Airspace Technology Demonstration 2 (ATD-2)
Integrated Arrival/Departure/Surface (IADS) Traffic Management

What is the problem?

Much of the inefficiency in today’s air transportation system can be attributed to a lack of information sharing amongst the operators responsible for managing air traffic in busy terminal environments. Concepts and technologies to improve the handling of arrival, departure, and airport surface traffic have been under development by NASA, the Federal Aviation Administration (FAA), and industry, but to date, these capabilities have largely been developed and implemented independently. NASA’s investigation into the needs of air transportation stakeholders, including airlines, air traffic service providers, airport authorities, and technology vendors, revealed that an integrated approach is needed to address this inefficiency. Without shared information across the operation, a lack of predictability of aircraft movement times persists and leads to overall system inefficiency and greater fuel burn and emissions.

The Airspace Technology Demonstration-2 (ATD-2) effort provides solutions to several problems in the complicated, multi-airport environment. At most airports today, departures are managed in the order they push back from the gate, which can overload runways and cause excessive taxi and hold times.

Additionally, significant uncertainty in the duration of the taxi-out, takeoff, and climb phases of flight leads to inaccurate demand predictions, decreased situational awareness, and overly conservative airspace restrictions that traffic managers are compelled to apply to compensate for this uncertainty.

What is NASA’s solution?

Working with the FAA and industry, NASA has developed an integrated arrival, departure, and surface (IADS) concept and technology to demonstrate the benefits of an IADS traffic management system for complex terminal environments. ATD-2 leverages previous investments by NASA, the FAA, and industry, including the FAA’s three major operational decision support system technologies (Traffic Flow Management System (TFMS), Time Based Flow Management (TBFM), and Terminal Flight Data Management (TFDM)).

The ATD-2 Field Demonstration will preview several aspects of the under-development TFDM system such as Surface Collaborative Decision Making (Surface CDM) departure metering, the Electronic Flight Data user interface in the airport tower, and data sharing with industry via the TFDM Terminal Publication (TTP) service.
A Traffic Management Coordinator (TMC) in the air traffic control tower at CLT (shown here) uses ATD-2 tools to coordinate departure release times with a TMC in the en route Center.

A ramp manager at CLT uses the ATD-2 IADS System to implement departure metering in collaboration with TMCs in the air traffic control tower.

What are the benefits?

Preliminary Phase 1 field demonstration results from the first 4 months of departure metering suggest that the ATD-2 IADS System saves fuel and emissions, reduces congestion on taxiways, and improves compliance with scheduled takeoff times for managing overhead stream insertion.

- The IADS System, on average, saves up to 1,000 pounds of fuel during each metered departure bank (CLT typically has nine banks per day) and reduces carbon dioxide emissions by up to 3,000 pounds, which is equivalent to planting 36 urban trees.
- Initial analysis indicates that the IADS System, at a minimum, does no harm to the ability of flights to depart the airport on time even with the additional gate holding and may actually improve on-time performance. Analysis showed that using the IADS System resulted in a 15% improvement in the number of flights departing within their airline-scheduled departure block times.

Over and above the departure metering benefits, analysis of two-months of overhead stream insertion data showed:

- Controllers reduced departure delays for 172 flights by a total of 22.5 hours by electronically renegotiating takeoff times using the IADS System.
- In addition, up to 43,000 pounds of fuel was saved when ramp controllers used the IADS System to advise gate pushback times for flights in order to meet their scheduled takeoff times more efficiently.

At the end of each demonstration phase, NASA will provide an ATD-2 technology transfer to the FAA and industry partners.

For more information on Airspace Technology Demonstration 2, please visit www.aviationsystems.arc.nasa.gov.

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