**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 subtask, 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) translate into special design requirements for crew interaction with information presented on computer displays. Cursor control devices (CCDs) must be specially designed to function under the variable, harsh conditions of space. The cursor control device work described below has fed and supplemented concurrent work on Orion cursor control device definition. Results of these studies have aided Orion device down selection, and software developed for this effort is being used for Orion cursor control device evaluations.

**TEXT:**

The unique environmental conditions encountered by crewmembers on space missions (vibration, varied g-levels, vacuum requiring pressurized suits) translate into special design requirements for crew interaction with information presented on computer displays. Cursor control devices (CCDs) must be specially designed to function under the variable, harsh conditions of space.

**EX:**

**TEXT:**

The unique environmental conditions encountered by crewmembers on space missions (vibration, varied g-levels, vacuum requiring pressurized suits) translate into special design requirements for crew interaction with information presented on computer displays. Cursor control devices (CCDs) must be specially designed to function under the variable, harsh conditions of space.

**RESULTS:**

Example test displays including simple text typical of crew interface text, including a variety of style components.

**PROCEDURES**

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

**DISPLAYS –Label alignment**

Vehicle displays are often made up of many columns of labeled information. Design decisions on alignment of these columns of text can have significant effects on the clarity of the display. The goal of this study was to aid designers in their alignment decisions under different environmental conditions: vibration, microgravity, and low-gravity.

**RESULTS:**

The unique environmental conditions encountered by crewmembers on space missions (vibration, varied g-levels, vacuum requiring pressurized suits) translate into special design requirements for crew interaction with information presented on computer displays. Cursor control devices (CCDs) must be specially designed to function under the variable, harsh conditions of space.

**DISPLAYS – Label orientation**

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

**RESULTS:**

The unique environmental conditions encountered by crewmembers on space missions (vibration, varied g-levels, vacuum requiring pressurized suits) translate into special design requirements for crew interaction with information presented on computer displays. Cursor control devices (CCDs) must be specially designed to function under the variable, harsh conditions of space.

**DISPLAYS – Auditory alarms**

Class 1 (warning): The goal of this study was to investigate auditory alarm display options for two existing visual classes using suitability ratings.

**RESULTS:**

The unique environmental conditions encountered by crewmembers on space missions (vibration, varied g-levels, vacuum requiring pressurized suits) translate into special design requirements for crew interaction with information presented on computer displays. Cursor control devices (CCDs) must be specially designed to function under the variable, harsh conditions of space.

**EVA OPERATIONS**

Working in confined, low-environmental pressure environments presents great challenges in terms of displays, controls, and tool interaction, especially in the harsh lunar environment. This is a new situation for FY21.

Work will be completed in the areas of:

- Visual display designs
- Hand-held controllers and motion control during EVA
- Next-generation and auditory displays

Example test displays including simple text typical of crew interface text, including a variety of style components.