mode that aimed to keep its solar panels pointed at the sun. But this holding pattern was perturbed after a sensor triggered the brief firing of a hydrazine thruster to correct the spacecraft's position. It overshot, then fired again to compensate. This thrust-counterthrust duet kept repeating. "We were [wobbling from] a thruster pulse about every 7 minutes or so, rapidly depleting the hydrazine fuel," recalls Bernhard Fleck, European Space Agency project scientist for SOHO. "It was a race against time."

But taking the craft out of safehold mode, as it's called, required input from the gyroscopes—all of which were broken. Instead, the engineers wrote software that allowed the spacecraft to ignore the gyroscopes. Next, they fired the thrusters to stabilize SOHO and fine-tuned its orientation by a subtle braking and accelerating of flywheels. The craft has been working normally since 2 February. "The operation was well planned and conceived," says Alan Gabriel of France's Institute of Space Astrophysics near Paris. "It brought the spacecraft back from death."

One hitch remains: Although SOHO is pointed at the sun, the images it sends back are rotated 69 degrees, which interferes with some measurements. This roll position is normally controlled by a star tracker—but that instrument is pointed away from its beacon. Engineers will attempt to fix this particularly thorny problem without gyroscopes early next month, says Fleck.

Astronomers are now geared up to start scrutinizing the sun again as it approaches a peak of activity around 2001. They lost about 6 weeks of observation, but consider it a small price for having the spacecraft back online. **–ALEXANDER HELLEMANS**

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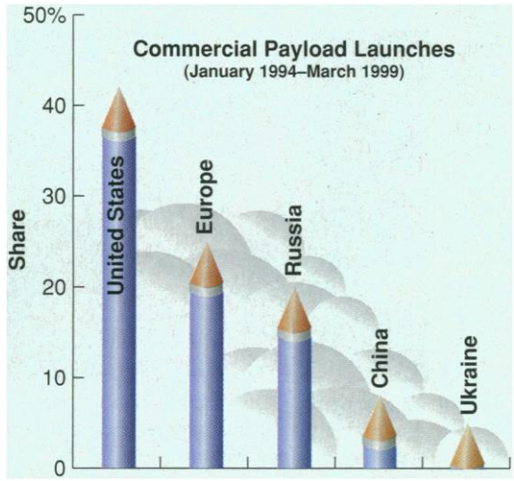
SPACE SCIENCE

Red Tape Entangles Small Satellite

Last summer, astronomer Mark Hurwitz won a coveted NASA grant to build one of the first members of a new generation of small, bargain-priced science satellites. But there was a catch: The University of California, Berkeley, researcher had to find a way to launch his payload, called the Cosmic Hot Interstellar Plasma Spectrometer (CHIPS). So Hurwitz designed his 25-kilogram instrument as a mechanical parasite that would hitch onto a U.S.–built communications satellite to be launched by a Russian rocket in 2001 or 2002.

End of story? Hardly. Instead of being a solution, that arrangement was only the beginning of Hurwitz's problems. His $9.8 million, 1-year mission—an extreme-ultraviolet spectrograph that will study a hot gas cloud that surrounds the solar system—has become imperiled by a U.S. policy that prohibits launching taxpayer-funded payloads aboard foreign rockets. And he's not alone. The 5-year-old policy has exacerbated a decade-long shortage of U.S.–made rockets that has discouraged researchers from planning small missions. Even the Air Force is scrambling to find overseas rockets for its experimental satellites. "It's a tangled and potentially sad tale," says Jim Barrowman of NASA's Goddard Space Flight Center in Greenbelt, Maryland.



SOURCE: U.S. DEPARTMENT OF TRANSPORTATION

Global adventure. Other countries have room for U.S. scientific payloads—if they win government permission.

Hurwitz's misadventure began in 1997. That's when NASA set up a competition for academic scientists with instruments that cost less than $13 million, a pittance in a field where missions routinely run $50 million or more. In designing the University-class Explorers (UNEX) program, however, NASA officials butted up against the problem of finding an economical way to launch the small payloads. Most U.S. rocket companies had little interest in building smaller, low-cost launchers, and the space agency's own Bantam minirocket program had yet to take off. NASA officials had also endured a logistical nightmare trying to find commercial and military launchers willing to carry small instruments funded under an earlier program.

The solution, says one UNEX planner, was "to unleash the creativity of the U.S. science community." For Hurwitz, that meant hooking up with Final Analysis Inc. of Lanham, Maryland, which hopes to launch some 40 communications satellites over the next several years. Last summer's other winner, astrophysicist John Wygant of the University of Minnesota, Twin Cities, made arrangements with the Air Force to launch his $13 million Inner Magnetosphere Explorer to study the response of Earth's Van Allen radiation belts to the solar wind.

Soon after NASA announced the winners, however, space agency officials learned that what appeared to be a minor complication in the CHIPS plan was a potential showstopper. Although U.S. space policy allows private companies to buy rides on foreign rockets (and many have), government payloads can't fly foreign. The 1994 rule is designed to protect the $1.2 billion U.S. launch industry from competitors and to prevent foreign nations from stealing U.S. technology. Only the president can issue an exemption.

Initially, NASA officials figured CHIPS didn't need an exemption because it wasn't an independent satellite. But they ran into stiff opposition from other U.S. agencies, in particular the Federal Aviation Administration, which is a vocal booster of U.S. rocketmakers. Another obstacle was the increasingly tense political climate created by last year's revelations that China may have stolen high-tech secrets from U.S. satellites launched there, and that Iran may have bought missile technology from Russia. Last December, partly in response to congressional accusations of lax security, the Administration clamped tighter controls on the use of Russian rockets to launch U.S.-owned geostationary satellites.

Although CHIPS doesn't need a geostationary orbit, the controversy cast a shadow over all U.S. users of Russian rockets. The dustups also strengthened the hand of exemption opponents—forcing NASA to ask the White House Office of Science and Technology Policy if CHIPS needed a waiver. That request, which "seemed very routine in August, has become not at all routine," says Hurwitz. Indeed, NASA "probably had a much [more receptive] audience last fall than we do today," adds NASA's Karen Poniatowski, who is drafting the document.

Administration sources familiar with CHIPS's predicament hope that the instrument's size and scientific merit will carry the day when the issue is brought before the White House. Policy-makers "probably didn't envision a science instrument the size of a watermelon that hitches a ride on a larger satellite" when they drafted the prohibition, one source said. But others predict a long and fractious debate.

NASA officials are cautiously optimistic, knowing that CHIPS's fate could set a precedent for other NASA projects. Hurwitz says he's "prudently exploring alternatives" but so far has drawn little interest from U.S. companies. Still, the uncertainty hasn't idled him. "We're moving ahead," he says confidently. "You can't sit on your hands forever."

–DAVID MALAKOFF