Shuttle: 4 for 4 and SDI too

The 18th space shuttle mission, designated 51-G, took off on June 17 with a lofty set of goals. There were the deployments of a record number of satellites — three dependent on auxiliary rocket motors of a sort that malfunctioned in the past, plus a fourth inaugurating an entirely new type of NASA spacecraft — as well the first space test in President Reagan's Strategic Defense Initiative, or "Star Wars," program, and more. The results, said one NASA official: "100 percent."

The flight's first day in space saw the deployment of Mexico's first communications satellite, Morelos A, named for Jose Maria Morelos y Pavón, a 19th-century hero of Mexican independence.

Day 2 featured Arabsat 1B, to provide communications for the 22 members of the Arab Satellite Communications Organization, including Libya and the Palestine Liberation Organization among others. NASA said that the launch arrangement was completed in 1981 with "explicit Department of State approval and authorization." The deal, noted NASA, "does not constitute recognition or imply political endorsement by the United States of either the PLO or Libya." Prior to the satellite's deployment, a warning light appeared to indicate that its solar panels had opened prematurely in the shuttle's payload bay, but the problem turned out to be only with the indicator. Included as a "mission specialist" in the seven-member crew was the first Arab to go into space, Saudi Arabian Prince Sultan Salman Al-Saud, nephew of Saudi King Fahd.

A third communications satellite — Telstar 3, owned by AT&T — was deployed on the flight's third day. Like Morelos A and Arabsat 1B, it was equipped with an attached rocket motor called a PAM, or Payload Assist Module, to boost it to its final orbit after deployment. Two PAMs had malfunctioned during past deployments from the shuttle, as had other types of "kick motors," but all three on mission 51-G worked just as planned. Together, they were a relief to interested parties ranging from engineers to NASA officials (aware of growing launch-business competition from Europe's Ariane booster) to satellite insurance underwriters.

Then came Star Wars day, earmarked for a Defense Department test of the ability of a ground-based laser to track a fast-moving object in orbit, such as an intercontinental ballistic missile — or, in this case, the shuttle. Mounted in one of the shuttle's windows was a "retro-reflector," designed to reflect a low-powered (4-watt) argon ion laser beam, aimed by a computer, directly back to its point of origin on Maui, Hawaii. On that day, however, officials sending instructions for the shuttle's computer to position the craft so that the reflector would face the laser mistakenly reported the elevation of the laser site in feet — 9,994 of them — rather than the much smaller number of nautical miles for which the computer program was written. As a result, the laser beam hit the shuttle, all right, but not the reflector — which was facing exactly the wrong way, toward an impossible mountain in space. Two days later, however, the test was repeated, and the result was successful enough that project officials did not even bother with an available third chance to try it.

The test, designed in part to measure the effects of atmospheric distortion on the beam's path and intensity, will be repeated in a few months, but with the reflector mounted on sounding rockets rather than the shuttle. The rockets will be traveling at speeds slower than the shuttle's orbital velocity of more than 17,000 miles per hour, but will also reach higher altitudes, giving a chance to evaluate the effects on the laser of a longer "path length" through the atmosphere.

The record-breaking fourth satellite deployed during the mission was NASA's own Spartan 1, carrying an array of Naval Research Laboratory detectors to map X-ray emissions from a number of celestial sources. These include a large cluster of galaxies in the constellation Perseus as well as what some researchers think may be a massive black hole in the center of our own Milky Way galaxy.

To minimize both cost and complexity, Spartans carry neither transmitters nor receivers, operating on pre-stored computer instructions and recording their data on magnetic tape or film rather than radioing it to the ground. Their "passivity" eliminates the need for ground-based tracking as well as concerns about electromagnetic interference with the shuttle's own systems. At the end of their short missions, the devices are simply retrieved with the shuttle's remote-control arm, as was done with Spartan 1 after less than two days. In fact, quips Leonard Arnowitz, chief of the special payloads division at NASA's Goddard Space Flight Center in Greenbelt, Md., an informal name for Spartan during its development used to be "KISS — for Keep It Simple, Stupid."

The next Spartan, to fly next January, will study Comet Halley, while later ones will focus on solar physics and ultraviolet astronomy. — *J. Eberhart*

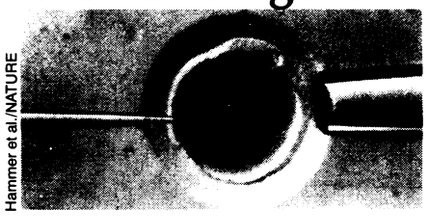
Pigs, sheep, rabbits with a human gene

While successes mount for genetic engineering in mice, the practical applications for farm animals lag far behind. But now a collaboration of experts in gene transfer and animal husbandry report the first demonstration that a gene of a foreign species, in this case a human growth hormone gene, can be injected into embryos of farm animals so that the gene joins a chromosome. In some cases the resultant animals make the protein that the gene encodes. But in no case so far reported is the animal's growth measurably enhanced.

One reason researchers have been slow to shift from mice to cows or sheep is that success rates are low; many eggs must be injected to produce an animal with a foreign gene incorporated into its chromosomes. Collecting eggs and providing "foster mothers" require far fewer animals with mice than with sheep.

Nevertheless, in the current work, about 2,000 rabbit embryos, 2,000 pig embryos and 1,000 sheep embryos were each injected with a few hundred copies of the human growth hormone gene fused to a mouse regulatory region, report Robert E. Hammer and Ralph L. Brinster of the University of Pennsylvania in Philadelphia, Vernon G. Pursel of the USDA Agricultural Research Service in Beltsville, Md., Richard D. Palmiter of University of Washington in Seattle and their colleagues in the June 20 NATURE. About 10 percent of the embryos injected survived to a full-term birth.

The gene-integration results in sheep were disappointing — only 1 percent. But in rabbits and pigs, the frequency of gene integration was considered good — about 12 percent. Among the animals with copies of the human growth hormone gene in their chromosomes, four rabbits and 11 pigs showed human gene activity.



Hammer et al./NATURE

Key to success: Inject genes directly into nucleus. This interference-contrast micrograph shows a rabbit fertilized egg.

The scientists attribute their success to the techniques they used to see into cells — methods that allowed them to inject the genes directly into nuclei or pronuclei (the nuclei of sperm and egg before they fuse in the fertilized egg). The eggs of many farm animals have an opaque cytoplasm, so a type of microscopy called interference contrast was used. In addition, the pig eggs were centrifuged to remove the darkest material from the part of the egg containing the nuclei.

The scientists conclude, "These experiments demonstrate that foreign genes can be introduced into several large animal species by microinjection of ova." — *J.A. Miller*