

Rodent Research Hardware System

Studying Animals in Space

Aboard the International Space Station

The Rodent Research Hardware System provides a research platform aboard the International Space Station for long-duration rodent experiments in space. Such experiments examine how microgravity affects animals, providing information relevant to human spaceflight and basic biology, and generating knowledge that can help treat human disease on Earth.

Rodent spaceflight experiments have contributed significantly to our understanding of the effects of microgravity on biological processes that are directly relevant to humans in space. Rodent studies provide information on the whole biological system, including the effects of microgravity on the structure and function of the sensorimotor, musculoskeletal, nervous, cardiovascular, reproductive, and immune systems. Specific research questions are defined in the National Research Council's 2011 Decadal Survey Report, "Recapturing a Future for Space Exploration: Life and Physical Sciences Research for a New Era."

Historically, short-term rodent experiments were transported into Earth's orbit aboard various vehicles, including Russian biosatellites and NASA's space shuttle. The International Space Station is the first essentially "permanent" orbiting science laboratory that offers the opportunity for longer-term experiments in space. In 2011, NASA's Ames Research Center in Moffett Field, Calif. developed the Rodent Research Hardware System to enable rodent studies aboard the space station. This project

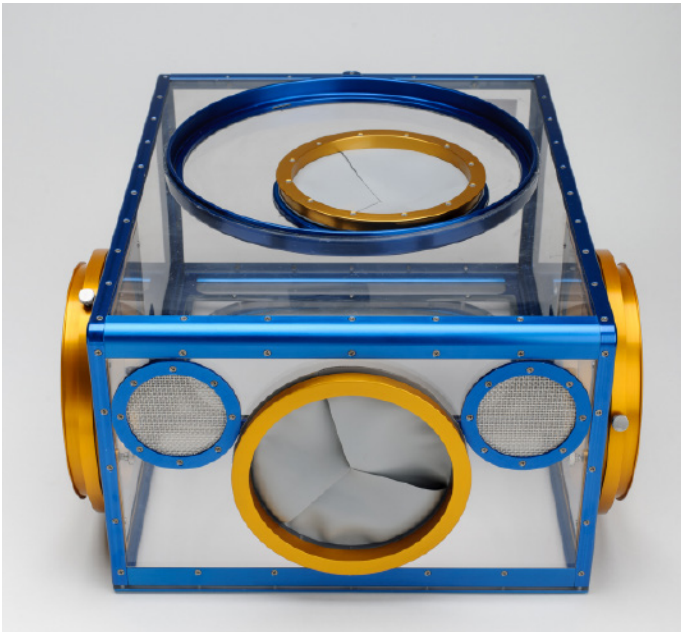
leverages the experience gained from 27 prior flight experiments with rodents using a space shuttle-based system. Advanced capabilities of the Rodent Research Hardware System include housing for long duration studies, light and dark cycle video monitoring, behavioral enrichment, mass measurement, grip strength measurement, and thermal support for anesthesia. In this post-shuttle era, the hardware supports the safe transport of rodents on the SpaceX Dragon.



Rodent Transporter - for transportation to and from the International Space Station. Image credit: NASA / Dominic Hart

The new system has three major components: the Transporter that safely transports rodents between Earth and the space station; the Animal Access Unit that provides containment during transfer of rodents between the Transporter and the Habitat; and the Habitat that provides long-term housing for rodents aboard the station.

Rodent Habitat Aboard the International Space Station

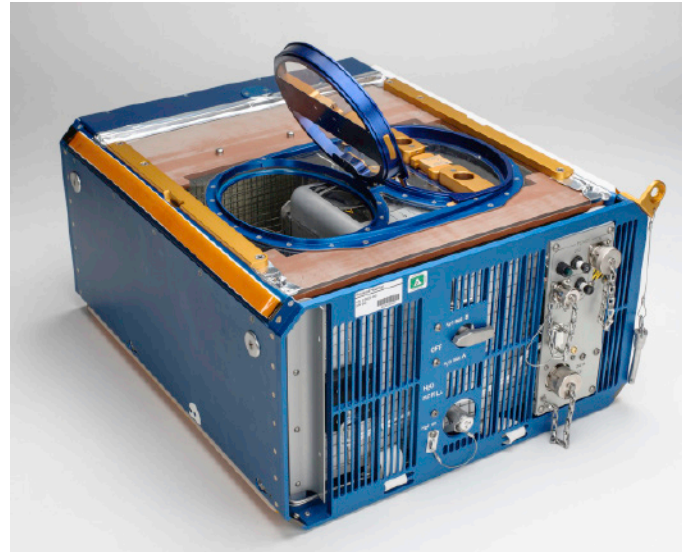


Animal Access Unit – for rodent transfer aboard the space station. Image credit: NASA / Dominic Hart

The maiden voyage of the system, Rodent Research-1, launched aboard SpaceX-4 in 2014. Hardware performance and critical research operations were successfully validated during this month-long study aboard the space station. Since that first voyage, NASA and the Center for the Advancement of Science in Space (CASIS) have supported multiple spaceflight investigations, some up to 60 days long, using the Rodent Research Hardware System. Ultimately, NASA and the International Space Station U.S. National Laboratory will conduct rodent studies as long as six months in duration.

The Rodent Research Hardware System was developed at Ames, benefiting from the expertise within the Space Biosciences Division.

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Rodent Habitat – for long term housing aboard the space station, shown here with one of the access doors open. Image credit: NASA / Dominic Hart

For more information, visit:

www.nasa.gov/ames/research/space-biosciences

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