

Increasing Autonomous Systems (IAS) in a Net-Centric Environment



Net-Centric Environment:

A net-centric air space system or architecture is a continuously evolving environment in which people, devices, information, and services are interconnected via a communications network. Inherent in this type of domain is an overwhelming amount of various forms of data that can provide decision makers, pilots, and air traffic controllers with superior awareness concerning events and conditions within it. Assisting a flight crew in gathering, organizing, and disseminating these data expeditiously is imperative and calls for implementation of technologies such as Increasingly Autonomous Systems designed to support future flight operations conducted within a net-centric national air space system.

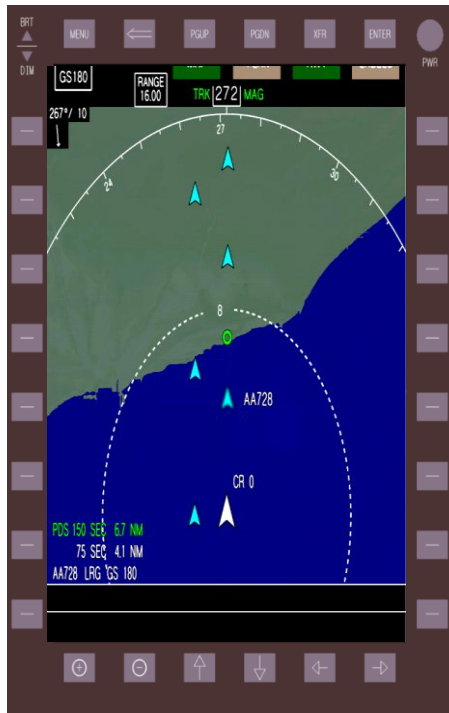


Increasingly Autonomous Systems (IAS):

Appropriate use of IAS begins with an effort to understand what autonomy is and the development of technology that encompasses it. Autonomy allows an agent – human or machine - to act independently within a circumscribed set of goals, delegating responsibility to the agent(s) to achieve overall system objectives. IAS are envisioned as intelligent machines - hardware and software systems – seamlessly integrated with humans to promote task performance of a combined system which is significantly greater than that achieved by individual

components. These systems have the ability to modify their behavior in response to their external environment and conditions. Working in concert with humans, this technology is expected to improve the safety, reliability, and operational efficiency of aviation. Important areas of consideration include:

- Technological implementation of autonomy
- Development of small task IAS
- Human-Autonomy-Teaming
- Trust in the machine



Dynamic Air Traffic Application (DATA):

DATA is a software subsystem developed to integrate aircraft state attributes such as traffic course, airspeed, altitude, intent, range, and bearing into machine learning features of Traffic Data Manager (TDM). DATA displays actual aircraft state information, acquired from FlightAware, and developed traffic scenarios which were used, during pilot data collection activities, to determine air traffic relevance. This allowed the collection of ~36K data points, which formed an air traffic relevancy knowledge-base. This knowledge-base was used to train TDM's supervised machine learning algorithm to make predictions on air traffic relevance with respect to an ownship.

**Traffic Data Manager (TDM):**

TDM is an IAS technology designed to prevent a flight crew from becoming overwhelmed by the volume of information inherent to a net-centric environment by creating an “intelligent” party-line. TDM employs machine learning to meet and enhance the informational needs of a flight crew, based upon expert human judgement, while adapting to changing environments and operations. Utilized in the area of air traffic and data communication information management, TDM is being trained to autonomously lessen a flight crew’s visual workload with respect to navigation display content.