Countdown for Spacelab 1: Experiments by the truckload

It will be the space shuttle's heaviest payload yet, about 17 tons, packed with some 70 experiments representing researchers in a dozen countries and operated by four Ph.D. astronauts in addition to the two other spacemen who will actually fly the craft on its eight-day mission. It is Spacelab, the European Space Agency's complex, modular, multi-disciplinary research facility, designed to support studies ranging from earth-resources mapping to astronomy to tests of processing new materials.

Its first flight, the shuttle's ninth, has been scheduled to take off on Oct. 28, although by SN's deadline this week National Aeronautics and Space Administration officials were still discussing whether the launching might have to be delayed by a month or even more. Following the shuttle's previous mission, engineers discovered that the nozzle-lining of one of the craft's two strap-on solid-rocket boosters had almost burned through; tests have been underway to see whether the nozzle linings for flight 9 would need changing, a time-consuming procedure requiring the shuttle to be hauled back from its launch-pad so that the boosters can be modified. "We'll take the safe route," said one NASA official, "but we're still hoping for the 28th."

The "payload specialists" primarily in charge of tending to Spacelab 1's experiments will include the first non-U.S. astronaut to be launched aboard a U.S. spacecraft, physicist Ulf Merbold from West Germany. With him will be Byron K. Lichtenberg, a biomedical engineering specialist from Massachusetts Institute of Technology in Cambridge. Also working with the Spacelab module will be "mission specialists" Owen K. Garriott and Robert A. R. Parker, both from the regular NASA astronaut corps. (Garriott, an amateur radio operator, will also be carrying a hand-held radio transceiver to permit brief contacts by "ham" operators around the world.) The shuttle's commander will be veteran astronaut John Young, along with rookie Brewster H. Shaw Jr.

Illustrations: NASA

Merbold, Lichtenberg in Spacelab mock-up.

Most of the experiments aboard Spacelab 1 will be housed inside the facility's pressurized laboratory section, a shirt-sleeve environment just as is the shuttle's main crew cabin. Others, requiring direct exposure to space, will be mounted on an open pallet. (A second pallet would fit in the shuttle's cargo bay with the pressurized module of the size being used for Spacelab 1, and there is a shorter pressure chamber that would leave room for up to three pallets. It is even possible to fly five pallets alone, and all such permutations — and more — of Spacelab's main sections are envisioned for use in future missions.)

Spacelab 1's official mission insignia.

Spacelab 1's experiments represent several broad disciplines:

• *Astronomy and space physics* — A Far Ultraviolet Space Telescope (FAUST) will be mounted on the pallet to take wide-field views of a variety of astronomical sources. Having already made observations from sounding rockets, FAUST represents the chance to demonstrate that Spacelab can be used for studies with existing instrumentation, rather than requiring all-new designs for each piece of equipment. There will also be a "very wide field" camera for general UV studies, as well as a spectroscopic instrument for detailed studies of cosmic X-ray sources. Three instruments will be devoted to the sun, measuring the solar spectrum as well as changes in the solar constant.

• *Space plasma physics* — The earth's magnetic field and charged-particle environment will be studied with the aid of particle accelerators that can inject high-intensity electron and ion beams and neutral gas clouds into space from the shuttle. Other experiments will focus on the effect of these beams on the earth's upper atmosphere, and follow the artificially accelerated electrons as "tracer particles" to chart electric fields parallel to earth's magnetic field. A low-light-level television camera and photometer will be used to produce images of optical emissions caused by both natural and artificial sources. Another instrument will measure heavy cosmic-ray nuclei (with a nuclear charge of 5 or more) as they penetrate the geomagnetic field.

Garriott with hand-held "ham" transceiver.

• *Atmospheric physics and earth observations* — Besides monitoring emissions from various atmospheric and ionospheric sources, there will be two experiments for studies of the earth's land and water surface. A "metric" camera designed for accurate mapping will give Spacelab 1 what ESA says is the first opportunity to take photos of the earth from orbit at up to 58° north and south latitude and then return them to earth. The camera, in fact, has been one of ESA's primary worries during the uncertainty about the mission's launch date, since delaying the mission by a month would move it into a time of poor weather (and thus low visibility) over much of Europe and Asia. After the late-October-early-November "launch window," says ESA, the next "optimum" time for surface photography there is not until next February, a postponement that would cost a lot of ESA's limited funds as well as raising problems for several other experiments. Designed to be independent of such visibility matters, however, is another Spacelab 1 instrument, a microwave radar capable of penetrating clouds and rain and sent along as a step in the development of an all-weather remote-sensing system.

• *Life sciences* — A variety of studies will be concerned with the effects of spaceflight on human beings and plants.

• *Materials science* — More than half of Spacelab 1's experiments will be in this area, which shows signs of becoming increasingly important as more concern is expressed over the possibilities of manufacturing and other commercial activities in space. The next Spacelab mission is tentatively set for November 1984.

— J. Eberhart