

## **MISSION POSSIBLE: BIOMEDICAL EXPERIMENTS ON THE SPACE SHUTTLE**

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Biomedical research, both applied and basic, was conducted on every Shuttle mission from 1981 to 2011. The Space Shuttle Program enabled NASA investigators and researchers from around the world to address fundamental issues concerning living and working effectively in space. Operationally focused occupational health investigations and tests were given priority by the Shuttle crew and Shuttle Program management for the resolution of acute health issues caused by the rigors of spaceflight. The challenges of research on the Shuttle included: limited up and return mass, limited power, limited crew time, and requirements for containment of hazards. The sheer capacity of the Shuttle for crew and equipment was unsurpassed by any other launch and entry vehicle and the Shuttle Program provided more opportunity for human research than any program before or since. To take advantage of this opportunity, life sciences research programs learned how to: streamline the complicated process of integrating experiments aboard the Shuttle, design experiments and hardware within operational constraints, and integrate requirements between different experiments and with operational countermeasures. We learned how to take advantage of commercial-off-the-shelf hardware and developed a hardware certification process with the flexibility to allow for design changes between flights. We learned the importance of end-to-end testing for experiment hardware with humans-in-the-loop. Most importantly, we learned that the Shuttle Program provided an excellent platform for conducting human research and for developing the systems that are now used to optimize research on the International Space Station. This presentation will include a review of the types of experiments and medical tests flown on the Shuttle and the processes that were used to manifest and conduct the experiments.

**Learning Objective:** This paper provides a description of the challenges related to launching and implementing biomedical experiments aboard the Space Shuttle.

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