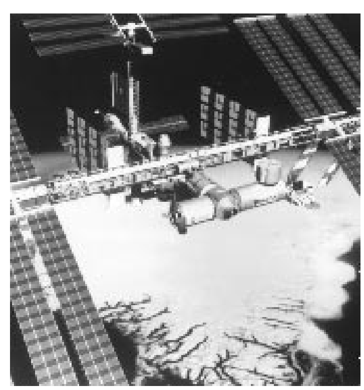
Opportunities for and Impediments to Expanded Cooperation 5

Foreign policy considerations, together with the budgetary pressures currently facing the civil space programs of the United States and of other spacefaring nations, provide a strong motivation for examining whether expanded space cooperation with Russia is desirable, in what fields, and on what basis. Additionally, there is a need to examine more closely the risks that would go along with such expanded cooperation and how those risks might be mitigated; this discussion is relevant to current cooperative programs as well. Finally, this chapter examines the role of the Russian and U.S. governments in civil space cooperation, particularly regarding control and regulation of private sector activities.

POTENTIAL FOR EXPANDED COOPERATION[1]

Launch Vehicles and Propulsion

Although the Clinton Administration's National Space Transportation Policy[2] directs the U.S. government to negotiate and implement agreements controlling trade in commercial space-launch services, it expressly authorizes the use of foreign launch services on a no-exchange-of-funds basis for cooperative government-to-government programs. The policy also states that "the U.S. Government will seek to take advantage of foreign components or technologies in upgrading U.S. space transportation sys-



[1] As used in this chapter, the term *cooperation* encompasses both government-to-government relationships and private sector ties such as joint ventures, co-production, and long-term supplier relationships.

[2] The White House, Office of Science and Technology Policy, "Fact Sheet—National Space Transportation Policy," Aug. 5, 1994.

tems or developing next generation space transportation systems."

The policy clearly was framed, among other things, in the knowledge that the greatest strength of the Russian space program (and the principal strength of the Ukrainian program) lies in launch vehicles and associated technologies, particularly propulsion and rapid payload processing and integration. The availability, robustness, and established reliability of Russian and Ukrainian launch vehicles, built on large-volume series production over many years, are potentially major assets for cooperative civil space activities. The use of those launch vehicles on a no-exchange-of-funds basis could permit some missions that would not be undertaken otherwise. Private sector development of these capabilities could also be a significant economic asset for Russia and Ukraine, but this dimension is currently limited by Western unwillingness to allow those states full access to the launch market.

As a practical matter, use of Russian and Ukrainian launch vehicles is being pursued on several fronts:

- Russian launch vehicles are being extensively scheduled to provide critical transportation for the assembly and operation of the International Space Station.
- The U.S. and Russian governments are discussing the use of Russian launch vehicles in cooperative projects such as planned missions to Mars and Pluto.
- The Lockheed-Khrunichev-Energia joint venture (LKE International) is marketing Proton launch services internationally, for both geostationary and low-Earth-orbit satellites.
- Boeing is seeking U.S. government approval for a joint venture with Ukraine's NPO Yuzhnoye (also known by its Ukrainian name, NPO Pivdenne),[3] RSC Energia, and a Norwegian builder of offshore oil platforms to market launch services using the Zenit vehicle.[4]
- U.S. manufacturers of propulsion and launch vehicles are pursuing proposals for the use of Russian propulsion systems, both to re-engine existing U.S. launchers and to include in proposals for future systems such as the X-33 reusable-launcher demonstration vehicle.

Space station program planners anticipate that Ukrainian Zenit launch vehicles (with Russian main engines) will be a key transportation element in the space station project, and a Russian-Ukrainian agreement is being negotiated to cover the provision of these and other Ukrainian goods and services to Russia for its use in the project. The agreement was expected to be ready for signature in 1995, but recent press reports suggest that the negotiations are not going well and that Russia is seeking to reduce its dependence on Ukrainian suppliers.[5] Meanwhile, the Boeing joint-venture proposal awaits licensing by the U.S. Department of State. Press reports indicate that the U.S. government is withholding its approval in part out of concern for the impact of another new entry in the commercial space-launch market, and also as leverage to help ensure Ukrainian conformity with the Missile Technology Control Regime. The regime seeks to deny the transfer of systems capable

