



Space: The International Approach

Have we reached a turning point?

By RON COWEN

The proposed international space station will link with the shuttle, which will transport six astronauts to relieve the crew already aboard.

NASA

Late next month, if all goes according to plan, the space shuttle Atlantis will fly within a meter or so of Mir, the Russian space station. The two vehicles will link metal rings in a cosmic handshake, then draw together in an airtight embrace. For almost 5 days, as astronauts and cosmonauts transfer equipment and exchange crew, the 87-ton Atlantis and the 103-ton Mir will orbit Earth together.

Never before has a shuttle docked with such a massive craft. And only once before, in 1975, when the United States' Apollo module linked with the Soviet Union's Soyuz, have craft from these two countries joined in space.

The docking of the lightweight modules 20 years ago, during the Cold War, did little to unify the two countries' space programs. But next month's linkup will help lay the groundwork for construction of an international space station, a 5-year project scheduled to begin in 1997. This latest incarnation of the space station represents the seventh redesign of the facility since NASA first proposed it more than a decade ago.

Will the docking usher in a new era of international space collaboration? Opinion is divided, but the end of the Cold War "has transformed the environment for cooperation on space projects and led to cooperative programs in space with Russia and other former Soviet Union states

that would have been unimaginable just a few years ago," states a report released earlier this week by the congressional Office of Technology and Assessment (OTA).

The onslaught of budget cuts for space programs in the United States and abroad may provide another motive for pooling resources and forming international partnerships, notes Louis D. Friedman, executive director of the Planetary Society in Pasadena, Calif.

“Let us explore the stars together,” exhorted President John F. Kennedy in his 1961 inaugural speech. Despite Kennedy's challenge, space exploration in the 1960s, notably the race to the moon, became a “symbol of U.S.-Soviet competition,” notes John M. Logsdon, director of the Space Policy Institute at George Washington University in Washington, D.C.

These days, he says, international cooperation “is not just talk. The world has changed, and it has now become a political imperative to seek international collaboration.”

Even in the 1980s, notes Friedman, “our government view was that America would decide what it wanted to do [in space], and then it would decide where international partners would fit. With America in the 1990s, it's very different. We try to decide what to do together.”

Part of that new strategy, says Friedman, is to keep alive Russia's aerospace industry and to maintain its aging launch facilities at the Baikonur Cosmodrome in the former Soviet republic of Kazakhstan. The harsh economic climate and political uncertainties in Russia could jeopardize its newly signed agreement to rent Baikonur from Kazakhstan.

Friedman notes that numerous assessments by such groups as the American Physical Society hold that the space station shows little promise as a laboratory for basic research. While he agrees that science is neither the sole nor the primary reason for the space station, he says its political justification is sound.

Indeed, it may prove invaluable for furthering collaboration with Russia and other countries, he notes. NASA is now gearing up to create an international space station by relying on parts originally intended for a second-generation Mir (SN: 12/11/93, p.399). “We have a vested interest in keeping the Russian space agency [intact] and bolstering the Russian space industry,” Friedman says. U.S.-Russian collaboration could make the difference between “working with the Russians [on space exploration] or having them sell out to another buyer.”

Between 1994 and 1997, the United States will have paid Russia about \$600 million, in part to use Mir as a training vehicle and for a new space station mod-

ule. Some \$20 million of that amount is earmarked for Russian civilian scientists.

Other cooperative agreements between NASA and a foreign country or space agency don't allow for an exchange of funds, notes Marcia S. Smith, space policy analyst with the Congressional Research Service in Washington, D.C. For instance, Canada, the European Space Agency (ESA), and Japan won't receive any money for their contributions to the proposed space station.

But that deviation from the norm shouldn't draw criticism, insists Friedman.

"No exchange of funds' is a dumb policy because it's [treated as] a rule, as if God handed it down on Mount Sinai," he says. Giving money "should be considered on a case-by-case basis."

The OTA report notes, however, that "such purchases entail some political risk in the United States, as well as the risk to the space station if the Russian government and enterprises are not able to perform. Some U.S. observers question the wisdom of supporting any part of the Russian aerospace industry, which provided much of the technological substance of the Soviet threat to the United States."

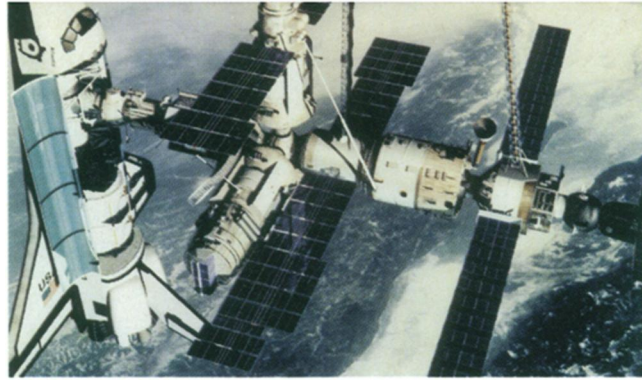
Smith says that other issues, including an unforgiving launch schedule, also raise concerns. To assemble the space station by 2002 will require 44 launches of spacecraft in 55 months, she notes. This includes 27 launches of the space shuttle. An additional 29 launches, all using Russian craft and launch vehicles, are needed to bring crews and fuel to the station. And because each of these 73 launches must go in a precisely timed order, a delay in one will affect the entire set.

