Real Time Metrics and Analysis of Integrated Arrival, Departure, and Surface Operations

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Integrated Arrival, Departure, and Surface (IADS) Operations

Airspace Technology Demonstration 2 (ATD-2)
Integrated Arrival, Departure, and Surface (IADS) Operations
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Overview

- Airspace Technology Demonstration 2 (ATD-2) Background

- Motivation for real time monitoring tool and analysis and method of developing requirements

- Description of data sources

- User interface and initial metrics

- Next steps
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Contributing Technologies to ATD-2

Spot and Runway Departure Advisor (SARDA)

Traffic Flow Management System (TFMS)
Decision support system for planning and mitigating demand-capacity imbalances in the NAS.

Time-Based Flow Management (TBFM)
Decision support system for metering based on time to optimize the flow of aircraft.

Terminal Flight Data Management (TFDM)
A new decision support system for airport surface management and ATC tower functions.

Precision Departure Release Capability (PDRC)
ATD-2 Partners
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IADS Data Exchange and Integration

Airline Operations
- Ramp Controllers
- Runway Utilization
- Flow Direction
- Runway Assignments
- APREQs/CFRs
- MIT restrictions

ARTCC
- TRACON
- ATCT
- Data Exchange & Integration
- Data quality updates
- Gate Conflicts
- Ramp Closures
- Flight Cancellations
- Runway Closures
- Dep Fix Closures
- Grounds Stops
- EDCTs
- Long on Board

Airport Operations
- Airline Operations
- ARTCC
Development of Real Time Dashboard

Initially developed as a researcher tool

Prototype development based on S-CDM and TFDM requirements

Held a series of nine user sessions with operational personnel from the Tower, Ramp, Center, and airport operations
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General Functionality

- Situational Awareness
- Monitoring Metrics
- Benefits Metrics
- Data Fidelity
General Functionality

- Configuration and Flow Information
  - Ramp Status
  - Metering Mode
- Situational Awareness
- Monitoring Metrics
- Benefits Metrics
- Data Fidelity
General Functionality

Throughput
- Predicted and actual runway capacity rates
- Delay values
- Arrival and Departure Taxi Time
- Excess Queue Time

Situational Awareness
Monitoring Metrics
Benefits Metrics
Data Fidelity
General Functionality

- Situational Awareness
- Monitoring Metrics
- Data Fidelity
- Benefits Metrics

CO₂ Savings
Monetary Benefits
General Functionality

Fidelity of incoming data feeds
System wide data deterioration
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Current dashboard features both vertical and horizontal display capability.
Specific metrics will show across the last 15 minutes, the last rolling hour, and the last cardinal hour.
Dashboard Pull Down Menu Metrics

![Dashboard Pull Down Menu Metrics](image)
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Next Steps

• Complete requirements for the real time dashboard leading up to Phase I go live date during which a version will be available to center, tower, and ramp controllers

• Constant iteration with operational users on the metric definitions, graphical views, and numerical information conveyed

• Refine requirements for additional features and develop new metrics based on input from operational users focused on predicative information that provides information to mitigate demand capacity imbalances
Phase 1: Baseline IADS Demonstration

Phase 1 Demonstration Goals

- Evaluate the Baseline IADS capability
- Enhance American Airlines CLT “departure sequencing” procedure with ATD-2 surface tactical metering
- Demonstrate improved compliance for a significant percentage of tactical TMIs
- Mature strategic Surface CDM capability via operational use, analysis, and feedback
- Reduce ATCT workload by replacing paper strips with EFD

Airspace Components

- ATCT TMU
  - Tactical departure scheduling capability via STBO display

- ARTCC
  - Tactical departure scheduling via modified TBFM/IDAC

Surface Components

- ATCT Control
  - Baseline electronic flight data capability via TFDM EFD

- Ramp Control
  - Tactical pushback advisories via RTC/RMTC display

- Surface CDM
  - Predictive mode: strategic metering info for situational awareness and analysis

Interfaces to external systems via SWIM plus ATD-2 SWIM extensions

= IADS user interface
Surface Metering Process Flow Diagram

1. Generate Demand and Capacity Predictions
   - IADS
   - Automation Assisted Capacity Predictions
   - ATC TMC Runway Utilization Intent
   - TRACON controller runway intent
   - Highly accuracy TBFM de-conflicted ON time estimate
   - TFM SWIM ETAs
   - TMIs, Controlled Take Off Times (CTOT)
   - Carrier provided EOBTs
   - Tactical airline intent (ramp controller)

2. Monitor Surface Demand Capacity Imbalances
   - Runway Delay
   - Time
   - If Surface Metering, Go to Step 3

3. Enable Metering, Set Hold Level

4. Honor TOBT and TMAT advisories
   - TOBT Advisory 6 min
   - TMAT Advisory

5. Evaluate Metering Effectiveness
IADS Tactical Departure Scheduling

APREQ/CFR departures merging into overhead streams

Flights subject to EDCTs due to downstream flow constraints

IDAC-style scheduling between IADS at CLT and TBFM at ZDC

Washington ARTCC (ZDC)
Concept Overview – Users

Overview video online at: http://aviationsystemsdivision.arc.nasa.gov/research/tactical/atd2.shtml
General Functionality

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