MALLEABLE HUMAN INTERFACES (MHI)

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The United States' human space flight goals are rapidly changing, and they will involve refocused cooperation and coordination between the commercial sector and several federal agencies. The newly established national Space Launch Initiative is the primary driver for refocused efforts, and the Malleable Human Interfaces project is a new conceptual design paradigm that is uniquely suited for this new environment. Combining research, design, and up-front test, the MHI project utilizes reconfigurable hardware and software components to cost-effectively develop and evaluate human/machine interfaces. The primary goal is to formulate critical concepts to be used as the basis of common crew interface design across a wide variety of crewed space vehicles and missions.

The second year of the three-part MHI project was primarily focused on performing task analysis on critical tasks and secondarily on developing prototype(s) of appropriate human interface(s) to efficiently accomplish those tasks. During this phase of the MHI project, the team identified several tasks critical to the successful performance of new concept crewed space missions. These tasks were identified as having potential human/machine system issues that needed to be resolved to enable continued successful human space flight. Additionally, the list of tasks to be performed was extrapolated to include an Exploration Mission, and was also developed with the help of subject matter experts (SME). Of the exploration tasks identified, those associated performing an extraterrestrial landing and subsequent excursion, with dedicated lander and rover mission vehicles, were selected. These tasks, although not principally related to RLV mission tasks were selected to explore the possibilities of common human perception that covered the spectrum of proposed human space flight missions. A task analysis was performed on these tasks.

The results of the task analysis indicated that developing controls and displays that are similar in operation for controlling navigation, communication, system health monitoring, and warnings, cautions, and advisories, in both the lander and rover, will decrease the amount of pre-mission and proficiency training required to operate distinctly different mission vehicles. Combined with the prospect of standardization of equipment and software, the cost savings potential is quite promising. By simply integrating a multi-functional display(s), a common system can present to the crewmember health status, positional data, Warnings/Cautions/Advisories, and allow the crewmember to readily control virtually all the systems of the vehicle(s) from a central location or remote terminal.

During this developmental year, the MHI project was also redirected to focus efforts on current crewed space vehicles. The concept was to investigate the benefits of applying MHI methodology and products to improve the mission effectiveness of at least one ISS or Shuttle critical needs area. The Caution and Warning Systems sector was identified as the best candidate critical needs area where Malleable Human Interfaces could provide significant benefit. Specifically, the Caution and Warning (C&W) System of the Space Shuttle was selected as a model from which notional user interface designs could be developed and demonstrated and,

additionally, be translated for use on developmental and conceptual space vehicles. Caution and Warning Systems are ideal candidates for common interface development, and they also provide significant potential for developing common human interactive conventions, guidelines and standards across current operational and advanced space vehicle programs.

A notional Shuttle C&W System Interface was developed, and will undergo performance and usability testing to determine utility of the design concepts. This testing is scheduled to be performed in the Concept Exploration Laboratory (CEL) during fiscal year 2002.