Initially, a number of shuttle missions will have to hook up with Mir. Because Mir's orbit lies at an angle of 51.6° relative to Earth's equator, there is only one 5-minute period each day during which the shuttle can be launched to reach the Russian craft at the proper orientation.

Further delays may occur, Smith notes, because scientists don't know for certain the number of space walks needed to assemble and operate the space station.

"If the schedule slips, there will be added costs, which is what everyone is trying to avoid. If there is a further modification in cost, Congress may say 'we've had enough [redesigns]'" and curtail funding, she notes. "Another factor is the Russian aerospace industry — can they fulfill their part of the deal?"

The OTA report notes that for other U.S.-Russian ventures, including joint efforts to observe Earth from space, "program managers understand the risks



Shuttle docking with Mir, the Russian space station.

involved and have made contingency plans to account for long-term risks." In contrast, Russia has a pivotal role in the proposed space station, and no one has devised a backup plan.

But Logsdon observes that concerns about the precarious position of Russia's space program are "almost a given, since we're trying to improve stability with this collaboration." Friedman adds that the United States can benefit from Russia's experience in launching hundreds of vehicles. "The Russians launch their spacecraft on schedule; it's the U.S. who has problems," he says. In addition, says Friedman, the Russians know firsthand about long-duration missions — three cosmonauts have stayed aboard Mir for over a year at a time.

"If the space station were the end goal, it would be a more questionable venture," notes Logsdon. "But the experience in this collaboration may determine the future of U.S.-Russian exploration beyond [the vicinity of] Earth.

"We have to do this first."

Joint missions to the sun, Mars, and Pluto have been under discussion since last year. In one proposal, known as Mars Together, a Russian craft would launch a U.S. orbiter in 1998. The orbiter, most likely the Mars Global Surveyor, already slated for a 1998 launch, would carry a Russian module that would descend onto the Martian surface.

The module would contain a balloon and rover that Russia had originally intended to launch in 1996. By piggy-backing on Surveyor, the Russian experiments could proceed without the added cost of a carrier.

According to an October 1994 report of the joint U.S.-Russian Technical Working Groups, "to take advantage of the 1998 opportunity, this mission [Mars Together] must start in earnest in 1995." But will it?

Roger D. Bourke, who helps coordinate Mars international programs from NASA's Jet Propulsion Laboratory in Pasadena, Calif., says the answer should come late next month. That's when a commission headed by Vice President Al Gore and Prime Minister Victor Chernomyrdin, which meets every 6 months, will con-

vene in Russia to discuss a variety of collaborations in science and technology.

Friedman says the pace of negotiations about Mars Together has proved disappointing, especially in contrast to the rapid action on the space station. "The main difference [is that Mars Together] is not as politically driven," he says. "It's played second fiddle to the space station, and the international leadership on Mars Together is not as strong."

Politics aside, the need to learn and adapt to each other's working style takes time, Bourke says. Russia and the United States have evolved separately for several generations, and "as a result, we've ended up doing things in a different manner.

"It doesn't jump out at you immediately. They dress the same, speak the same, appear to be culturally the same, and yet as you start working with them, their style of doing business, their assumptions on how life works are significantly different."

Taken individually, such realities as the scarcity of computer paper to make an extra printout or the reluctance of Russian scientists to ask all the questions needed to fully understand a new proposal may seem small, says Bourke. But overall, these differences can hamper communication unless scientists recognize and adapt to them, he notes.

Bourke still finds the potential for collaboration encouraging, but "it's going to take longer than I had originally estimated because the differences are greater than I had originally anticipated."

Two other proposed missions, FIRE and ICE, would explore the extremes of the solar system. To examine Pluto and its moon, Charon, ICE would include two U.S. spacecraft, each carrying a Russian probe. The probes would be released a month before the encounter with the frigid planet and would relay data about the atmosphere and composition of Pluto or Charon back to the U.S. craft.

FIRE would send one Russian and one U.S. craft close enough to the sun to probe simultaneously its million-degree outer atmosphere, or corona, and the solar wind, or stream of charged particles blowing out from the sun.