[3] An umbrella space agreement between the United States and Ukraine was signed November 22, 1994, by Presidents Bill Clinton and Leonid Kuchma. The agreement is very similar to the 1992 U.S.-Russian agreement and is permissive rather than specific. The two Presidents also announced that NASA and the Ukrainian National Space Agency will prepare recommendations for flight of a Ukrainian payload specialist on the Space Shuttle (see "Joint Statement on Future Aerospace Cooperation Between the United States and Ukraine," Office of The Press Secretary, The White House, Nov. 22, 1994).

[4] The Zenit uses a highly automated launch-processing system, which could give it a competitive advantage; this Russian innovation could, in principle, be applied to evolving U.S. systems, as well.

[5] Peter B. deSelding, "Russia Ready To Use Ukraine-Built Zenits," *Space News*, pp. 1, 21, Oct. 3-9, 1994; "Zenit Rockets To Be Used in International Space Project," Kiev *Unian* (in Ukrainian), Nov. 15, 1994 (translated by the Foreign Broadcast Information Service); Peter B. deSelding, "Russia Distances Space Program from Ukraine," *Space News*, p. 3, Feb. 20-26, 1995.

of the long-range delivery of weapons of mass destruction.[6]

Spacecraft

Russian spacecraft capabilities are mixed. The fact that the Russians use robust, simple, low-cost, shorter-lived operational systems does not indicate, as some have argued, that they are necessarily inferior to U.S. designs—simply different. This difference does mean, however, that it may not be cost-effective to adapt high-cost, unique U.S. instrument designs, developed for long-lived U.S. spacecraft, to fly on Russian operational spacecraft with a shorter lifetime. Simpler instruments, or instruments that replicate existing hardware, may be a good fit, however, depending on the cost of adapting them to the new platform.

In the past, the United States has not been able to anticipate some adaptation costs. For example, in preparing to fly the Total Ozone Mapping Spectrometer (TOMS) instrument on a Russian Meteor-3, the National Aeronautics and Space Administration (NASA) initially assumed that the Russian satellite included a mass data storage subsystem, as is standard in U.S. satellites. Instead, NASA learned that the Russian satellite did not have this capability, which meant that NASA had to build and fly, for the first time, a solid-state memory unit dedicated to TOMS data. In addition, NASA learned that Russian meteorological satellite integration facilities did not have "clean room" capabilities for protecting sensitive instruments from contamination; because the TOMS required such handling, NASA provided a portable "clean room" for the TOMS integration.[7]

Russian scientific spacecraft present somewhat different issues. Some, such as the Luna and Venera planetary probes, were robust and resilient designs. Others, notably the two ill-fated Phobos spacecraft, both of which failed after launch in 1988, were not.[8] Some U.S. spacecraft specialists attempting to understand Russian spacecraft designs have had difficulty with the withholding of specific design information by the spacecraft manufacturers—at least in part a residuum of Soviet-era secrecy and bureaucratic compartmentalization, as well as a reflection of the Russians' perception that the design information might have commercial value.

Maintenance of schedule on new-design scientific spacecraft has also been a Soviet (and now a Russian) weakness; historically, the Russians have been much more successful at producing a series of spacecraft once a design is in series production. The current delay in completing the Mars '94 spacecraft, for example, reportedly results as much from technical problems as financial shortfalls.[9]

Mir and Mir-related spacecraft (such as the Functional Cargo Block (FGB) and other major Russian components of the space station) represent a special case. On the one hand, Russian experience in human spaceflight is unmatched, and Mir systems, although not technologically as sophisticated as systems being planned in the West for use on the space station, are mature and well tested. On the other hand, the FGB has not flown in the form that will be required for the space station, and delivery-schedule problems have been common during Mir's lifetime—the Spektr and

[6] See, e.g., Warren Ferster, "U.S. Eyes Zenit Warily," *Space News*, pp. 1, 28, Dec. 12-18, 1994.

[7] From an unpublished interview with George Esenwein, NASA Program Manager for the TOMS/Meteor-3 flight, 1991.

