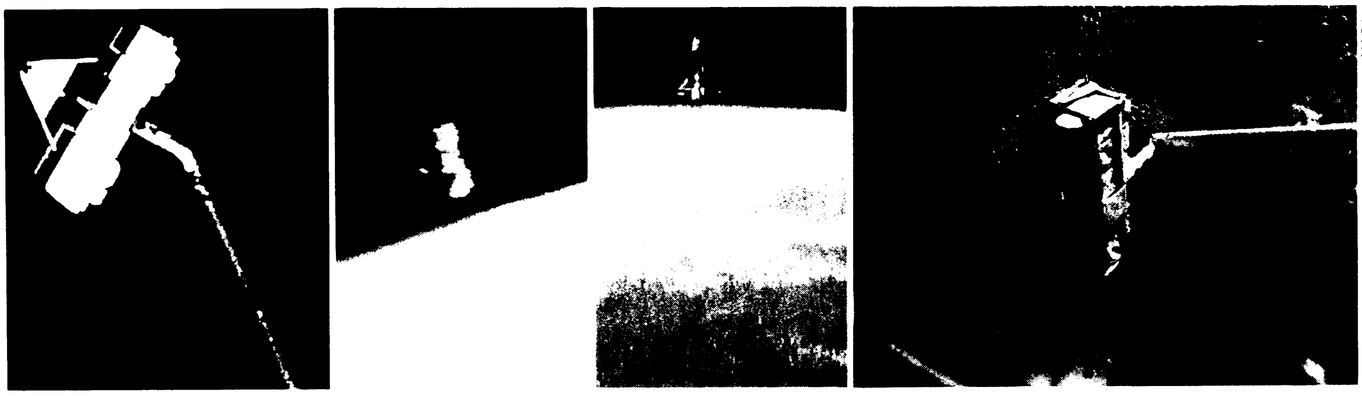
Shuttle 7: 'We Pick Up and Deliver'



L to R: The SPAS-1 satellite pallet, grasped by the shuttle's remote-control arm, is lifted out of the cargo bay, then set free in space where it moves away and photographs the shuttle itself, and is later retrieved by the arm.

"We've been told some crews in the past have announced, 'We deliver,'" said Robert Crippen, commander of the seventh space shuttle mission, alluding to the deployment of a pair of communications satellites during flight 5 last November (SN: 11/20/82, p. 324). "Well, for flight 7, we pick up and deliver."

Carrying payloads up from earth and depositing them in space is a major part of the shuttle's business, ranging from setting out satellites for communications and weather-watching purposes to deploying major observatories such as the huge Space Telescope, now expected to be launched in 1986. Another important role, however, is getting some of them back again. Some may be satellites that need repair, like the Solar Maximum Mission, or Solar Max (SN: 5/23/81, p. 324), whose ailing attitude-control system is scheduled for an attempt at on-site replacement during flight 13 next April. According to the head of NASA's shuttle program, Air Force general James A. Abrahamson, the ability to conduct such tasks (past satellites have been known to succumb to ills as minor as blown fuses) will "revolutionize the way we operate in space, bringing down costs and improving reliability." Other payloads will be retrieved for deliberate return to earth, like the Long Duration Exposure Facility (LDEF), designed to stay aloft for as long as a year at a time to subject various test materials to the space environment, after which it will be brought back down, given a new load of samples and sent up again. Before the crew of shuttle flight 13 goes to work on Solar Max, it is scheduled to place LDEF in orbit, for pickup by flight 24 the following March.

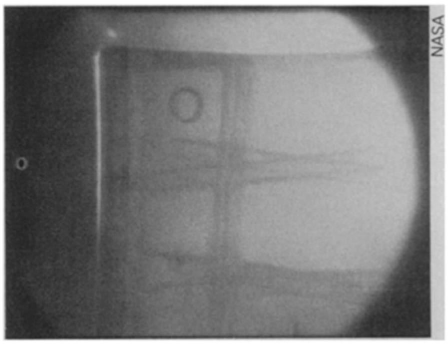
The highlight of flight 7, which lifted off on time on June 18, was the first test of whether the shuttle could indeed retrieve objects in space. The first items on the mission's busy agenda, however, were the deployment, as on flight 5, of two communications satellites. Canada's Anik C-2 is the second in a three-satellite series that will operate entirely in the 12/14 gigahertz communications band, each providing

Under zero-gravity conditions, splitting up is easy to do

A forerunner to an orbiting drug factory was put to the test last week on the space shuttle Challenger. While all the data from that test have not yet been analyzed, preliminary results look promising. In fact, officials from the companies that sponsored the experiment expect an improved model of the system — which separates a stream of sample material into individual chemicals and does so more efficiently under zero-gravity conditions — to be generating the first space-manufactured commercial product within several years.

The chemical-separating scheme — called a continuous flow electrophoresis system (CFES) — already had passed with high marks tests on two previous shuttle missions, say officials of the sponsoring companies, McDonnell Douglas Astronautics Co. and Ortho Pharmaceutical Corp. (a division of Johnson & Johnson). The tests are leading up to the production in space by the CFES of a new drug for the treatment of a protein deficiency disease, says David W. Richman of McDonnell Douglas in St. Louis. (The details regarding that drug still are corporate secrets.)

Electrophoresis is the movement of particles in solution when they are placed in an electrical field. The continuous flow version involves injecting a continuous stream of sample material onto a carrier fluid. Because the particles in the stream have different charges and sizes, they move at different speeds away from one electrode toward another with opposite charge, Richman explains; "this natural phenomenon makes electrophoresis a very useful technique for separating the different components of a mixture." On the ground, the technique is generally only useful for separating dilute solutions, because gravity can cause a sample that is more dense than its carrier fluid "to collapse in a blob around the [sample injection] port," Richman says. In space, where gravity is no longer a limiting factor, the CFES has been shown to generate 463 times more volume of separated material per unit time than that of the corresponding ground system, he says.



On board the shuttle, the CFES separated protein mixtures and also was shown to successfully separate pigmented plastic spheres into distinct streams of red (far right vertical band), white (left) and blue (center).

During the recent shuttle mission, Sally K. Ride, Frederick H. Hauck and John M. Fabian tested the system on the complex mixture of proteins naturally produced by living cells, in an attempt to isolate potentially therapeutic proteins. A McDonnell Douglas engineer is scheduled to operate such a system during a 1985 shuttle flight to obtain enough of the new protein deficiency disease-fighting drug in order to start testing on human subjects.

—*L. Garmon*