THE SPACE HUMAN FACTORS ENGINEERING DATABASE TO SUPPORT EXTENDED DURATION MISSIONS

C.R. Booher and R.I. Burnett
NASA Johnson Space Center

INTRODUCTION

Future human-based space missions will have durations many times longer than even the currently anticipated ISS missions, and communications with the ground will be very limited. The level of isolation and autonomy will be far greater than in any previous space missions. Equipment and habitat design, supplies, training materials, and crew operations must be planned on the basis of the best available information from numerous disciplines, including human factors, biomechanics, education, cognitive and social psychology, and physiology. New technologies developing before the mission must be tracked and their human interfaces understood. Automation and intelligent systems will play a major role in this type of mission, and the allocation of tasks, responsibilities, and time to various players – human or machine – must be based on the best information available.

Planning for long-duration missions involves developing the human systems design requirements that are necessary to maintain human system performance during all phases of the mission, including all anticipated changes in crew performance.

SYSTEM DESCRIPTION

A database and tracking system is being developed to capture the interrelationships of research in a variety of fields and enable human factors engineers to locate and retrieve results from other disciplines. The database will capture not only information about human performance and its dependence on the environment, but also information about who is doing relevant research, what experts are available to interpret it, and when significant changes in knowledge or technology make previous requirements obsolete. This capability to link information to sources is a key feature of this program.

The database is designed to contain five major classes of information. (1) The first class contains the information or requirements needed to answer critical questions and resolve issues within the requirements. (2) The second class contains known requirements that are well established and based on factors that are not expected to change, such as the amount of lighting or oxygen required by crewmembers. (3) The third class contains information relevant to human-system requirements, such as findings from published research. (4) The fourth class contains draft requirements that must be reviewed by the community before being established a new requirement. (5) The fifth class contains information on sources of new data that may lead to a change in requirements. This includes names and contact information of individuals responsible for specific research and development in areas of human factors. It also includes links to web sites that feature information on specific research and development topics.

METHOD

The design and development of the database and tracking system has been accomplished to reflect the interrelationships of requirements and data in the structure of the database. Although the structure is complete, population of the database is the next major developmental phase.

The step-wise process for the rest of this activity is as follows. First, all known requirements data and publication information is entered into the database. The chapters of NASA-STD-3000 serve as the outline for technical areas to be addressed in the database. Existing requirements documents are to be analyzed and any discrepancies between these and the established set of requirements are to be entered into the database. People with expertise in specific areas will be identified and contact information for them will be entered into the database so that we may invite them to participate in future requirements reviews. These reviews will generate information about the adequacy of established requirements and the need to propose or draft new requirements. An Editorial Board, formed from the group of technical consultants, will convene for the purpose of evaluating the suggested inputs to the database. The Editorial Board will have final say over the approval or rejection of requirements.

CONCLUSIONS

The database and tracking system will ensure that engineers have immediate access to human systems design requirements necessary to maintain performance during all phases of the mission. This will significantly reduce the risk of mission failure or loss of crew life due to human systems design. This database will be an ongoing tool for tracking and integrating knowledge in space human factors throughout the years.