[8] One actually failed due to an erroneous command from the ground, but it was observed at the time that the spacecraft lacked fail-safe provisions that might have enabled controllers to save the mission.

[9] Frank Morring, Jr., "NASA Applies New Philosophy To Meet Old Goals in Mars Exploration," *Aerospace Daily*, p. 111, Oct. 21, 1994.

Priroda modules, for example, were originally scheduled for delivery in the late 1980s, then in 1992, but will not reach Mir until this year.[10]

As discussed in chapter 2, there are basic differences in spacecraft and instrument design philosophy between the U.S. and Russian programs, which can make designing and implementing interfaces between U.S. and Russian hardware difficult. U.S. systems have tended to be expensive, complex, high-performance, long-lived, heavily ground-tested, one- or few-of-a-kind designs. The Russian approach, on the other hand, emphasizes relatively low-cost, simple, moderate-performance systems that are flight-tested and put into series production, with the expectation that they will need to be replaced on orbit in a comparatively short time.[11]

Instrumentation

Russian scientific spacecraft, particularly during the 1980s and early 1990s, relied heavily on foreign instrumentation.[12] Western instrument technology is generally acknowledged to be superior. On the other hand, the Soviet Union had outstanding success in such technological areas as automated sample return (the Luna series), automated roving vehicles (the Lunokhod), and the series of Venera landers in the high-temperature, high-pressure environment of the Venusian surface. Other instruments and components with military applications or ancestry (such as the Vega imaging system, which used a Soviet military charge-coupled-device (CCD) array in a Hungarian-designed camera with French optics) have been very successful, as well. Russian military-derived remote-sensing systems, particularly those using photographic film, also produce excellent results. Radar-imaging systems with a similar heritage may be another asset, and there are reportedly plans to commercialize high-resolution, digital optical-imaging systems in the near future.

Human Resources

According to NASA officials and other observers, Russian scientific and engineering talent represents a great strength. Russian capabilities in mechanical engineering, software development for science and engineering, and science theory are excellent.[13]

"Brain drain" represents a major potential problem for Russia, as the best (or best-known) specialists are offered opportunities to leave for jobs outside Russia or in other fields. One reason for the U.S. government to support programs that stress in situ employment of such people is to counter such losses of talent, both to stem potential proliferation of militarily relevant know-how abroad and to encourage economic development and defense conversion at home.[14]

Other Capabilities

Russian deep-space communications assets—notably, the 70-meter-class antennas at Yevpatoria

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[10] A launch schedule for 1995 Shuttle-Mir activities, including launch of the two modules, was signed by Russian Space Agency (RSA) General Director Yuri Koptev and NASA Administrator Daniel Goldin at the December 1994 meeting of the Gore-Chernomyrdin Commission. This came after a late-1994 announcement of a two-month slip in the Spektr launch date, which seemed to threaten the scientific return on the investment in NASA astronaut Norman Thagard's visit to Mir, beginning in March 1995.

[11] Some observers have suggested that these differing design philosophies also reflect fundamental systemic differences in approach to technology. In this view, capitalist firms tend to look for new technological solutions and invest heavily in research and development, while Soviet (now Russian) entities place a lower value on innovation and seek to make the best (often clever) use of existing technology rather than take the risk of developing something new.

[12] Much of the major instrumentation on the Vega and Phobos missions, for example, was of Western European origin.

[13] An early initiative under the 1987 space agreement was the exchange of scientists between the science teams of various missions, including Phobos, Magellan, Mars Observer, and Cassini.

[14] See U.S. Congress, Office of Technology Assessment, *Proliferation and the Former Soviet Union,* OTA-ISS-605 (Washington, DC: U.S. Government Printing Office, September 1994), pp. 62-66, and chapter 6 of this report.

