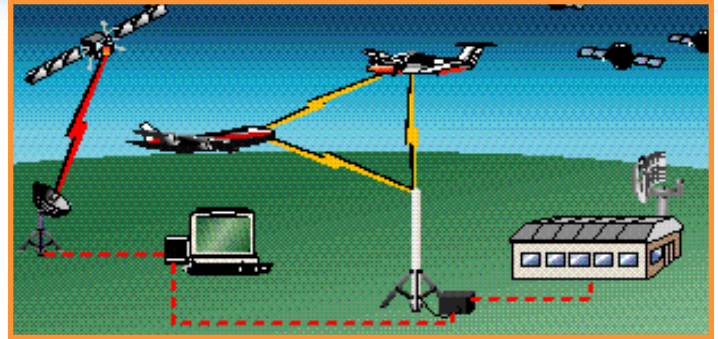


## Multipurpose Broadcast Data Link System



The aviation community has recently expressed significant interest in a broadcast mode of data link services. A broadcast mode of delivery is well suited for applications of a general interest to many users and for applications that require periodic updating. Broadcast delivery is also attractive because of the protocol simplicity and spectrum efficiency. A data link system supporting broadcast services represents a unique opportunity for rapid implementation of a system with high utility that can be largely independent of existing infrastructure.

The Universal Access Transceiver (UAT) is a multipurpose broadcast data link architecture that can meet the need for in-cockpit traffic and weather information in a cost-effective manner. The MITRE Corporation's Center for Advanced Aviation System Development (CAASD), a federally funded research and development center sponsored by the Federal Aviation Administration, developed the concept for UAT and conducted extensive prototyping and flight testing of the system.

The UAT supports two basic types of broadcast transmissions. The first is broadcast transmissions from aircraft supporting aircraft-to-aircraft or aircraft-to-ground surveillance applications. These include position reports, velocity vector, intent and other relevant information about the aircraft. This type of transmission is referred to as Automatic Dependent Surveillance-Broadcast mode (ADS-B) and is considered a cornerstone of the Free Flight concept. Unlike ADS, which operates on a contract mode with a ground air traffic control facility, all users that are within transmission range can receive and use an ADS-B report. Thus, aircraft in the same airspace can "see" each other through ADS-B. ADS-B is a cooperative service that relies on a high level of user equipage to maximize utility and benefit. Providing immediate benefits by including uplink products will help to foster early equipage. Therefore, the second type of transmission supported by UAT is uplink broadcast of information from fixed ground stations. Potential services that can be supported with this uplink broadcast capability are listed below:

- Weather broadcasts and aeronautical information (e.g., status information on airports, nav aids, special-use airspace, and uncharted obstacles), referred to as Flight Information Services - Broadcast mode (FIS-B)
- Traffic information broadcasts derived from ground-based surveillance systems referred to as Traffic Information Services - Broadcast mode (TIS-B)

The UAT development objective was to produce a radio that had a simple and robust design based on proven communication techniques and readily available components to keep costs reasonable. Additionally, the design was to support consistent operation in any airspace density or on the airport surface. To meet these objectives, the design employs a single frequency with a bandwidth of approximately two megahertz. The UAT will transmit and receive on the same frequency to allow full aircraft-to-aircraft connectivity for ADS-B with a minimum of new hardware. To keep channel management simple and robust, all

aircraft will access the channel autonomously, at random, and without the need for centralized ground control.

In conjunction with the broadcast transceiver, CAASD developed the Ground Broadcast Server (GBS). The GBS processes data to be transmitted and received over a broadcast data link and interfaces the broadcast architecture with end systems. Various data received from private and FAA sources can be acquired via the GBS and uplinked to aircraft. Data received from aircraft can be sent to air traffic control facilities, airline operation centers, or other appropriate entities.

Flight testing of this broadcast data link system began in November 1995 in Melbourne, Florida, with the assistance of the Florida Tech Aviation Program and Embry Riddle Aeronautical University. Test aircraft exchanged ADS-B messages while simultaneously receiving uplink broadcast

from ground stations. GBS/UAT systems located at Daytona and Melbourne, Florida receive ADS-B transmissions from aircraft and uplinked radar-derived traffic data, real-time weather radar imagery, lightning, surface observations (METAR), and terminal forecasts (TAF) data obtained from WSI, Inc., a commercial weather products provider.

CAASD has transferred the UAT technology to the aviation industry through non-exclusive, royalty-free licenses. The transfer has facilitated an industry evaluation of alternative ADS-B technologies and the commercialization of a broadcast communication system that will enable beneficial applications and services.

The UAT and GBS are currently fielded and in use as part of the FAA's Alaska Capstone Program. The systems are part of an initiative to improve air safety in Alaska. The UAT technology was chosen as part of a competitive industry

bid and is installed in over 100 air-taxi aircraft in Southwest Alaska. The GBS is used to provide the uplink of FIS-B products to aircraft and provide Remote Maintenance and Monitoring (RMM) of UAT-based ground stations. The ADS-B system is certified to provide radar-like services in areas where radar coverage is not available.

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