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ABSTRACT AsMA

Legacy of Environmental Research during the Space Shuttle Program

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The Space Shuttle Program provided many opportunities to study the role of spaceflight on human life for over the last 30 years and represents the longest and largest U.S. human spaceflight program. Risks to crewmembers were included in the research areas of nutrition, microbiology, toxicology, radiation, and sleep quality. To better understand the Shuttle environment, Crew Health Care System was developed. As part of this system, the Environmental Health Subsystem was developed to monitor the atmosphere for gaseous contaminants and microbial contamination levels and to monitor water quality and radiation. This program expended a great deal of effort in studying and mitigating risks related to contaminations due to food, water, air, surfaces, crewmembers, and payloads including those with animals. As the Shuttle had limited stowage space and food selection, the development of nutritional requirements for crewmembers was imperative. As the Shuttle was a reusable vehicle, microbial contamination was of great concern. The development of monitoring instruments that could withstand the space environment took several years and many variations to come up with a suitable instrument. Research with space radiation provided an improved understanding of the various sources of ionizing radiation and the development of monitoring instrumentation for space weather and the human exposure within the orbiter's cabin. Space toxicology matured to include the management of offgassing products that could pollute the crewmembers' air quality. The Shuttle Program implemented a 5-level toxicity rating system and developed new monitoring instrumentation to detect toxic compounds. The environment of space caused circadian desynchrony, sleep deficiency, and fatigue leading to much research and major emphasis on countermeasures. Outcomes of the research in these areas were countermeasures, operational protocols, and hardware.

Learning Objectives: This symposium will provide an over view of the major environmental lessons learned and the development of countermeasures, monitoring hardware, and procedures.