

**DEVELOPMENT AND DEMONSTRATION OF AN INTEGRATED,
INDEPENDENT HUMAN FACTORS EVALUATION PROCESS FOR SPACE
PAYLOADS AND EQUIPMENT, INCLUDING ASSOCIATED PROCEDURES,
USER'S MANUALS, DISPLAYS AND LABELS**

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At NASA, and in everyday life experience, there are multiple examples of equipment that has passed through a rigorous requirements validation process, but which nevertheless is shown to have major usability difficulties upon implementation and actual use. At NASA, these usability difficulties can have a major impact on very precious resources—crew time on-orbit and the time of ground controllers. In extreme cases, such as responding to emergencies, usability difficulties can even threaten the physical well being of the crew.

The project proposed here covers one way to improve the ultimate usability of fielded NASA equipment and systems, and thus enhance the productivity of crew and ground controllers—namely the use of an integrated, life-cycle human factors evaluation process. An integrated human factors evaluation process will be proposed that focuses on the unique NASA context and addresses NASA equipment and payloads, along with their associated procedures, user's manuals, displays, labels and training.

During the initial stages of this activity, a root-cause analysis will be performed on one or more already fielded pieces of NASA equipment or payloads with known usability concerns—so called exemplar hardware. The analysis will focus on the process-related reasons for the resulting usability problems, which occurred even though all NASA equipment must undergo a rigorous requirements validation process.

Based upon the results from root-cause analyses, from crew comments, and from a literature review, an integrated human factors process document specific to NASA will be drafted. The benefits of this process will then be demonstrated via pilot demonstrations (evaluations) with NASA payload(s) in the early design stage. Payload(s) will be selected such that physical and cognitive interfaces can be evaluated, along with related procedures, owner's manuals and labeling. Human factors professionals, crew, and payload engineers and procedures writers will participate in the demonstration. Data from the pilot demonstration will be analyzed to determine the beneficial impacts from using the human factors process. Lessons learned from the pilot demonstration will be incorporated in the final version of the process document.

Regarding the current status, this project is in its early stages. A detailed list of selection criteria for exemplar hardware has been developed, along with a systematic set of questions to be asked of developers and program office personnel who have worked on the relevant hardware. A list of potential exemplar hardware has also been developed, and evaluated for appropriateness based on the selection criteria. Although a final

decision has not yet been made, two probable candidates are the Treadmill with Vibration Isolation System (TVIS) and Robotics Workstation (RWS).