(actually in Crimea, Ukraine, but controlled by Russia) and Ussuriysk—could provide a useful complement to the capabilities of NASA's Deep Space Network, particularly in times of extremely high workload such as during the Galileo encounter with Jupiter beginning in December 1995. In 1992, the first NASA contract awarded to a Russian entity involved feasibility studies of such complementary uses, which demonstrated that using the Russian antennas would be of some modest value. Negotiations broke down, however, when NASA's Russian counterparts demanded a price for the use of the antennas that was much higher than NASA was prepared to pay. Discussions were broken off at that point, in 1993, and NASA has since developed and implemented other plans to handle the expected workload.[15]

Russian capabilities in advanced materials offer a potential for commercial development that has not, so far, been realized. U.S. engineers have explored the use of materials such as aluminum-lithium alloy, titanium, and carbon-carbon composites on U.S. spacecraft and launch vehicles. Kazakhstan has significant production capacity for beryllium, but a joint-venture project to exploit this capability, which was launched soon after the dissolution of the Soviet Union, has achieved only limited results.[16]

RISKS AND RISK MANAGEMENT

Clearly, civil space cooperation with Russia involves risks—some that are common to cooperation with the United States' traditional cooperative partners and some that are unique to Russia. This section characterizes those risks and discusses some options that managers in both the United States and Russia might adopt for managing them.

Risks

The programmatic benefits of international space cooperation are offset, to some degree, by:

- an increment of technical risk (presuming that the international partner's technical capabilities are not as well known as one's own, or that new developments are required);
- added management complexity; and
- exposure to additional political risk, if only because the needed budgets must survive two or more political systems rather than only one.

Generally, NASA and its traditional partners have judged these risks worth taking.[17]

In the case of cooperation with Russia, the picture is somewhat more complex, and additional risk factors are clearly present. These additional factors include:

- Russian political and economic uncertainties on the most fundamental level, which cast doubt on whether (or when, at least) commitments will be honored, whatever the intentions of the parties.
- The risk of "reverse linkage," in which strains in other aspects of the U.S.-Russian relationship adversely affect cooperative space projects (this has happened before, most clearly in 1982, when the government-to-government space agreement was allowed to lapse to express U.S. ire over the imposition of martial law in Poland).
- Russian systemic immaturity, that is, the substantial lack of a settled legal and institutional framework within which cooperation can go forward in a relatively predictable fashion.
- Exacerbated programmatic uncertainties, deriving from limited cooperative experience and 30 years' mutual isolation.

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[15] Interview with Charles Force, NASA Associate Administrator for Space Communications, Dec. 22, 1994.

[16] See appendix C.

[17] The overall record in high-technology cooperation with U.S. friends and allies is distinctly mixed, principally because of institutional mismatches (e.g., annual funding in the United States versus multiyear funding in other countries). See U.S. Congress, Office of Technology Assessment, *Arming Our Allies: Cooperation and Competition in Defense Technology*, OTA-ISC-449 (Washington, DC: U.S. Government Printing Office, May 1990).

- Reliance on the Baikonur launch site in Kazakhstan, with its attendant political and infrastructural uncertainties.
- Problems of communication and understanding, again derived from a lack of common experience and from cultural factors.

Risk Management

Political and economic uncertainties in Russia (and elsewhere in the former Soviet Union) present particular difficulties for risk management in civil space cooperation, as described in chapter 2. During the Office of Technology Assessment's (OTA's) November 9, 1994, workshop, "Civil Space Cooperation with the Former Soviet Union," several participants expressed doubt that the deteriorating overall condition of the Russian aerospace sector will permit it to deliver on the commitments to space cooperation being made by the Russian government. The Ukrainian economy, including its small aerospace sector, is in even worse condition than Russia's. Under these circumstances, it is extraordinarily difficult for U.S. program managers to decide how much to invest in hedging against the Russian (or Ukrainian) partner's default. The extent of such hedging is likely to be limited by available resources on the U.S. side, but some increment of confidence could be gained through further systematic analysis of post-1991 trends in the Russian aerospace sector.

Even assuming that broad political and economic stability can be maintained and that the aerospace sector (or key elements of it) does not collapse, it still appears certain that the sector, including the enterprises that support civil space activity, will continue to be severely underfunded, undersupplied, and hard-pressed to retain its skilled personnel. Recently, senior Russian Space Agency (RSA) officials have warned publicly that the Russian human spaceflight program is in imminent jeopardy, although this undoubtedly reflects some degree of posturing for domestic political effect.[18]

The Russian government response could be—as it has been in science and technology more generally—to insist on "maintaining a broad front of research... [forcing] cuts on a random basis, without any rational decisions about what is needed for economic development or military security."[19] To the extent that the Russian authorities are unable or unwilling to establish priorities, Russian enterprises that are key to particular cooperative space projects with the United States will be more-or-less equally at risk across the board.

