

Mission Highlights Human Health Experiments

Overview of STS-107 Mission and Key Research

STS-107 is a mission recommended by the National Research Council and approved by the U.S. Congress to ensure that the NASA space research community has continuing flight opportunities during the period when new capabilities are being developed aboard the *International Space Station (ISS)*.

The flight crew and principal investigators will conduct outstanding peer-reviewed and commercial research to advance knowledge in medicine, fundamental biology, fluid physics, materials

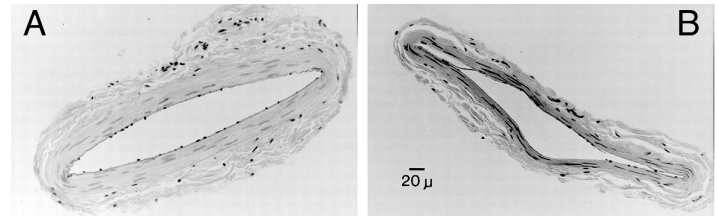


research, and combustion science. The mission will be comparable to the multidisciplinary Spacelab missions flown during the 1980s and '90s. In most cases, STS-107 experiments build on these highly successful results, and serve as a prelude to long-duration investigations planned aboard *ISS*.

The Bioreactor Demonstration System (BDS-05) will culture prostate tumor cells as part of an effort to understand the growth of this devastating disease which becomes a greater risk as men age. African-American males are at even greater risk than the general population.

The mission will be carried out aboard Space Shuttle *Columbia* which will carry the first flight of the SPACEHAB research double module, housing lab space where the flight

crew will work, and the Fast Reaction Experiments Enabling Science, Technology, Applications and Research (FREESTAR) payload, carrying experiments in the space environment. The 16-day mission will be enabled by the Extended Duration Orbiter kit

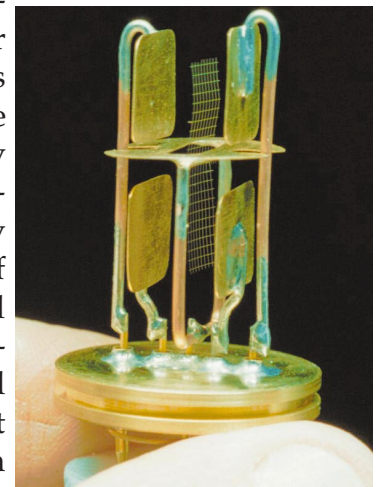


How microgravity leads arteries to reshape from healthy, 1-g forms (left) to weaker structures (right) will be investigated in a study that addresses astronaut health needs on long missions as well as vascular problems on Earth.

carrying additional hydrogen and oxygen for use by the Orbiter's fuel cell system and life support system.

NASA's Office of Biological and Physical Research (OBPR) is the primary sponsor for the mission and is responsible for 30 investigations in four major divisions: Bioastronautics Research (12, such as the risk of getting kidney stones in space), Fundamental Space Biology (6, such as a study of bacteria physiology and virulence), Physical Sciences (5, such as a soil mechanics experiment that addresses issues in earthquake engineering; plus 2 accelerometer systems), and Space Product Development (5, such as the Water Mist experiment to enhance fire-fighting technologies). In addition, STS-107 will

carry experiments for NASA's Office of Earth Science (3), education (2), technology development (1 for *ISS*), the European Space Agency (6), and a number of commercial and other experiments sponsored by SPACEHAB, the U.S. Air Force, and other parties.



Even the tiniest experiments may hold great impact. Data from a tiny screen vibrating in liquid xenon (Critical Viscosity of Xenon-2) will help us understand the flow of shear-thinning fluids, thick liquid, like blood, that flow well under pressure.

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Mission Scientist: Dr. John Charles, Johnson Space Center, Houston, TX
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Background Information

Mission Profile

Vehicle: Space Shuttle Orbiter *Columbia* (OV-102) augmented by Extended Duration Orbiter (EDO) kit
Primary payloads: SPACEHAB Research Double Module, FREESTAR.
 OBPR payload share weighs about 2,434 kg (5,365 lbs.).
Orbit: 278 km (150 n.mi.), 39° inclination
Duration: 16 days

Flight Crew

Commander: Rick Husband. **Pilot:** William McCool
Mission Specialists: Mike Anderson (payload commander), Kulpana Chawla, Dave Brown, Laurel Clark
Payload Specialist: Ilan Ramon
 Crew will work in alternating 12-hour shifts.



The STS-107 configuration closely resembles that of the SPACEHAB double-module mission flown on STS-95 (above), a 1998 research mission. In addition to a different array of experiments, STS-107 will also carry the FREESTAR external payload (right) in the payload bay aft of the module.



OBPR Investigations on STS-107 ¹

Bioastronautics Research

- Advanced Respiratory Monitoring System
- Calcium Kinetics During Space Flight
- Effects of Microgravity on Microbial Physiology
- Flight-Induced Changes in Immune Defenses
- Incidence of Latent Virus Shedding During Space Flight
- Microbial Physiology Flight Experiment
- Pharmacokinetics and Contributing Physiological Changes During Space Flight
- Protein Turnover
- Renal Stone Risk During Space Flight
- Sleep-Wake Actigraphy and Light Exposure During Space Flight
- Spaceflight Effects on Fungal Growth, Metabolism, and Sensitivity to Antifungal Drugs
- Spatial Reorientation Following Space Flight

Fundamental Space Biology

- Anatomical Studies of Central Vestibular Adaptation ⁴
- Application of Physical and Biological Techniques to Study the Gravisensing and Response Systems of Plants
- Arterial Remodeling and Functional Adaptations Induced by Microgravity ⁴
- Bacterial Physiology and Virulence on Earth and in Microgravity
- Choroidal Regulations Involved in the Cerebral Spinal Fluid Response to Altered Gravity ⁴
- Development of Gravisensing and Response System of Plants

Physical Sciences

- Bioreactor Demonstration System-05
- Critical Viscosity of Xenon-2
- Laminar Soot Processes-2 ²
- Mechanics of Granular Materials-3
- Orbiter Acceleration Research Experiment ³
- Space Acceleration Measurement System-Free Flyer ³
- Structure Of Flame Balls at Low Lewis-number-2 ²

Space Product Development

- Astroculture™ Plant Growth Chamber
- Commercial ITA (Instrumentation Technology Associates) Biomedical Experiment
- Commercial Protein Crystal Growth
- Water Mist ²
- Zeolite Crystal Growth Furnace

1. Excludes other NASA divisions, non-NASA agencies or commercial concerns.
2. Conducted in Combustion Module-2, a multi-user facility.
3. Acceleration and vibration measurements supporting several experiments.
4. Part of Fundamental Rodent Experiments Supporting Health (FRESH).

