A1.05  Data Mining and Knowledge Discovery

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 on the fleet level or above. As such, the successful proposal will develop validated data mining and machine learning based methods 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. Simulated data that is representative of the interactions between humans and automation found on flight systems and on data from real world aircraft and supporting ground-based systems should be used. The total of the data set under study should be at least 10 TB in size, and exhibit appropriate statistical and operational complexities found in real world human automation interactions. Furthermore, a deep knowledge of human-automation interaction from the human-factors perspective as well as the ability to create novel machine learning and data mining algorithms should be clearly demonstrated.