Alternatively, RSA could decide to set clear priorities among space activities on the basis of their economic or operational value and to suspend support to those that fall too far down the list. Such a decision was made early in the post-Soviet period, when RSA funding was terminated for both the Buran space shuttle and the Energia heavy-lift launch vehicle. Deeper cuts may now be under way, judging by the economic problems currently facing the Russian Mars program and the further delay in the Spectrum-X mission.[20] The U.S. public and private sectors can, of course, influence these decisions over priorities, as they have through procurements for the space station program and joint commercial ventures such as LKE International.

Russian behavior since 1991 apparently reflects both tendencies. Even though the decisions to stop funding the Energia and Buran programs were made at the highest levels of the government,

[18] See, e.g., "Manned Space Program in Imminent Jeopardy," *Trud*, Moscow, p. 2, Dec. 10, 1994, in which senior RSA officials warn that the Russian piloted space program "could be terminated in late February 1995" unless more funding is found. The article was published just before the December 15-16, 1994 meeting of the Gore-Chernomyrdin Commission and as the Russian State Duma was debating the 1995 state budget, which suggests a tactical motivation for emphasizing the negative.

[19] Harley Balzer, *Some Thoughts on S&T Cooperation with Russia: Problems of Communication and Perception* (Organisation for Economic Cooperation and Development, in press).

[20] Peter B. deSelding, "Russian Woes Hampering Mars Project," *Space News*, p. 1, Dec. 19-25, 1994.

a year or more passed before Russian officials ceased sending confusing signals in the press about the future of these programs.[21] Similarly, Russian officials delayed postponing the Mars '94 mission until the last possible moment, even though well-documented rumors of the budgetary and technical causes of the delay were circulating a year earlier.[22]

Russian and U.S. program officials could reduce risk from this missed communication to some extent by communicating privately and explicitly with each other about programmatic priorities and funding decisions as they are being made (or as soon as possible thereafter). On occasion, with other partners, such "early warning" has worked extraordinarily well. In 1990-91, for example, NASA's cancellation of the Comet Rendezvous Asteroid Flyby (CRAF) mission, which had significant European (particularly German) involvement, was privately signaled well in advance and has had little lasting political impact. On the other hand, in 1981, the United States gave no warning to the European Space Agency (ESA) before canceling its spacecraft in the International Solar Polar Mission, and European confidence in U.S. reliability as a partner was severely shaken.[23] Frank and open communication with the Russians, although currently more difficult to achieve than such communication with ESA, could prove effective, at least in the non-space-station areas of the relationship.

The problem of "reverse linkage" is more complex and, from the programmatic perspective, may be less tractable than problems of communication. Space cooperation, in general, and space station cooperation, in particular, are highly visible, politically significant components of the overall U.S.-Russian relationship. Vice President Al Gore and Russian Premier Viktor Chernomyrdin are personally engaged, through showcasing space cooperation in their commission's activities. At the same time, the decisions to involve Russia in the space station program, to permit Russian entry into the commercial launch- services market, and to make significant purchases in Russia as part of the new relationship were clearly influenced in large part by the desire to secure continuing Russian adherence to the Missile Technology Control Regime (MTCR). The Gore-Chernomyrdin Commission meeting planned for June 1993 was postponed because of a failure to reach agreement on this issue; at their September 1993 meeting, the two officials announced agreements on MTCR, Russian participation in the space station, and the commitment to spend $400 million on a NASA-RSA contract.[24]

Some observers believe that the linkage between Russian missile-technology-proliferation behavior and space cooperation that has been created in this way could ultimately pose a greater threat to the space station than do technical or programmatic considerations; others believe that the space station relationship is so important to Russia that it provides a strong motivation for continued MTCR compliance.[25] The high profile

[21] Part of the confusion may be due to the emergence of space enterprises with some independent ability to keep systems and projects alive on their own. RSC Energia claims that it has continued to maintain and market the Energia launch vehicle (private correspondence from Jeffrey Manber, Managing Director, North American Operations of RSC Energia, to Ray Williamson, OTA, Feb. 3, 1995).

