Future Surface Decision Support
Overview

Airspace Technology Demonstration 2 (ATD-2)
Industry Workshop

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Agenda

• ATD-2 Overview

• Electronic Data Exchange

• Common Situational Awareness

• Surface Scheduling

• Departure Scheduling for Overhead Stream Insertion

• Surface Metering
Operational Environment for the ATD-2 Concept

- Center boundary
- Center airspace
- Terminal airspace
- Departure meter points
- Departure meter points
- Arrival meter point
- Arrival meter point
- Overhead stream insertion
- Downstream demand/capacity imbalance
- Less-equipped airports
- Well-equipped airport
- Queue
- Spot
- Gate
- Departure Metering
What is Airspace Technology Demonstration 2 (ATD-2)?

- NASA/FAA/Industry collaborative project that demonstrates the benefits of an integrated arrival, departure and surface (IADS) traffic flow decision making process while introducing new trajectory based operations (TBO) technologies and procedures.
- Responds to a NextGen Advisory Committee (NAC) recommendation/need.
ATD-2 Capabilities

Capabilities build upon each other

- **Real-Time Electronic Data Exchange**: The foundation of all of the other ATD-2 capabilities

- **Common Situational Awareness**: Shared view of flights, airport, airspace, and TMI

- **Surface Scheduling**: Predict when each flight will operate and determine how it will fit into the overhead stream

- **Surface Metering** (Phase 1 & 2): Hold flights at the gate to reduce surface congestion and save fuel + emissions

- **Departure Fix Load Balancing** (Phase 3): Use improved predictions and TOSs to balance demand across fixes

The capstone needed for each capability to work and provide benefits...
ATD-2 System Overview

Data from External Systems → Flight Matching and Fusion → TMI Processing → IADS Model & Scheduler → STBO Client

Flight Matching and Fusion:
- Flights
- External Flight Data

IADS Model & Scheduler:
- Model / Scheduling / Metering Data
- Surface Modeling, Scheduling, and Metering

STBO Client:
- Flight Data

RTC:
- TTP SWIM Feed
Electronic Data Exchange
Electronic Data Exchange between ATCT and Airlines

*NOTE: With TFDM, the data to and from ramp tools will need to be routed through the airline’s SWIM feeds
NASA and the FAA are collaborating to provide a prototype TFDM Terminal Publication (TTP) feed via SWIM R&D network as part of the ATD-2 Field Demonstration.

The ATD-2 Prototype TTP feed will include these services:
- Flight Data
- Airport Information
- Traffic Management Restrictions
- Flight Delay
- Operational Metrics

TTP is now available on SWIM R&D for CLT. You are welcome to onboard now!
Electronic Data Exchange with GA / BA
Mobile App Ready-to-Taxi Time Submission

RTT Location
~ 10 – 15 minutes after RTT submission

One pilot waits in the FBO for passengers.

When the passengers arrive ...
...

... the pilot submits their best prediction of Ready-to-Taxi Time (RTT) and Ramp Area
(for one Corporate Flight Co., that is +10–15 min)

Data Elements
Pilots receive Data Elements (see image)
ATD-2 data elements are integrated into AEFS V5.5.0 Build 1 which was deployed to CLT on Thu 9/20/2018.

ATD-2 Times: EOBT, TOBT, AOBT, TMAT, AMAT, ETD (TTOT)

Other data from ATD-2: ONR, SWAP, STOP
Electronic Data Exchange
Of Traffic Management Initiatives (TMIIs)

Current Restrictions
This page refreshes every minute. Last updated Fri, 23 Aug 2019 17:40:37 UTC

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ATC Personnel

Restrictions, GSs, GDPs

NTML

OIS

Restrictions

FSM

TfmData Flow

TFMS

ATD-2

SWIM
Common Situation Awareness
• A single system running with multiple users (i.e., Tower, Ramp, TRACON, Center) to interact with one another

• Users share the same data, exchange information, and make decisions collaboratively

• Inputs are from multiple sources, including FAA, Airlines, ATC, and Ramp
The ramp traffic console has many lessons learned woven into its Human Computer Interface.
**Common Situational Awareness – Ramp View**

**ATC to Operator**
- Real-time traffic management initiatives
- Airport configuration coordination
- Runway intent information

**Ramp Tool Colors and Symbology**

- **Call for release (APREQ)**
  - UAL1087 A319 E
  - KILNS-EWR
  - A2100
  - A10 27 18L '1916

- **Ground delay (EDCT)**
  - FDX1935 B752 E
  - KILNS-EWR
  - E2230
  - FDX 18L 916

- **Miles in trail (MIT)**
  - DAL8928 B752 E
  - BARMY-EWR
  - M20
  - A2 27 18L '1916

- **APREQ + EDCT**
  - JIA5026 A319 E
  - KILNS-DCA
  - E2340Q
  - E5 27 18L P1916

- **Dep Fix closure**
  - JBU1118 E190 E
  - KILNS-JFK
  - A4 27 18L 1916

- **ATC runway change**
  - SWA210 A319 E
  - KILNS-DCA
  - A6 18L P1916

- **Dep Fix change (CDR)**
  - AAL1864 A319 E
  - KILNS-DCA
  - D12 27 18L P1916

- **Airport ground stop**
  - UPS1283 B752 E
  - KILNS-PHL
  - UPS 18L 1916

- **Ramp control entries are key to accurate measures of benefit and good system performance.**

- **Arrivals are green**
- **After pushback, engine symbol indicates spool up state**
- **Westbound departures are brown, eastbound are blue**
- **Hollow icon (if no surveillance)**
- **A flight assigned to the hardstand has yellow border**
- **Super type aircraft has thick white border**
Surface Scheduling
Surface Modeling

- Detects the flight’s current state
- Predicts which resources a flight will use
  - Gate
  - Spot
  - Runway
  - Fix
- Predicts undelayed 4D trajectory
- Tracks aircraft line of flight and predicts gate conflicts
Surface Scheduling

- Predicts when each flight will take off or land
- Considers
  - Current flight state
  - Undelayed 4D trajectory
  - Other flights arriving and departing from the same runway
  - Runway separation requirements
  - EDCTs
  - Release times
  - Ground stops and fix closures
Scheduling Flights into Overhead Stream

• ATD-2 allows ATCT TMC to electronically negotiate release time into the overhead stream using IDAC-style interface

• Displays green-space / red-space that shows available time slots for flight to take off

• Take off time prediction for flight shown relative to other flights on the same runway

• EDCT and local information displayed for the flight
Pre-Scheduling with EOBTs from CLT to ATL / ORD

1. At an adaptable time prior to departure (e.g. 20 min) the ATD-2 system uses the EOBT, taxi time estimate and a buffer to electronically submit a release time request to TBFM.

2. Center TMC approves or adjusts the time based on center constraints.

3. ATCT and Ramp utilize the now visible APREQ time on their strips and pushback advisories.

4. IDAC-style scheduling between TBFM and ATD-2 is used to re-schedule as necessary.

The data is made available on the TTP SWIM feed so that Operators can get it to their pilots.
Surface Metering
Surface Metering – Process Flow

1. ATD-2 generates demand and capacity predictions

2. TMC enables metering capability and sets metering parameters in collaboration with ramp manager

3. ATD-2 recommends and TMC affirms SMPs.

4. Ramp controllers honor metering hold advisories