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 subareas, within the Information Presentation DRP are: 1) Controls, 2) Displays, 3) Procedures, and 4) EVA Operations.

CONTROLS – Cursor Control
The unique environmental conditions encountered by crewmembers on space missions (vibration, varied g-levels, vacuum requiring pressurized suits) challenge design of displays and controls. Crew's ability 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 subareas, within the Information Presentation DRP are: 1) Controls, 2) Displays, 3) Procedures, and 4) EVA Operations.

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

RESULTS
- Text orientation: None of the groups could read the horizontally oriented text faster than the rotated and marquee text.
- This confirms that horizontal alignment is the preferred type for display of labels.

Next Steps
- Additional studies need to be done to further evaluate vertical text styles, 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 other Constellation documentation (M&H, H&H).

DISPLAYS - Label alignment
Vehicle displays are often made up of many columns of labeled data values. Design decisions on alignment of these columns of data should be considered. The goal of this study was to experimentally compare different types of alignment.

RESULTS
- 1) Participants could read the horizontally aligned text faster than the rotated and marquee text.
- 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 other Constellation documentation (M&H, H&H).

PROCEDURES
- An Electronic Procedures Viewer (EPV) is one of the most operationally critical interfaces for next-generation crewed space vehicles, particularly for real-time fault isolation and recovery operations.
- We recently completed a human-in-the-loop evaluation of two fault management concepts, one (BESI) where the EPV is functionally integrated with an Advanced Caution and Warning (CAWS) System, and another less advanced concept (ELSIE) with no functional connections between the EPV client and the CAWS system.

DISPLAYS - Auditory alarms
The goal of this study was to investigate the impact of auditory alarms on performance using subject ratings, within-subjects design. Within each trial there was one hidden reference representing the existing alarm used on current space vehicles for each condition, and five alternative alarms based on results from a previous study on alarms by the same authors.

Next Steps and Impact
- Crew participants are currently being in the study, a validation study will be done to confirm the results; before recommendations are made.
- Results will be submitted to Orion and Constellation standards documents.

EVA OPERATIONS
Working in extravehicular activities presents great challenges in terms of displays, controls, and equipment, especially in the harsh lunar environment. This is a new suite for FY19.

Work will be completed in the areas of:
- Display design
- Hose-handback and fine-motion control during gloved operations
- Near-eye and auditory displays