[22] Ibid.

[23] CRAF was paired with the Cassini mission to Saturn, using many of the same spacecraft components and systems that Cassini did, to save money. When it became clear that the cost of the combined program would exceed congressional guidelines, CRAF was canceled while work on Cassini continued. For a discussion of the International Solar Polar Mission (ISPM) cancellation, see U.S. Congress, Office of Technology Assessment, *International Cooperation*, OTA-ISC-239 (Washington, DC: Government Printing Office, July 1985), p. 384.

[24] See Marcia S. Smith, *Space Activities of the United States, CIS, and Other Launching Countries/Organizations: 1957-1993*, 94-347 SPR (Washington, DC: Congressional Research Service, March 1994 (updated periodically)), pp. 36-39.

[25] See, e.g., Marcia S. Smith, "Space Stations," Congressional Research Service Issue Briefs, Washington, DC, October 1994 (updated periodically), pp. 8-9, 16.

afforded the space station in the overall cooperative relationship may also afford it a degree of protection; from this vantage point, the space station may be affected less by negative developments in the overall relationship than are other, lower-profile aspects of space cooperation, including private sector activities.[26]

Businesspeople interviewed by OTA generally find systemic problems in Russia to be a significant brake on developing business relationships. The Russian institutions and legal system, developed under the Soviet regime and undergoing rapid change to fit the new situation, do not yet provide an appropriately stable business environment; observers have described the situation in Russia as resembling that in the United States during the 19th century's "robber baron" era. Sudden, unexplained changes in basic business law and regulations are commonplace, as are corruption and, increasingly, crime. These factors have not deterred U.S. aerospace firms from attempting to establish business relationships in Russia, but they have undoubtedly impeded progress in some cases. The most effective counter to this impediment, most of those interviewed suggest, is to obtain sound specialist advice, expect delays and reverses, and wait out the evolving system.

Relative mutual unfamiliarity, mistrust, and the resulting additional programmatic uncertainty are the inevitable consequence of 30 years of enforced isolation of the two national space programs from one another. For their part, U.S. officials and businesspeople express frustration at their inability to penetrate beyond the largest, best-known of Russian space enterprises; five years ago, they were largely unaware that these enterprises existed. Many Russian managers and officials carry with them entrenched habits of bureaucratic secrecy and tend to resist requests for information, even when those requests have sound business justification and do not jeopardize trade secrets or sensitive technology. Only time and effort on both sides (and, particularly, people in place in each other's establishments) can gradually lower these barriers to the point reached with the United States' traditional cooperative partners; the incorporation of Russian capabilities squarely in the critical path of space station development will necessarily accelerate this process, but at the probable cost of some expensive misunderstandings along the way.[27]

The sheer scale and complexity of the cooperative arrangements with Russia that are in place today for the International Space Station make it unprecedentedly difficult to insulate the program from disruption at any affordable cost. NASA is making a concerted effort to plan for such disruptions, but it acknowledges that a Russian delay or default, depending on when it occurred and what elements of the space station were affected, could cause significant cost or schedule penalties. Moreover, as one observer has suggested, Russian participation may, in fact, be in two critical paths —programmatic and political. Placing Russia in the programmatic critical path means that the program will incur significant delay and resultant increased costs if Russian components are delivered late or not at all. Although very substantial, this risk is at least broadly quantifiable, and from this standpoint, Russian participation is not necessarily essential to the program. The "political critical path" concept addresses whether the United States would be willing to continue the project at all, without Russian involvement, in the current budgetary environment. Those supporting this analysis believe that continuation of the International

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[26] Russia's unsettled politics make choosing among these hypotheses very difficult.

[27] For example, James T. McKenna, "Mir Docking Device Readied for Rendezvous," *Aviation Week and Space Technology*, p. 72, Sept. 19, 1994, describes difficulties in reaching agreement on the safety certification of the Russian-built docking module for the Shuttle-Mir program. On the other hand, the successful accommodation reached between the two programs, permitting the February 1995 Shuttle-Mir rendezvous to continue despite Russian concerns about a leaking Shuttle thruster, demonstrates what can be accomplished when the stakes are high enough.

