



Global Positioning System for Civil Air Navigation

In December 1993, the Department of Defense declared initial operational capability for a new high-technology radio navigation system, the Global Positioning System (GPS). Based on studies done by The MITRE Corporation's Center for Advanced Aviation System Development (MITRE/CAASD) and others, the Federal Aviation Administration (FAA) and the aviation community recognize that while GPS provides a beneficial operational capability to many users, aviators operating under instrument flight rules require augmentation.

MITRE/CAASD has helped the FAA identify various aspects of GPS performance that must be improved to support high-availability GPS flight operations, including precision approach and airport surface operations. These components include signal integrity, signal accuracy, and system availability.

To achieve these improvements and to expedite GPS use for vertically-guided instrument approaches, MITRE/CAASD helped define the Wide Area Augmentation System (WAAS), a capability that adds differential corrections and ranging information to information relayed by geostationary satellites. As part of this effort, MITRE/CAASD also developed and tested algorithms to mitigate the effects of signal delays in the ionosphere and to ensure the integrity of broadcast ionospheric delay corrections. MITRE/CAASD also helped to establish performance requirements for WAAS and had an important role in the transfer of technology to the prime contractor. To ensure that the WAAS design achieved the necessary degree of integrity for vertically-guided approaches, the FAA established a WAAS Integrity Performance Panel (WIPP)—consisting of MITRE/CAASD, industry, and academia—that worked with the prime contractor throughout the implementation of WAAS. WAAS achieved Initial Operational Capability in July 2003.

To help the FAA determine the number of geostationary satellites necessary to provide signal ranging, differential corrections, integrity broadcast services, and

the number and location of reference stations to meet specified requirements, MITRE/CAASD developed a Satellite-Based Augmentation System (SBAS) Worldwide Availability Tool (SWAT). The SWAT predicts the performance of an integrated network of satellites, ground stations, and communication links. MITRE/CAASD is currently working with the FAA to define WAAS enhancements for the Full Operational Capability system.

MITRE/CAASD is also working with the FAA to develop the Local Area Augmentation System (LAAS). LAAS provides corrections via a Very High Frequency data broadcast to aircraft within line-of-sight distances. It is being developed to provide precision approach capability for all the runways at an airport equipped with LAAS. MITRE/CAASD's role in specification development and validation includes analyses of signal integrity and availability. In addition to LAAS specification activities, MITRE/CAASD has also provided technical expertise to FAA/industry partnerships, FAA's Key Technical Advisors on LAAS, and the LAAS Integrity Panel. MITRE/CAASD is working with the FAA to ensure the integrity and safety of a future LAAS system that will support landings to Category III standards.

MITRE/CAASD is also helping to define requirements for a modernized GPS system in which multiple frequencies will be available to civil users. Finally, MITRE/CAASD is working across the international community to assure signal compatibility between future GPS and future international satellite navigation capabilities.

For more information, contact:

Fran Hoover
Information Management Specialist
+1.703.983.5912