

NASA

Firmer Footing for Delayed Station

Only in the international space station program could an 8-month delay be considered good news. But NASA's assurances last week that the first components would be launched in June 1998 and that Russia would remain an important partner appear to have shored up congressional support for the \$30 billion orbiting lab.

The rubles necessary to build Russian parts of the station are finally flowing, says NASA station chief Randy Brinkley. Although some of those parts will be late, House and Senate appropriators gave NASA the green light last week to use \$130 million in space shuttle funding to cover the costs resulting from the Russian-induced delays. Another \$70 million that NASA requested will likely be granted soon, despite opposition from one key lawmaker, according to agency managers.

The launch delay will drive up costs, however, including an additional \$150 million to \$200 million primarily for modifications to the Functional Cargo Block, a small control module, which will be launched first. That structure will be redesigned to include some features that are part of the Russian-built service module. The launch of the service module—which will provide



In control. This control module, to be launched next summer, will be the first piece of the space station.

important command and control functions for the station—has been delayed until the end of 1998.

Despite that delay, NASA officials are buoyed by recent events in Russia. "That funding problem is behind us," Brinkley says. The Russian government has already released one-third of the total needed this year for the hardware to the Russian Space Agency, he says, with another payment due next week and the rest coming this summer. Russian managers "essentially opened their books to us" during a recent visit by

NASA officials to Moscow, says Brinkley. "We opened boxes at [the industry contractor] and put our hands on components that cost money."

However, not everyone is convinced that the crisis is over. Representative James Sensenbrenner (R-WI), who chairs the Science Committee which oversees NASA, remains skeptical that Russia will meet its obligations, and he sees the transfer of funds from the space shuttle as a threat to its safety (*Science*, 18 April, p. 347). "I don't think we can trust the Russians for anything," Sensenbrenner told *Science*.

But his chances of blocking the transfer are dimmed by the fact that control over NASA's purse strings rests with those who appropriate the agency's budget, not those who authorize its programs. That political reality was clear in his 16 May letter to NASA Administrator Dan Goldin, which outlines his objections but makes no specific threat to halt the transfer. And despite his concerns and the continuing arguments of longtime station critics about the program's value, it seems assured of receiving the president's request of \$2.1 billion in 1998, according to Administration and congressional sources. That amount would put the station on more solid ground as it heads toward orbit.

—Andrew Lawler

PLANETARY SCIENCE

Japanese Mission to Explore Asteroid

TOKYO—Japan's Institute of Space and Astronautical Science (ISAS) has earned a reputation for collecting big scientific and engineering payoffs from modest budgets. It hopes to continue that tradition with a \$200 million mission that will attempt to collect samples from a small asteroid and bring them back to Earth for study. The mission, scheduled for launch in January 2002, got a boost last week when NASA announced that it would contribute a 1-kilogram instrumented robotic rover.

"It will be a world first," says Akira Fujiwara, an ISAS planetary scientist in charge of the scientific aspects of the asteroid mission, called MUSES-C. Fujiwara expects the samples to provide insights into the materials and conditions that formed the rocky inner planets in the very early days of the solar system. "These are the fossils of the solar system," he says.

The 350-kilogram, \$104 million spacecraft will take 20 months to reach Nereus, a near-Earth asteroid, 1 kilometer in diameter, that was first spotted in 1982. MUSES-C will stay near the asteroid for 2 months, making three landings to let

NASA's rover out and to collect samples. "The rover will be the smallest ever flown in space," says Jürgen Rahe, head of NASA's solar system exploration program. A reentry capsule carrying the samples will parachute to Earth in January 2006.

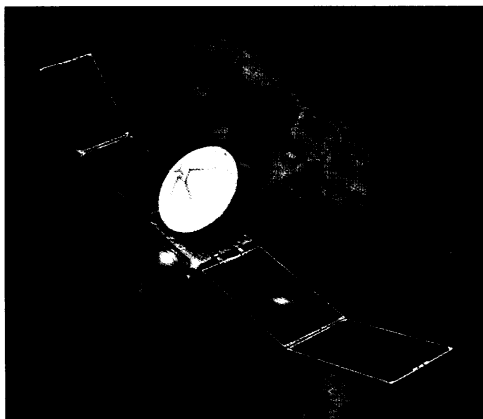
Along with the challenge of landing on such a small target, engineers also face the problem of gathering samples when there

is insufficient gravity to drill or pick at the surface. MUSES-C will fire a small metal projectile into the asteroid's surface, breaking away fragments with enough force that some of them are expected to bounce up through a funnellike device and into a receptacle on the spacecraft.

That technique may yield only 1 to 5 grams of material. But Fujiwara says that the amount should be enough to help resolve such questions as the mismatch between the relative abundance of materials in asteroids based on studies of meteorites—tiny pieces of asteroids that have landed on Earth—and spectrographic studies of asteroids. "It's not entirely clear just how well meteorites are representative of the material in the solar system," he says. Studying materials from a known source that has been spectrographically observed, he adds, could also help refine spectrographic studies.

Collecting the samples is just one of many engineering challenges. The mission's primary objective is to develop technologies "for planetary exploration in the 21st century and beyond," says Junichiro Kawaguchi, a design engineer for the spacecraft, and there will be several such elements on board.

The craft will be powered by an ion thruster, in which xenon ionized by micro-



Rocky welcome. MUSES-C satellite hopes to collect samples from Nereus in 2003.