA budget and no money set aside especially for international programs. Funding for international projects must come out of the budgets of the NASA program offices (essentially science, applications, space flight, and aeronautics), The Associate Administrators of the Program Offices and their managers are rated not on how many international projects they have, only on how successful they are in achieving their program goals. Thus, for an international approach to a project to be undertaken it must not only contribute to achieving the goals of the interested program office, but it must be considered to be among the best approaches to achieving those goals. The sole modification to this principle occurs when a major U.S. foreign policy objective can be effectively served through an international space cooperative project; even here, however, the project must be technically sound.

NASA recognizes that if a "national" and an "international" approach are rated about even technically and fiscally, the national approach will allow for easier management and greater resource efficiency. Thus, self interest and relative efficiency tend to guard against undertaking marginal international projects.

Another factor contributing to the success of NASA and its international programs is the requirement that the agency pursue an extremely high standard of technical excellence. In the space business, it is possible to build a spacecraft that is 97 percent perfect and still have a disaster. While most nonspace organizations would be overjoyed with that degree of success in a major development effort, it is inappropriate for high risk, high visibility projects which have frequently launched beyond man's ability to repair easily.[2] A great deal of senior management attention, time and money is spent making sure that the last 3 to 5 percent of a project is done correctly. The importance of this for international projects is that NASA managers want as much insight into them as they have into a NASA-only project. This dictates a principle of "keep it simple" in management and technical interfaces. This means that NASA prefers bilateral relations over projects that might involve three or more countries or organizations.

The concern with technical and scientific excellence also contributes to NASA's international programs in another fundamental way. From the very beginning the principal area of international space cooperation has been in the sciences. NASA made a decision early in its history to involve in its programs not only the best scientists in the United States, but also those from throughout the free world. After all, "science" means "possession and pursuit of knowledge, " and the way to attain excellence is to work with the very best scientists. This may seem like a straight-forward approach, but it has marked a difference over the years between the science programs of NASA and the European Space Agency (ESA). Until very recently, ESA restricted direct participation in its own satellite projects only to European scientists.

In short, the basic character of NASA's international programs has stemmed significantly from the character of the agency itself and was set quite early: international projects would be undertaken only if they contributed to NASA's own program goals, foreign policy objectives would be supported, bilateralism would be the fundamental method of conducting international projects, and NASA's science programs would be oper to participation on a competitive basis by the besi minds from throughout the free world.

Three additional guidelines used in planning NASA'! international programs deserve prominent mention First, each cooperating nation is expected to assum[full financial responsibility for its own efforts on z project; i.e., no exchange of funds occurs in either di rection between NASA and the foreign cooperatin~ agency, This rule serves to reduce considerably the cos of the projects to NASA and to ensure close project

● Prepared by the International Affairs Office, NASA.

'See President's **1982** report to Congress on International Activities in Science and Technology (Title V).

● *One of the objectives of the "Space Activities of the United States" is (sec. 102): "Cooperation by the United States with other nations and groups of nations in work done pursuant to this Act and in the peaceful application of the results thereof, "

[2] EHutchings, Jr , "The Autonomous Viking, " *Science, vol.* **219, 1983,** pp **803-807.**

budget responsibility. Second, whatever the division in responsibilities between the partners in a joint project, each side must have the capacity to carry out its own responsibilities. This principle was established to limit technology transfer to partners. In pursuit of this objective, NASA seeks to define cooperative projects so that the interfaces between the contributions are as well defined and "clean" as possible. Third, the results of scientific cooperative efforts are to be made openly available to the international scientific community within a reasonable period of time through appropriate channels (depending on the type of project).

Following these prescriptions, NASA has concluded over 1,000 agreements with over 100 countries in its 25-year lifespan.[3] These agreements are not generalized, umbrella-type arrangements, but rather cover the specific elements of a discrete undertaking. NASA's philosophy is that specificity avoids misunderstandings and discourages "inventing" projects to satisfy the spirit of a diffuse agreement. While a number of major satellite, experiment and facility development projects are included in these totals, many of the cooperative projects are for smaller efforts such as remote sensing investigations (with **.53** countries), scientific and technical information exchanges (70; double counting of countries is involved here), geodynamics projects (43) and sounding rocket projects (22).

The importance of these "smaller efforts" should not be overlooked. Many of them have been with developing countries providing them with an opportunity to learn how to work with remote sensing data or how to build scientific payloads for sounding rockets or how to gain access to recent scientific reports in the open literature. One of the strengths of the bilateral approach to specific projects is that it facilitates cooperation with developed and developing countries on different sized projects at different levels of sophistication.

