NASA Facts

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STS-95 Get Away Special Payloads

Aboard the STS-95 mission will be four Get Away Special payloads. G-779, otherwise known as Hearts in Space, and G-467 are described here. The other two Get Away Special experiments are part of the International Extreme Ultraviolet Hitchhiker-03 payload and are explained in that fact sheet.

G-779

The Hearts in Space, or G-779, was developed by researchers at Bellarmine College in Louisville, KY. The original Hearts in Space experiment (G-572) was initially flown aboard the Space Shuttle Discovery on STS-85 in August 1997. Failure of an electrical connector prevented the on-orbit recording of physiological pressure and flow data and the payload is being reflown on STS-95.

The purpose of the payload is to study why astronauts' hearts become smaller in space. NASA scientists have previously reported, by taking echocardiographs of astronauts, that the size of the heart (the ventricular volume index) decreases in astronauts following adaptation to weightlessness, usually by the second day. In addition to becoming smaller in size, the heart also pumps approximately 15-20 percent less blood per heartbeat (the stroke volume index) during microgravity. The body automatically makes internal adjustments via hormones and nervous control which maintain blood pressure and heart rate so that astronauts suffer no ill effects from the reduced size of the heart. The underlying physiological reason for these changes has never been explained.

The Hearts in Space experiment to be flown aboard Space Shuttle Discovery will demonstrate how these changes to the heart happen. The goal of the experiment is to prove that the biological changes to astronauts' hearts are directly attributable to the loss of gravity. On Earth, there are several factors that cause the heart to fill. These include: the overall speed and force of the blood entering the heart, the stretch of the heart wall, and the weight of the volume of blood in the heart.

The science team has built an experimental apparatus consisting of an artificial human heart and mechanical circulatory system that simulates the blood pressure and flow in a normal adult. The payload uses the same clinical artificial heart that has been implanted in patients with heart disease. Since the apparatus will not be influenced by normal biological reactions to microgravity such as hormone release, blood vessel constriction, and nerve impulses, scientists should get a more accurate picture of the physical forces affecting the heart in outer space.

Principal Investigators are: Thomas E. Bennett, Ph.D., Department of Biology, Bellarmine College, Louisville, KY; George M. Pantalos, Ph.D., Department of Surgery, University of Utah, Salt Lake City; and M. Keith Sharp, Sc.D., Dept. of Civil Engineering, University of Utah, Salt Lake City.

G-467

The objective of the G-467 payload is to demonstrate in space the working principle and performance of a heat transfer system that includes a two phase capillary pumped loop with two advanced evaporators, a two-phase vapor quality sensor with two condensers in parallel, and a control reservoir.

Capillary pumped loops are two-phase heat transfer systems that use wicks with small internal tubing to move the working fluid from an instrument that needs cooling to the spacecraft radiator for heat ejection to space. A two phase flow loop system allows heat to be transferred but contains no moving parts and requires minimal power.

Another objective is to compare data on capillary pumped loop behavior in low gravity with analytical predictions from computer modeling and performance here on Earth. The in-orbit experiment is to demonstrate that the capillary pump loop has the capability to operate under different heat loads imposed on two evaporators in parallel; to share heat load between two evaporators; to prime an evaporator by controlled management of the reservoir fluid content; to start up from low temperature conditions; to adjust and maintain a temperature set point while operating under different heat load and sink conditions, also for two condensers exposed to different thermal environments. Additionally, the G-467 will provide low-gravity calibration of the VQS; carry out simple control exercises to demonstrate the usefulness of a VQS for system control; and determine the performance limits of the CPL and its evaporators.

The G-467 Get Away Special payload is sponsored by the European Space Agency, Paris, France. The payload manager for this experiment is Andre Robelet.

The Get Away Special program is managed by the Small Shuttle Payloads Project at NASA Goddard Space Flight Center in Greenbelt, MD. This program was created to allow access to space to all individuals and countries. At a comparatively modest cost, the program allows the private and public sectors of all countries an opportunity to send scientific research and development experiments into space aboard NASA's Space Shuttle. Find more information on the Shuttle Small Payloads Project at http://sspp.gsfc.nasa.gov/gas/gas.html .