Abstract
The goal of the Information Presentation Directed Research Project (DRP) is to address design questions related to the presentation of information to the crew. The major areas of work, or subtasks, within this DRP are: 1) Displays, 2) Controls, 3) Electronic Procedures and Fault Management, and 4) Human Performance Modeling. This DRP is a collaborative effort between researchers at Johnson Space Center and Ames Research Center.

Visual displays
Label Alignment and Label-Value Distinction
The purpose of the FY08-FY09 studies was to investigate the effects of label orientation and label alignment on visual search. FY08 studies looked at the effect of label orientation, alignment, label length, and wrapping of text on visual search in various display group sizes. To inform development of best-practice guidelines for label formatting, the study in FY09 examined the effects of the visual distinction of labels and values, label length, and label alignment on visual search times. After reading a target word, participants searched for its associated value in an array of eight label-value pairs embedded within an Orion-type display.

Auditory displays
Alarms
In this study alarms currently in use with NASA flight deck displays and proposed candidate alarms have been evaluated. Eleven non-crew and 3 crew subjects were asked to rate six candidate alarms in comparison to the current alarm for each category of alert used: caution, warning, fire/smoke, and depressurization. Five of the candidate alarms were based on the current alarm or a runner-up alarm sound from previous studies. The sixth sound included a speech component that gave specific information about the situation. The sound of choice for each category was also rated on perceived urgency level, overall satisfaction, and the perceived value of a potential speech component. The results show that the use of a speech component is preferred by both crew and non-crew.

VIBROVOX: Evaluation of speech communication under simulated launch vibration (0.7 g)
The potential effects of extreme acceleration and vibration during Ares-I launch scenarios may impact the crew's speech production. We studied the effect of 0.5 and 0.7 g whole body vibration on the speech production of words (using the standardized Diagnostic Rhyme Test word list). Six subjects were recorded in a supine position using a specially designed chair and vibration platform. Vocal warbling, pitch modulation, and other acoustic distortion were observed.

The effect of vibration can be seen by comparing the right and left halves of the graphs below. Under vibration, the voice's temporal waveform becomes "roucher" due to the addition of higher frequency vibrations and greater amplitude modulation. In the spectral plots (bottom), these effects correspond to interruption of the horizontal red and yellow lines (representative of acoustic energy at specific frequency regions). This temporal and spectral distortion under vibration results in perceptual effects (e.g., vocal warbling, pitch modulation) that may impact intelligibility.

Fault management studies
We analyzed eye-movement data (collected during a previous human-in-the-loop Fault Management study) at a more granular level. This allowed us to subdivide originally identified "regions of interest" into more specific "areas of interest" corresponding to individual display elements, such as edge-key labels. We then used the temporal sequences of fixations to these areas of interest as input to develop a visualization tool. This tool allows us to visualize (given the current area of interest), the likelihood that each area of interest will be the next fixation target.

Controls
Cursor control Device Test Battery
The cursor control devices test battery was developed in Visual Basic. Five tasks were based on ISO 9241-9 (2000). Non-ISO tasks that had been used in previous evaluations were also added, including a multi-size and multi-distance pointing task (Everett, Holden & Whitmore, 2005), a text selection task (Gillan, Holden, Adam, Rudisill, & Magee, 1992), and a new task that includes interaction with standard interface elements such as drop-down menus, sliders, and checkboxes. The test battery software captures pointing, tracking or dragging times, as well as the number and types of errors. Furthermore, parameters such as target size, pointing direction, and distance between targets are adjustable for all tasks. In FY09 the test battery has been updated with a main menu that allows researchers to set up studies for multiple subject and devices. The user guide has been updated as well to reflect the changes.

Cursor Movement
The purpose of the FY09 study was to compare the performance of multiple discrete CCDS on an Orion-type display. Twelve participants used the display with four devices in 2-way mode and all but the rocker switch in 4-way mode with their left-hands in extravehicular activity (EVA) gloves. Tasks for each device consisted of three elements: main menu navigation, navigation to objects within the display, and commanding or selecting options for those objects. Response times, errors, and subjective ratings were collected for each device and mode combination.