In addition to the scientific, technical, and political returns to NASA and the U.S. from this cooperation, over $2 billion in contributions have resulted from NASA's international cooperative programs. The amount grows to more than $3 billion when reimbursable services are included, such as for launching and providing tracking support for foreign satellites.

Statistical summaries are useful, but they also have a static quality which may not convey the dynamic nature of NASA's international cooperative programs. in fact, the NASA program is continually adjusted to -eflect new situations and opportunities. For example, NASA'S success in international participation became a political liability in 1980-81 when, in order to absorb its share of the administration's budget reductions, NASA found it necessary to reduce funding in one of its major science missions. The problem was that all three of the major ongoing science projects had significant international participation: Space Telescope (with ESA), Galileo/Jupiter orbiter probe (Germany) and the International Solar Polar Mission (ESA). This high degree of involvement of international participation in the science program meant that, for the first time in its history, NASA found it necessary to step back from an international commitment. NASA decided to terminate development of the U.S. satellite for the International Solar Polar Mission. The project was subsequently restructured to include only a single satellite built by Europe, to be launched by NASA on the space shuttle. Situations such as this may never be fully avoidable but they point up the necessity of carefully reviewing each prospective international project to assure, insofar as possible, its long-term merit. This is because the consequences of modifying or terminating an international project tend to be more far reaching and damaging to U.S. interests than with projects that are wholly national in character.

Limited funding also dictates that NASA cannot do everything there is to do of importance in space. Indeed, the expanding capabilities of other countries makes this unnecessary. A prime example is the upcoming return of Halley's Comet. After reviewing its options, the United States decided not to mount a mission to Halley's Comet. However, ESA, the Soviet Union, and Japan all decided to develop encounter missions. To provide important data and to assure that U.S. scientists and the world scientific community at large fully participated in this historic event, NASA organized of an International Halley Watch (IHW) program. IHW is an international network of ground based observatories that will provide significant scientific data but which will also provide ephemeris data important for assisting the three Halley encounter missions. In addition, the Space Telescope will make Halley observations from Earth orbit, as will three ultraviolet telescopes mounted on board Spacelab mission 0SS-3 in the shuttle's cargo bay. Finally, NASA is sending the ISEE-3 spacecraft, which has successfully completed its primary mission through the Earth's magneto tail to make the first ever in-situ cometary measurements with comet Giacobini-Zinner in September 1985. These data will be useful in their own right but may also provide valuable insights for the encounter Halley missions in 1986. By sharing leadership for exploring the heavens with other qualified space-faring nations, NASA stretches its own resources and is free to pursue projects which, in the absence of such sharing and cooperation, might not be initiated.

[3] A Review of NASA International Programs, NASA report, January 983

The space shuttle also presents NASA with the means to enter into new international cooperative opportunities. For example, during a visit to Sao Paulo on December **2,** President Reagan invited a Brazilian payload specialist to fly aboard the space shuttle. The President's remarks were based on the revision in NASA policy announced October 22, 1982, expanding opportunities for foreign and domestic sponsors of payloads on the space shuttle to nominate payload specialists to fly with them. Training and flight of these payload specialists will normally be on a reimbursable basis, although in the case of cooperative missions, other specific arrangements may be made. Since the announcement, NASA has discussed the expanded policy with a number of its cooperative partners and reimbursable shuttle customers.

It is therefore quite likely that, beginning in late 1983 with the first flight of a foreign payload specialist on Spacelab 1 (Ulf Merbold of ESA), a continuing stream of foreign payload specialists will join U.S. astronauts on the shuttle.

In the same vein, the possibility of the United States developing a **space** station to be serviced by the space shuttle also opens up potential new opportunities for international cooperation. Space Station is not at this time an approved program. However, should such a project receive future approval, the possibility of international participation in its development and use is a prospect deserving serious consideration. Potentially interested governments are being kept advised of developments in the United States and some foreign studies paralleling U.S. exploratory efforts are underway. These studies are being funded by the foreign government without commitment on either side with respect to future cooperation.

In summary, the outlook for mutually beneficial international cooperation in space, both in the short and long term, is very good. As in the past, most of this cooperation will be conducted on a bilateral basis. Where multilateral efforts are manageable and make sense, however, they also will be vigorously pursued.