The notion of two spacecraft studying the sun simultaneously may seem bittersweet to the European Space Agency. In the early 1980s, ESA and NASA were set to fly a pair of craft over the sun's north and south poles, simultaneously collecting the first data on the magnetic fields in these uncharted regions.

But budget cuts in the first year of the Reagan administration forced NASA to back out of the original plan. Although the agency continued to collaborate on the project, only one craft was launched.

The lone explorer, Ulysses, begins its pass over the sun's north pole in June.

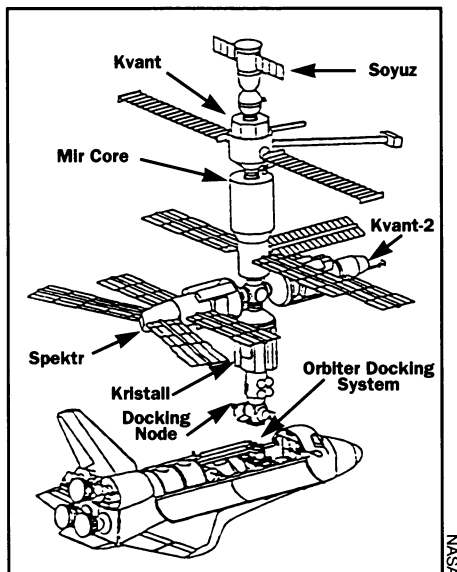
"Many people believe it hurt our alliance with the Europeans," says Smith.

The European space community has long since recovered from this blow, says Ian W. Pryke, head of ESA's office in Washington, D.C. More recently, according to Smith and other analysts, the United States upset the original foreign investors in the space station — ESA, Canada, and Japan — when it didn't consult them about Russian participation until it was a fait accompli.

A key difference between NASA and ESA, says Pryke, is that the European agency gets a multiyear funding commitment from its constituent countries up front. NASA must usually await each new budget year with trepidation to find out whether a project already under way will get sufficient funding to continue. That's one reason, he notes, that ESA chose to go ahead with its own infrared telescope rather than collaborate with NASA.

ESA's Infrared Space Observatory, scheduled for launch later this year, has an anticipated lifetime of only 18 months. A proposed NASA infrared observatory, called the Space Infrared Telescope Facility (SIRTF), would last longer, but budget cuts have made its future highly uncertain. Had ESA waited for SIRTF, the Europeans might have been out of luck, Pryke says.

He notes that ESA has collaborated with NASA for years and is currently look-



Docking of space shuttle with the Kristall module on Mir.

ing ahead to the Cassini project. This mission, which could be the most costly planetary NASA-ESA venture for some time to come, is scheduled for launch in late 1997 and will examine Saturn and its moons. It will include a special probe that should finally determine whether the moon Titan has a methane ocean.

Nonetheless, ESA has also felt the budget ax. As of late last year, ESA was to have contributed \$4.5 billion to the space

station between 1996 and 2003. But cost-cutting concerns among its member countries forced the agency to reduce its proposed contribution to \$3.2 billion.

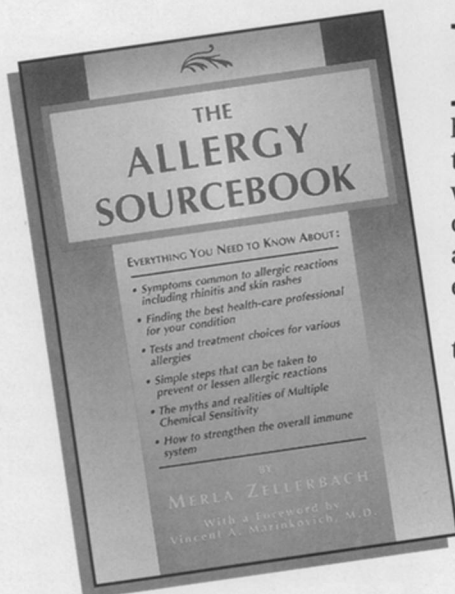
Although members reaffirmed their commitment to the international space station at an ESA council meeting in Paris last March, they did not put a formal price tag on that support. A definite monetary figure may not be decided until a meeting of ESA ministers in October. At present, ESA has come up about \$500 million short of the amount needed to carry out its space station plan over the next 5 years, says Jorg Feustel-Buechl, director of manned flight at ESA headquarters in Paris.

"It's our duty to either find additional financing capital from [our] member states or to reduce our contribution further," he told SCIENCE NEWS.

Moreover, as a reflection of recent changes in Europe, the agency may have some special identity problems. "Europe doesn't know what it wants in space," says Logsdon.

"There is a lot of ambivalence in Europe about the space program, probably because European priorities have changed since the end of the Cold War," Friedman says. "[It takes money] to reunify Germany, and it's not clear how space exploration fits into the picture."

Such realities, he notes, may force an even greater reliance on international cooperation. □



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