Space Station program depends on continued Russian participation.[28]

U.S. officials have focused a great deal of concern on the future viability of the Baikonur launch site, or cosmodrome, which is essential to Russia's participation in the space station, as well as to the commercial use of the Proton launch vehicle for commercial launches. On December 10, 1994, Russian Premier Chernomyrdin and Kazakhstani Prime Minister Akezhan Kazhegeldin signed what appears to be a definitive agreement for the long-term lease of Baikonur to Russia. Earlier, in October 1994, Russian President Boris Yeltsin issued a decree that seemed to resolve internal Russian government differences over the continued maintenance and funding of the cosmodrome. If these measures are implemented and if the resources are made available for restoring the infrastructure at Baikonur and in the supporting city of Leninsk, this concern could recede; first reports are encouraging.[29]

Problems of communication and understanding have their roots both in inherent cultural differences and in the legacy of 75 years of Soviet experience. One participant in OTA's November 1994 workshop declared that "although things are changing very slowly, the most realistic assumption is that the system and attitudes have not changed at all."

U.S. officials and businesspeople emphasized several keys to controlling such risks:

- *Make use of the best available expertise in Russian business law and practices, both to structure relationships correctly and to avoid surprises as much as possible.*
- *Invest in high-quality interpreting and translating.*
- *Never assume a common understanding of terms and concepts; when in doubt, spell them out.*
- *Find out who has the authority to make the needed decisions; many decisions go straight to the top.*
- *Avoid postures or assumptions of superiority. Particularly in technical areas, mutual respect for capabilities and achievements is critical.*

THE ROLE OF GOVERNMENT

This section reviews the roles of government (or, more properly, the U.S. and Russian governments) in civil space cooperation between the United States and Russia. The same observations apply, as well, to cooperation with other states of the former Soviet Union.

Governments as Actors

Historically, NASA has resisted "umbrella" space agreements between the United States and other countries and between itself and other space agencies, preferring instead to construct relationships based on a series of individual, self-contained project-level agreements. NASA's rationale for this position is that umbrella agreements tend to create pressures to make projects cooperative whether or not the substantive basis for such projects exists.

This pattern has been broken with the Soviet Union, China, and other countries, including, most recently, Ukraine. In each case, the political symbolism of the umbrella agreement was judged to be such that agency interests were overridden. The current relationship with Russia carries this mutual coupling to a new level of intensity.

[28] Kenneth S. Pedersen, Research Professor of International Affairs, Georgetown University, private correspondence with Ray Williamson, OTA, Feb. 13, 1995.

[29] "Working Conditions at Baikonur Improve Following Kazakh Agreement," *Aerospace Daily,* p. 140, Dec. 30, 1994. In late February 1995, a NASA team, returning from work at Baikonur on preparations for launch of the Spektr and Priroda modules, reported that conditions on the spaceport itself were totally satisfactory and that hotel accommodations in Leninsk, except for an absence of hot water, were adequate. NASA also notes that the Russians continue to launch from Baikonur twice each month. On the other hand, one OTA workshop participant questions whether Russia will be able to afford both to maintain the spaceport and to arrest the deterioration of Leninsk.

A second tenet of NASA policy toward international cooperation has been that each side should bring to the venture the financial resources needed to carry out its side of the bargain. The fundamental rationale for this approach is that mutual programmatic interest and priority is best ensured when each party pays its own way and, secondarily, that spending taxpayer dollars abroad is politically risky. Historically, NASA has not opposed international teaming between its contractors and those in cooperating countries; indeed, such teaming has often been needed for the foreign partner to deliver its contribution. Occasionally, as in the case of the space station project, NASA has discouraged its contractors from pursuing such teaming agreements until the governments involved have put the fundamental decisions in place, but the private sector relationships have then followed quickly. Today, for example, U.S. firms and counterparts in Canada, Europe, and Japan have entered into space-station-related contracts and other agreements valued at over $200 million.

