NASA SBIR 2011 Phase I Solicitation

A1.08 Crew Systems Technologies for Improved Aviation Safety

Lead Center: LaRC

The NASA Aviation Safety program aims to model and develop integrated crew-system interaction (ICSI) concepts and to subsequently evaluate this concept in a relevant operational environment in comparison to state-of-the-art. NASA seeks proposals for novel technologies and evaluation tools with high potential to support an ICSI with effective crew-system interactions in the context of NextGen operational requirements (e.g., 4D trajectory-based operations, visual operations in non-visual meteorological conditions, etc.) and assumptions (e.g., net-centric information management environment) (NextGen described in http://www.faa.gov/nextgen/).

To improve these interactions, we seek interventions that proactively identify and mitigate NextGen flight deck risks; address documented crew-related causal factors in accidents; and improve the ability to unobtrusively, effectively, and sensitively evaluate and model crew and crew-automation system performance. In particular, we seek proposals for the development of advanced technologies that address:

- Crew challenges associated with piloting terminal area 4D Trajectory-Based Operations in Instrument Meteorological Conditions (IMC).
- Displays, decision-support, and automation interaction under off-nominal conditions; in particular in that lead to spatial disorientation and loss of energy state awareness leading to loss-of-control (LOC).
- The appropriate levels of integrity for new classes of information to be made available to the crew as a result of NextGen's net centric information management environment.
- Pilot proficiency in increasingly automated flight decks (e.g., manual handing skill erosion).
- Optimal methods for information presentation as distributed over time and display space for multiple operators to maximize crew information processing and coordination.
- Appropriate trust in, and therefore use of, automation and complex information sources by, for example, conveying constraints on automation reliability and information certainty/timeliness.
- Effective joint cognitive system design and evaluation with multiple intelligent agents (human and automated, proximal and remote).

- Improved oculometer, neurophysiological, or other sensors and/or data integration methods that would improve the ability to characterize operator functional status in real time.
- Improved human-system interaction through effectively modulating operator state, and/or effectively adapting interfaces and automation in response to this functional status.
- Evaluation of adaptive and adaptable crew-system interfaces.
- A priori assessment of human error likelihood and consequence in NextGen scenarios

Phase I proposals that demonstrate relevance to the NASA Aviation Safety Program's VSST and/or SSAT programs, include a detailed resource-loaded schedule, literature-based justification, highly competent staffing, prescription for Phase II work, and clear path to commercialization or utilization in NASA programs are most valued.