Spacelab 1: A little of everything

The six people who took off aboard Columbia on Nov. 28 constituted the largest crew ever carried by the space shuttle. Their 10-day mission was the longest, their 17-ton payload the heaviest, their round-the-clock work schedule of 12-hour shifts the most demanding. Their agenda of some six dozen scientific experiments was the most wide-ranging and their associated army of more than 700 support personnel on the ground below the most elaborate.

It was the maiden mission of the Spacelab research module, designed, built and paid for by the European Space Agency (ESA) to the tune of nearly $1 billion. And though Spacelab will be used in a variety of configurations on subsequent shuttle flights, its first outing was more complex than any that will follow, according to National Aeronautics and Space Administration officials. The first priority was to check out Spacelab itself, but to do so, NASA and ESA equipped it to study a host of questions in the life sciences, atmospheric physics, earth observations, astronomy, solar physics, space plasma physics and materials science. This meant that Spacelab never slept. The crew was divided into two shifts — a red team and a blue team — each including an astronaut to fly the shuttle itself and two specialists (one on each team being a scientist not even recruited from the ranks of the astronaut corps) to operate the diverse experiments.

There were problems — one device to generate beams of electrons and ions never did work in the high-power mode that would have let it produce auroras visible from the ground for ionospheric studies. But the crew proved such able Mr. Fixits that they repeatedly drew cheers from the groundlings for saving various pieces of equipment. When a film magazine jammed on a mapping camera, astronaut Robert A. R. Parker carried the device into the bunk area of the shuttle's mid-deck, zipped himself into the darkness of a sleeping bag, took the magazine apart, untangled its 14 rolls of film and put it back together. On another occasion, he unjammed an essential high-data-rate tape recorder, and German colleague Ulf Merbold (the first non-American to fly in a U.S. spacecraft) successfully dislodged a sample that had become stuck in an oven used for materials-processing. "It is another marvelous example of how useful it is to have men on board this laboratory," said chief ESA Spacelab scientist Karl Knott. "Trained people are priceless parts of this mission." Europe not only has its involvement with Spacelab, but also hopes for a more-than-token role in a U.S. space station, if NASA can get the idea off the ground.

Wide World

Spacelab astronaut Robert Parker in elastic harness for "shock-and-drop" test.

Throughout the mission, the Spacelab crew conducted a series of experiments to study human responses to weightlessness. In what were dubbed "drop-and-shock" tests, for example, the astronauts would hold themselves near the "ceiling" while taut elastic cords would extend to their legs from the "floor." When the handholds were released, the men would be snapped "downward," creating an illusion of falling that would normally be perceived first by the inner ear. In weightlessness, however, the inner ear seems to provide a weaker cue, so that the brain becomes confused between that and the stronger "falling" sensations from the eyes and muscles. Motion sickness can result (SN: 11/26/83, p. 342), and the Spacelab tests indicated that it was necessary for the brain to learn to filter out the weaker, conflicting signal, concentrating instead on visual and other cues to avoid sickness. Both before and after the mission, the astronauts would carry out similar tests in a laboratory at NASA's Dryden Flight Research Facility in California, providing "baseline data" about their responses in normal gravity for comparison.

The effects of weightlessness on the processing of various materials were also evaluated, including several studies of the role of convection versus gravity in the growth of large crystals. In another test, an alloy was successfully produced from aluminum and zinc — different or impossible in earth's gravity because of their difference in weight. All of the mission's astronomy experiments proved successful, including the detection of X-ray and far-ultraviolet sources that can only be studied from above earth's atmosphere. Seven days into the flight, Spacelab's orbit carried it into a position from which it was in full-time sunlight, ending most of the astronomy experiments but setting the stage for the full-time activation of a suite of sun-watching instruments.

And prompted as much by the mission's successes as by its "glitches," Spacelab officials extended the already record-long nine-day flight to 10, aiming for a Dec. 8 desert landing in California.

—J. Eberhart

Kidney hormone may limit osteoporosis

A synthetic compound of the kidney hormone calcitriol may effectively treat osteoporosis. Studies conducted by John Gallagher of Creighton University in Omaha, Neb., Lawrence Riggs of the Mayo Clinic in Rochester, Minn., and Hector DeLuca of the University of Wisconsin in Madison suggest that calcitriol, when taken by osteoporosis victims in the appropriate doses, cuts down on the number of spinal bone fractures and increases bone mass with a minimum of side effects.

Osteoporosis afflicts 15 million mostly older and female U.S. residents causing their bones to become brittle and to easily break. The resulting complications make osteoporosis the twelfth leading cause of death in the United States (SN: 8/27/83, p. 140). According to a Food and Drug Administration spokeswoman, there is no drug presently approved by the FDA for treating osteoporosis. But physicians use chloride, anabolic steroids, estrogen and calcitriol among other medications for their patients with osteoporosis.

In the 120-person study, neither the medical personnel nor the patients knew who was getting the placebos and who was getting the calcitriol. After the first year people on the placebos were switched to calcitriol for ethical reasons, according to Gallagher, because the people on calcitriol were breaking fewer bones. "We saw a 50 to 75 percent reduction in spinal fractures," Gallagher says of the half of the population studied that took .25μg of calcitriol twice daily.

These findings will first go to Hoffman-LaRoche Inc. of Nutley, N.J., which manufactures calcitriol (Rocaltrol) in the United States, according to Gallagher. Then the researchers will submit the results for publication. Hoffman-LaRoche plans to file for FDA approval for the use of calcitriol in the treatment of osteoporosis in 1984, says a Hoffman-LaRoche spokesman. He adds that so far the FDA has approved the use of Rocaltrol for kidney dialysis patients who suffer from bone loss.

Hoffman-LaRoche funded part of the Gallagher-Riggs-DeLuca research and has invested further in two additional clinical trials, both larger in scale and employing more sophisticated equipment for measuring bone mass. Charles Chestnut III, an associate professor of medicine and radiology at the University of Washington School of Medicine in Seattle, says: "It is very interesting initial pilot data that says this drug may be useful in treatment and prevention, but we need definitive studies."

—J. C. Amatniek