The following article prepared by NASA Marshall Space Flight Center Historian Mike Wright appeared in 1993 in *Research and Technology, Annual Report of the Marshall Space Flight Center* which was dedicated to the Spacelab Program.

Salute to Spacelab

Spacelab

A Short-Term Spaceborne Laboratory

As space shuttle development began at the Marshall Center in the 1970's, planners at the Center were studying ways to use the proposed new vehicle's capabilities for scientific research. Early studies at the Marshall Center had called for the development of a versatile, reusable laboratory facility. This facility would fit inside the payload bay of the shuttle orbiter and provide the crew of career astronauts (mission specialists) and members of the science community (payload specialists) with workbench space, power, computer support, and racks and storage for experiment equipment. The ninth flight of the shuttle, launched on November 28, 1983, carried Spacelab—a multiconfiguration spaceborne scientific laboratory—into orbit.

In 1970, the Marshall Center had requested proposals from industry for the preliminary design of a research and applications module as a way to provide versatile laboratory facilities for Earth-orbital research and applications work. In 1971, the Marshall Center began in-house studies on a laboratory called the Sortie Can, later renamed the Sortie Lab. The Sortie concept for Spacelab included a combination of habitable, pressurized modules in which scientists could conduct investigations and unpressurized pallets for instruments requiring direct exposure to space, such as telescopes.

In 1972, NASA began negotiations with the European Space Research Organization, the forerunner of the European Space Agency (ESA). This ultimately led to an agreement between NASA and ESA, with ESA assuming responsibility for funding, developing, and building Spacelab. Under this arrangement, Marshall Center did the feasibility and preliminary design work during the Sortie studies, and ESA did the engineering design and hardware development based on Marshall-defined requirements. Marshall, however, retained responsibility for technical and programmatic monitoring of Spacelab development activities, which involved 50 manufacturing firms in 10 European countries.

In addition to program management responsibilities, Marshall Center built related Spacelab flight components, including an optical window for scientific observations, and developed a pressurized transfer tunnel for passage of crew and equipment between the shuttle's orbiter cabin and the laboratory module, where astronauts and scientists could work in a shirt-sleeves environment.

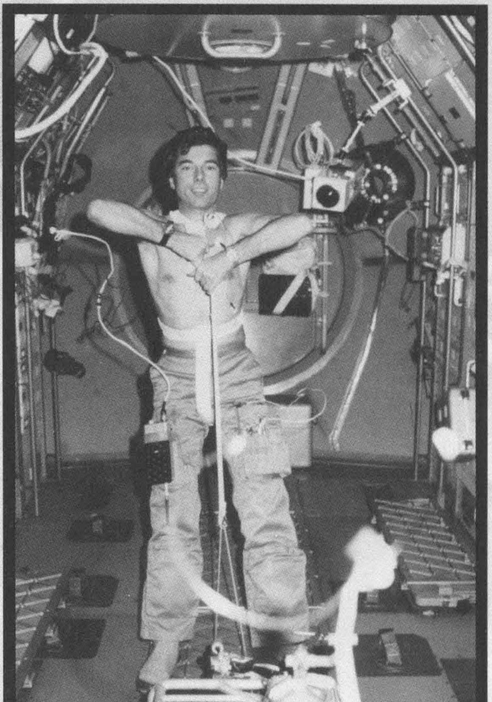
Flight controllers and experiment scientisits direct Spacelab science activities from the Marshall Center.

The Marshall Center also was responsible for Spacelab's command-and-data-management subsystem and its high-data-rate multiplexer and recorder. In addition, a software development facility was established to develop and verify programs for Spacelab experiment components. Other contributions ranged from the development of ground support equipment to sophisticated scientific instruments.

The Spacelab program also required engineers and other specialists at the Marshall Center to perform systems analyses, design and develop integration hardware, oversee assembly and checkout, plan the flight timeline, conduct simulation and training exercises, and provide real-time support for the missions. Marshall's Payload Crew Training Complex became a training site for Spacelab mission specialists from the astronaut corps and payload specialists from the scientific community. Prior to the establishment of the Marshall Center Spacelab Mission Operations Control Center facility, Marshall mission managers monitored, controlled, and directed experiments aboard Spacelab from the Johnson Space Center.

The primary purpose of the first Spacelab mission was to demonstrate the scientific capability of the laboratory and to check the thousands of structural, mechanical, and electronic parts making up the laboratory. During the 10-day mission, the science crew conducted more than 70 separate investigations in life sciences, atmospheric physics, Earth observations, astronomy, solar physics, space plasma physics, and materials science and technology. Spacelab–1 was a truly international mission, with 14 countries participating.

Numerous Marshall-developed and managed experiments and investigations were on board. The Imaging Spectrometric Observatory was among the atmospheric and Earth observation experiments on Spacelab–1. It was designed to provide new insights into the varied reactions and energy transfer processes that occur in the Earth's environment. Another experiment, the Space Experiments with Particle Accelerators, was among the investigations in space plasma physics and was designed to carry out active and interactive experiments on and in the Earth's ionosphere and magnetosphere. Atmospheric Emission Photometric Imaging, another space plasma physics experiment, was used to observe faint optical emissions associated with natural and artificially induced phenomena in the upper atmosphere.



How the body reacts to weightlessness may provide clues to diseases on Earth. Here Spacelab–1 payload specialist Merbold exercises on orbit, while instruments measure his heart's performance.

Prior to the first Spacelab mission, the Far Ultraviolet Space Telescope (FAUST), a compact, wide-field-of-view instrument, had been used on rockets for brief astronomical observations. FAUST, however, was used on the first Spacelab mission to observe galaxies and quasars, and for joint observations with Spacelab–1 experiments. An investigation in materials science was called Tribological Experiments in Zero Gravity and was designed to observe wetting and spreading phenomena and fluid distribution patterns without the interference of gravity.