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Spacelab 1

This issue contains the first scientific reports of results obtained with Spacelab 1 during its flight of 28 November through 8 December 1983. The mission was the first of many in which a complex laboratory designed and built by the European Space Agency will be used. Accordingly, although experiments were conducted, a primary purpose of the mission was to prove out the thousands of structural, mechanical, and electronic parts that make up the laboratory. For example, the Spacelab structure and the laboratory components were monitored during ascent and descent when they were being subjected to maximum accelerations and vibrations. More than 200 sensors situated throughout the Spacelab were used.

The Spacelab consists of two major elements: a pressurized, habitable laboratory called a module in which scientists can work without cumbersome space suits and unpressurized pallets designed to support instruments which require direct exposure to space. The particular module used in Spacelab 1 had a diameter of 4.26 meters and was 7 meters long.

Spacelab was a multidisciplinary mission with five major areas of scientific research represented: astronomy and solar physics, space plasma physics, atmospheric physics and earth observations, materials science, and life sciences. The laboratory contained 38 different experimental facilities. Sixteen were situated on the pallet and 20 in the module; two had components both on the pallet and in the module. Some of the experimental facilities operated automatically, while others were operated from the ground or remotely by the scientific crew through the computer. Other experiments in the module were operated directly by the crew.

The 38 experimental facilities were used to conduct more than 70 investigations. These experiments were selected from more than 400 proposals solicited by NASA and ESA in 1976. An international panel selected the experiments to be conducted on the basis of scientific merit and suitability for flight on the Spacelab-shuttle. A minority of the investigators are located in the United States. In this issue about two-thirds of the reports are authored by European scientists.

Overall the facilities in the Spacelab functioned quite well. There were some problems, but most defects could be corrected or circumvented by the scientific crew. The major disappointment was the delay in the launch of the shuttle Columbia for more than a month.

Communication between Spacelab 1 and ground was excellent. Real-time television images from orbit were available for long periods, permitting close interaction of the scientific crew with principal investigators on the ground. As the mission progressed results poured in, and the new information was used to alter procedures for experimentation later in the mission.

Some investigations produced results immediately. This was especially true of the life science experiments. Other studies involved collection of enormous amounts of data that were stored electronically for complete analysis later. In addition, results are available from only a few of the materials science experiments. The full story awaits detailed study of samples returned from the mission.

Long-term support for Spacelab missions will depend on perceived possibilities of practical applications. The potential that has been most talked of is materials processing. On Earth, when substances crystalize they have a density different from the liquid and hence the crystals move up or down. Under microgravity the crystals remain suspended. The usefulness of this phenomenon was demonstrated in Spacelab 1 when protein crystals with a volume 1000 times those obtainable on Earth were prepared.

Those who go into a laboratory for the first time to conduct an experiment under new conditions are lucky when they have any kind of a result to show for their efforts. The patient and careful planning for Spacelab 1 paid off in the many results reported in this issue. The achievements thus far are a good omen for further successes as the lessons learned to date are used in planning for later Spacelab missions.—PHILIP H. ABELSON.