The U.S. Army desires to improve safety during Intelligence, Surveillance, Reconnaissance (ISR) operations by removing Warfighters from direct line-of-fire by enhancing ISR operational capabilities with unmanned systems, also known as Robot-Aided ISR (RAISR) (DOD, 2013). Additionally, RAISR presents an opportunity to fulfill ISR capability requirements of modern combat environments including: detection of High-Value Individuals (HVI) from safer distances, identification of baseline behavior, and interpretation of adversarial intent (U.S. Army, 2008). Along with the demand and projected acquisition of RAISR technology, there is the added need to design training requirements for system operation and task execution instruction. While documentation identifying specific training standards and objectives for ISR tasks utilizing unmanned systems is limited (DOD, 2013), simulation-based training has been identified as a critical training medium for RAISR (U.S. Army, 2008). ISR analysts will primarily conduct RAISR tasks via Indirect Vision Displays (IVD) which transition well into multimodal simulations (Salcedo, Lackey, & Maraj, 2014). However, simulation alone may not fulfill the complex training needs of RAISR tasks, therefore, incorporating instructional support may improve the effectiveness of training (Oser, Gualtieri, Cannon-Bowers, & Salas, 1999). One method to accomplish this is to utilize a Scenario-Based Training (SBT) framework enhanced with instructional strategies to target specific training objectives.

The purpose for the present experiment was to assess the effectiveness of SBT enhanced with selected instructional strategies for a PC-based RAISR training simulation. The specific task type was the identification of HVIs within a group through behavior cue analysis. The instructional strategies assessed in this experiment, Highlighting and Massed Exposure, have shown to improve attentional weighting, visual search, and pattern recognition skills, which are critical for successful behavior cue analysis. Training effectiveness was evaluated by analyzing the impact of the instructional strategies on performance outcomes, including detection accuracy, classification accuracy, and median response time, and perceptions of the level of engagement, immersion, and presence during training exercises. Performance results revealed that the Massed Exposure strategy produced significantly faster response times for one subtle and one familiar target behavior cue. Perception results indicated that Highlighting was the least challenging instructional strategy and the Control offered the preferred level of challenge. The relationships between performance and perception measures revealed that higher levels of engagement, immersion, and presence were associated with better performance in the Control, but this trend did not always hold for Massed Exposure and Highlighting. Furthermore, presence emerged as the primary predictor of performance for select target behavior cues in the Control and Massed Exposure conditions, while immersion and engagement predicted performance of select cues in the Highlighting condition. The findings of the present experiment point to the potential benefit of SBT instructional strategies to improve effectiveness of simulation-based training for behavior cue analysis during RAISR operations. Specifically, the findings suggest that the Massed Exposure strategy has the potential to improve response time when detecting both familiar and novel targets. The results also highlight directions for future research to investigate methods to alter instructional strategy design and delivery in order to improve trainee perceptions of the instruction.
Daniel Barber, Professor
Peter Kincaid, Professor

Approved for distribution by Stephanie Lackey, Committee Chair, on June 13, 2014.

The public is welcome to attend.