



NASA SBIR 2014 Phase I Solicitation

A1.05 Identification of Sequences of Atypical Occurrences in Massive Heterogeneous Datasets Representing the Operation of a System of Systems

Lead Center: ARC

The fulfillment of the SSAT project's goal requires the ability to transform vast amounts of data produced by aircraft and associated systems and people into actionable knowledge that will aid in detection, causal analysis, and prediction at levels ranging from the aircraft-level, to the fleet-level, and ultimately to the level of the national airspace. For this topic, we are especially interested in automated discovery of previously unknown precursors to aviation safety incidents involving human - automation interaction. We expect to gain knowledge on latent deficiencies in crew training, communication, and operations that is of paramount importance to future SSAT project goals and objectives. The incorporation of human performance will be invaluable to the success of this effort, and as such it will be important to use heterogeneous data from varied sources that are matched on a per-flight basis with flight-recorded data, such as radar track data, airport information, weather data, flight crew schedule information, maintenance information, and Air Safety Reports. This topic will develop revolutionary and first-of-a-kind methods and tools that incorporate the limitations of human performance throughout the design lifecycle of human-automation systems to increase safety and reduce validation costs in NextGen.

The focus of this effort will be from the aircraft-level to fleet level and above. As such, the successful proposal will develop validated predictive analytics to uncover systemic human-automation interaction issues that manifest at a much broader level than those incidents that occur within a single flight or for a single aircraft. Real data from a defunct airline will be made available as GFE (government furnished equipment), representing the interactions between humans and automation found on flight systems, data from aircraft as well as supporting ground-based systems. As such, a deep knowledge of algorithmic development across multiple heterogeneous data sources and the ability to address recent developments in the growing area of "big data" should be clearly demonstrated. The successful proposer will have a proven track record of deploying groundbreaking, innovative approaches in a real-world setting to similar "big data" challenges.