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Astronaut Training, Accommodation, and Operations in Space (5)

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LESSONS FROM THE SPACE STATIONS

Abstract

In several decades of space operations on ISS, Mir, Skylab, Salyut, as well as short-duration sortie missions on Spacelab and Spacehab, different approaches were taken towards mission integration, utilization planning, crew training, interdependence of vehicle and crew operations, communications continuity and flight and ground segment task division.

Some elements evolved as a result of changing vehicle characteristics, system capabilities and technological sophistication. Some elements were handled differently because of different approaches differing mission durations. Some aspects have changed as the result of better understanding of human factors. Some aspects have changed because of different US and international organization functions and responsibilities.

Early and short duration missions used detailed, continuous scheduling of crew time and activities and typically required dedicated crew support for all mission operations. Later and longer duration missions using more sophisticated technologies and communications often permitted ground control of mission critical operations, permitting flight crew to focus on utilization, research and maintenance activities.

Critical to the success of the missions has been crew selection and appropriate levels of training, workload management. Task division between flight and ground segments has proven important in optimizing utilization and in future planetary missions where communications will be restricted because of distance and time factors, will be even more critical. Optimizing mission goals and utilization will requiring balancing crew support, automation and ground control of spacecraft systems, robotic tools; interfaces to command, control and communications and the choice of the appropriate crew to support specific kinds of payloads and research.

The paper will address the systems and processes required to expedite the integration of payloads, enhance the utilization of resources, and safely accommodate intravehicular and extravehicular operations. Pre-mission, mission, and post mission processes and supporting systems will be reviewed and assessed.

This paper will trace the evolution of concepts, technologies and operations over the course of the space utilization era beginning in the 1960s, continuing at the present time and of significance for successfully designing and developing future space missions.

The paper will codify the experience in space utilization in processes, tools, documentation and data to examine what elements that have worked successfully and those that have not. Successful tools should be a starting point for future programs.

This paper is intended to serve as a guide for considerations and approaches to future human space mission and vehicle requirements, design and operations attributes.