Again, the U.S.-Russian space station relationship has broken new ground; in addition to Russian contributions on the usual no-exchange-of-funds basis, direct NASA payments to RSA and directed procurements by NASA contractors from Russian suppliers will total close to $650 million over four years. As discussed in chapter 3, these payments serve important foreign policy goals, although NASA argues that they are also good value and a practical necessity, enabling cooperation to continue during Russia's difficult economic transition.

■ Governments as Regulators

Historically, U.S. export controls were a highly effective and nearly total block to space trade with the Soviet Union; Russia and the other former Soviet republics remain on the list of proscribed countries in the International Traffic in Arms Regulations (ITAR), meaning that the Secretary of State (or his designee) must grant a waiver before any export of goods covered by those regulations can take place.

In 1993, partly in recognition of the end of the Cold War, the United States revised the ITAR Munitions List, placing almost all civil space hardware (except for launch vehicles and associated technology, remote-sensing satellites, and communications satellites and components with significant military utility) under the control of the Department of Commerce. Significantly, however, detailed design and manufacturing information on all space hardware and software remains on the Munitions List.

NASA has negotiated with the Departments of State, Defense, and Commerce a blanket data-export authorization for the space station project, which permits the export of all interface and specification data necessary for Russia to carry out its responsibilities, on the same basis that such data are exported to the other partners. Other cooperative activities, such as the export of instruments and related data for flight on Russian spacecraft, continue to require case-by-case authorization.

Private sector activities are still subject to ITAR in most cases because, almost without exception, the first stage of developing a joint venture or other cooperative relationship involves an "export" of technical data for the purpose of initiating substantive discussions. During the OTA workshop, several participants from the private sector complained that the process continues to place an onerous burden on their activities, often including a requirement that their negotiations be monitored by Defense Department personnel. Others noted that the U.S. government uses the licensing process to pursue its policy goals in areas such as space-launch trade and missile-technology proliferation, holding back on license approvals until appropriate agreements are obtained, as in the case of Boeing's proposed joint venture to market a Ukrainian launch vehicle's services. Others commented that in many cases, the problem appeared to be less the substance of the regulations themselves than the "old Cold Warrior" attitudes they ascribe to the officials and military officers involved.

Although information is more fragmentary and Russian institutions in the field of technology-transfer control are less well-developed than they are in the United States, there have been some indications of impediments to expanded cooperation at work in Russia, too. Complaints about Russia's selling off its technical birthright for pennies on the dollar have been common in the Russian press. One firm reported that an important deal was being delayed because of lack of approval for transfer of the technology involved by a Russian interagency group concerned with technology security. Because of extensive commonality between Russian remote-sensing systems and their military counterparts, security concerns have imposed considerable overhead on efforts to market remote-sensing data products in the West, some businesspeople report.

Another important regulatory area is the field of space-launch trade. As mentioned above, one of the most important motivations for Russian agreement to abide by the MTCR was U.S. willingness to allow Russian space-launch services to compete to launch U.S.-built commercial satellites. Competitive issues aside, potential earnings from commercial launch sales may be important to keeping Russian rocket designers employed at home rather than offering their services to Third World missile programs. The current agreement, signed in September 1993, is designed to be transitional and allows Russia a total of only eight geostationary orbit launches through the year 2000. However, by the end of 1994, LKE International had reportedly won 15 firm contracts or options worth more than $1 billion and was expected to fill the Russian quota with firm launch contracts during 1995.[30] The Clinton Administration is coming under pressure from Lockheed, U.S. satellite manufacturers, and the Russians to expand the quota, particularly in light of the conclusion in January 1995 of a much more liberal agreement between the United States and China. Meanwhile, U.S. launch-vehicle manufacturers and Europe's Arianespace complain that the current agreement's price provisions, in particular, are not being adequately enforced, and those companies oppose any further market share for Russia.[31]

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30 "Lockheed Signs Up 15 Launches for Proton Venture," *Aerospace Daily*, p. 390, Dec. 20, 1994. Only very limited information on the financial arrangements between the partners is publicly available, but Lockheed's investment to date has apparently been modest compared with the potential revenues involved.

31 Andrew Lawler, "U.S. To Begin Launch Talks with China, Russia," *Space News*, p. 1, 20, Sept. 12-28, 1994.