The third shuttle: Satellites and ice

There were legitimate grounds for nervousness at the maiden launching of Discovery, third member of the U.S. space shuttle fleet. Postponed three times by technical problems, it was more than two months behind schedule and had already forced the National Aeronautics and Space Administration (NASA) to cancel the subsequent mission completely and reshuffle the planned payloads of several others, in hopes of getting the increasingly tight calendar back on track. Furthermore, when Discovery took off on Aug. 30, the type of rocket motors used in two of the three satellites it would deploy had failed twice on a previous mission.

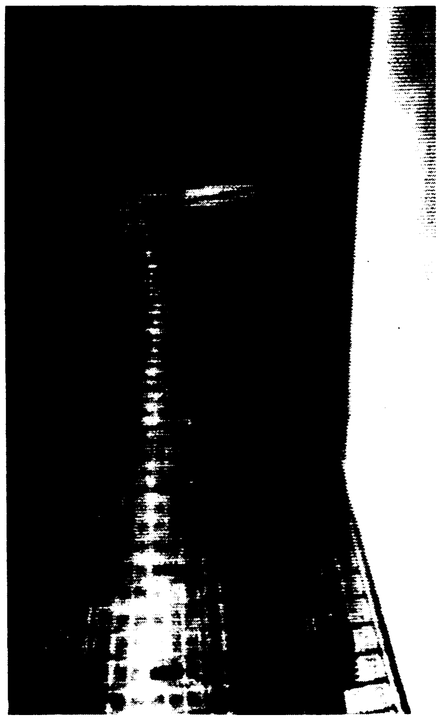
Eight hours into the mission, Satellite Business Systems' SBS-4 communications satellite was successfully deployed from the shuttle, but that had never been a problem. It was when mission control at Johnson Space Center in Houston reported the proper performance of the satellite's own rocket, carrying SBS-4 up toward its final orbit, that Discovery astronaut Steven A. Hawley radioed back, "We're up here celebrating."

Photos: Wide World

Ice blocks shuttle's liquid-waste vent.

The other such rocket, called a Payload Assist Module, performed equally well on the flight's third day, raising the orbit of AT&T's Telstar 3 satellite. On the intervening day, the Hughes Communications Services Leasat 2 satellite was successfully deployed by a very different method, in which it was flipped, spinning, out of the shuttle's cargo bay, in what Hughes called (after getting permission from the Wham-O Corp.) a "Frisbee launch."

The most spectacular piece of equipment on Discovery's first flight, however, was a huge, experimental solar-cell array designed to test the deployment and stability of such structures for use in providing power to a future space station. Consisting of 84 accordion-folded panels of a thin plastic film, the array (sometimes dubbed a "solar sail," though it is designed to use light for electricity rather than propulsion) was stored in a package only seven inches thick. With astronaut and electrical engineer Judith A. Resnik at the controls, the device was drawn out by the gradual extending of an epoxy-fiberglass mast, which stretched the array out of the cargo bay to a height of 102 feet, about 10 stories. Opening it first to about 70 percent of its height, Resnik initially reported indications of some sticking between the panels, but after retracting and extending it some more, the sticking appeared to have ceased. A key question involved the extended device's stability, including whether it would wobble or bend when the shuttle was moved or vibrated using its reaction-control jets. Even at full length, it turned out, the array moved less and was more stable than its engineers had expected.



Solar array looms from shuttle bay.

Discovery's maiden flight was also the fifth shuttle mission to carry a continuous-flow electrophoresis experiment, designed to take advantage of weightlessness for the separation of biological materials such as hormones for the pharmaceutical industry. Tending the device was "payload specialist" Charles D. Walker of McDonnell Douglas Corp. in St. Louis, and his presence turned out to be fortuitous. When the balanced pressure required in the instrument's separation chamber failed to keep steady under automatic control, Walker was able to adjust it by hand, using an audible alarm in an earphone to keep in touch even in his sleep.

One problem during the mission was the formation of a chunk of ice on the shuttle's hull, which in part blocked off the liquid-waste vent from the craft's toilet. Turning the ice toward the sun initially failed to help, as did shaking the shuttle with its jets. But most of it was removed with the craft's remote-control arm, one day before its Sept. 5 landing. —*J. Eberhart*

Gene engineering: Patent for products

The U.S. Patent and Trademark Office has awarded two California scientists a controversial patent on recombinant DNA molecules containing foreign genes and on the uses of such molecules in bacteria. This "product" patent, issued last week, is a companion to a "process" patent, issued in 1980, that covers the basic method of splicing and recombining genes. A third patent, on the use of recombinant DNA molecules in more complex organisms, such as yeast, is still pending.

The road to this second genetic engineering patent has been rough. The original patent application, filed 10 years ago, covered both process and product. But it was separated into two applications in 1978, so that the process application could be granted while the products patent could be considered further.

Within the biotechnology community, there is no consensus on how well the newly granted product patent will hold up to legal challenges. Harvey S. Price of the Industrial Biotechnology Association in Rockville, Md., says he still expects to see "a lot of dispute and a lot of litigation." The stakes are high. The two patents granted, which are assigned to Stanford University, give Stanford a proprietary position until 1997 over the basic methodology and tools currently used throughout the biotechnology industry, says Niels Reimers of Stanford's office of technology licensing.

The process patent alone has already brought in almost $3 million to Stanford and the University of California, which shares the royalties. The patents are based on work in 1973 by Stanley N. Cohen of Stanford and Herbert W. Boyer of the University of California at San Francisco. So far, 66 companies have received licenses, but many more are thought to be employing the gene-splicing techniques.

"We believe that virtually all genetic engineering companies are using this patented technology in their research and development," says Katharine Ku of Stanford's office of technology licensing.

So far only one product of genetic engineering is on sale to the public. It is human insulin, called Humulin, produced in bacteria by Eli Lilly & Co. of Indianapolis. Other pharmaceutical products are expected to become available soon.

Several major questions slowed the issuing of the patents. One was whether the application was accurate and detailed enough to enable other researchers to produce the DNA described. Another was whether Cohen and Boyer were the only co-inventors. Finally, there was a dispute over whether a magazine report of a talk by Boyer more than a year before the patent application was filed counted as "public disclosure" and could result in forfeited patent rights. —*J.A. Miller*