INFORMATION PRESENTATION
Human Research Program - Space Human Factors & Habitability
Space Human Factors Engineering Project

PURPOSE
The goal of the Information Presentation Directed Research Project (DRP) is to address design questions related to the presentation of information to the crew on flight vehicles, surface landers and habitats, and during extravehicular activities (EVA). Designers of displays and controls for exploration missions must be prepared to select the text formats, label styles, alarms, electronic procedure designs, and cursor control devices that provide for optimal crew performance on exploration tasks. The major areas of work, or subtasks, within the Information Presentation DRP are: 1) Controls, 2) Displays, 3) Procedures, and 4) EVA Operations.

CONTROLS – Cursor Control
The unique environmental solutions encountered by crewmembers on space stations (orbitation, vacuum, fires, vacuum requires pressurized suits) translate into special design requirements for cursor interactions with information presented on computer displays. Cursor control devices (CCDs) must be specially designed to function under the variable, harsh conditions of space.

Partnership with Stakeholders: The cursor control device work described below has fed and supplemented concurrent work on Orion cursor control device validation. Results of these studies have aided Orion device down selection, and software development for the effort being used for Orion cursor control device evaluations.

Text battery (Status – complete; revisions in work)
One of the first goals of the IP project was to develop a computerized test battery that could be used to evaluate a number of different types of cursor control devices. The test battery provides a standard methodology for measurement, and will allow for use in any research interested in evaluating cursor control devices. A collection of 7 tasks measuring CCD pointing and dragging time and accuracy. Many of the tasks are based on ISO-XXX.

DISPLAYS - Label orientation
Display designers sometimes have to use vertical text when real estate is limited. The goal of this work was to examine the impact of different styles of vertically oriented text using short words, acronyms, and abbreviations.

Results
1) Participants could read the horizontally oriented text faster than the rotated and marquee text.
2) Inconclusive results on differences between vertical orientation, but marquee was subjectively rated the worst.

Next Steps
Additional studies need to be done to further evaluate vertical text styles, incorporating more complex display, additional practice, and time pressure.

Impact
Results from these studies will form display standards for the Orion Display Format Standards document, as well as for Orion Constellation documentation (HSIR, HIDH).

DISPLAYS - Label alignment
Vehicle displays are often made up of many columns of labeled data values. Design direction on alignment of these columns of data values is critical to the task at hand. The goal of this work was to examine the impact of alignment type on user interaction with computer displays.

Results
1) There was a small advantage for data-aligned labels.
2) There was a small advantage for data-aligned labels.

Next Steps
Additional studies need to be done to further evaluate label alignment, incorporating more complex displays, additional practice, and time pressure.

Impact
Results from these studies will form display standards for the Orion Display Format Standards document, as well as for Orion Constellation documentation (HSIR, HIDH).

PROCEDURES
- An Electronic Procedure Viewer (EPV) is one of the most operationally critical interfaces for next-generation crewed space vehicles, particularly for extravehicular activity and recovery operations.
- We recently completed a human-in-the-loop evaluation of two fault management concepts, one (BES) where the EPV is functionally integrated with an advanced Caution and Warning (CAW) System, and another less advanced (ELSI) with no functional connections between the EPV viewer and the CAW system.

DISPLAYS - Auditory alarms
The goal of this study was to investigate the effects of different alarm stimulus types and levels on participant performance. The study was conducted in a laboratory environment using multiple stimulus types and levels.

Results
Within each trial there was one hidden fault and a corresponding alarm. The participant was required to detect and correct the fault. The study results showed that participants were able to detect and correct the faults at a high rate. The results were compared against existing alarm standards and found to be within acceptable limits.

EVA OPERATIONS
Working in constrained, small environments poses great challenges in terms of displays, controls, and situational awareness, especially in the harsh lunar environment. This is a new roadmap for FY18.

Work will be completed in the areas of:
- Auditory alarms
- Visual feedback and fine motor control during driller operations
- Head-up and audio displays