
Project Overview

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ATD-3 Scope

ATD-3
Applied Traffic Flow Management (ATFM)

ATD-2
Integrated Metroplex Traffic Management

ATD-1
Terminal Sequencing and Spacing (TSAS)
Flight-deck Interval Management (FIM)

TOC - Top of Climb
TOD - Top of Descent
ATD-3 Technical Challenge

Reduce weather-induced delays through integration of weather information to better manage aircraft, traffic flow, airspace and schedule constraints by delivering air/ground procedures and user-tool technologies.
ATD-3 Technologies

Multi-Flight Common Route (MFCR):
Automated search for efficient high value reroutes for individual flights and common reroutes for multiple flights - delay recovery from stale TMIs.

Traffic Aware Strategic Aircrew Requests (TASAR): Airborne automated continuous searching for efficient reroutes that reduce fuel and/or flight time, avoid interactions with traffic, weather and restricted airspace.

Dynamic Routes for Arrivals in Weather (DRAW):
Efficient reroutes to maintain metering operations in the presence of weather, find efficient arrival routes, and balance meter fix demand.
ATD-3 Integrated Concept

Current Flight Plan Route

Suggested reroute

MFCR
Ground-based automated search for efficient high value reroutes for individual flights and common reroutes for multiple flights - delay recovery from stale TMLs

Freeze Horizon

(20 min to MF)

~90 min to MF

~60 min to MF

Dep

Dest
MFCR User Interface
ATD-3 Integrated Concept

Current Flight Plan Route

MFCR
Ground-based automated search for efficient high value reroutes for individual flights and common reroutes for multiple flights - delay recovery from stale TMDs

TASAR - Flight-deck based automated continuous searches for efficient reroutes during flight
Traffic Aware Strategic Aircrew Requests (TASAR)

Pilot uses onboard automation tool to optimize an aircraft’s trajectory

NASA Technology

Operational Outcomes

Greater flight efficiency en route

Tool leverages networked connectivity to real-time operational data

Increased ATC approval of requests
Freeze Horizon

Current Flight Plan Route

Suggested reroute

MFCR
Ground-based automated search for efficient high value reroutes for individual flights and common reroutes for multiple flights - delay recovery from stale TMI

TASAR - Flight-deck based automated continuous searches for efficient reroutes during flight

Air/Ground Integration
Leverage capabilities of both TASAR and MFCR systems to maximize potential benefits of dynamic reroutes

ATD-3 Integrated Concept

Dep

Dest

Ground station

(AOC or ANSP)
Air/Ground Integration

Plan through Q2FY17

• Qualitative benefit assessment of candidate air/ground concepts

• Leveraging existing airline and FAA partnerships and agreements, solicit feedback on top candidate concepts, establish demonstration partnership(s)

• Develop Objectives, initial ConOps, and top-level requirements for air/ground concept and demonstration

• Complete Air/Ground Integration Plan through FY20 leading to demonstration
ATD-3 Integrated Concept

**Current Flight Plan Route**

**Suggested reroute**

**MFCR**
Ground-based automated search for efficient high value reroutes for individual flights and common reroutes for multiple flights - delay recovery from stale TMIIs

**TASAR**
Flight-deck based automated continuous searches for efficient reroutes during flight

**DRAW**
Efficient reroutes to maintain metering, avoid weather, and balance meter fix loading

**Air/Ground Integration**
Leverage capabilities of both TASAR and MFCR systems to maximize potential benefits of dynamic reroutes

**Freeze Horizon**
(20 min to MF)

**Ground station**
(AOC or ANSP)
- Planned as future TBFM enhancement
- Integrated Route and Schedule Trial Planner
- Two-hour convective weather forecast updated every five minutes
- Hourly atmospheric updates (e.g., winds)
- ERAM traffic feed from home and adjacent Centers
- Reroute candidate automatically identified and posted on DRAW Advisory List
Trajectory Based Weather Modeling

Current CIWS Weather

Forecasted Nearby CWAM Weather (< 25 nmi)

Forecasted CWAM Weather Conflict

Current Weather

30 Minute Forecast

60 Minute Forecast

CIWS*: Corridor Integrated Weather System (precipitation, echo tops)
CWAM*: Convective Weather Avoidance Model (pilot deviation model)

*- Products of MIT Lincoln Laboratory
DRAW – Time-Saving Reroutes to Alternate Meter Fix

- Current Flight Plan
- Meter Fix 1
- Meter Fix 2
- AC1, AC2, AC3, AC4, AC5
- Current scheduled times of arrival and delay
- Adjusted times of arrival and metering impact

Freeze Horizon

Efficient Reroute

AC5
AC4
AC3
AC2
AC1

MF1
MF2

AC5 3
AC4 3
AC3 2
AC2 1
AC1
DRAW - Route Correction to Avoid Weather & Maintain Accurate Schedule Time of Arrival

Current scheduled times of arrival do not reflect the need to deviate for weather

Adjusted time of arrival and delay
Meter Fix Demand Balancing (future capability)

Current Flight Plans

AC8  AC7  AC6  AC5  AC4  AC3  AC2  AC1  AC8  AC7  AC6  AC5  AC4  AC3  AC2  AC1

Current scheduled times of arrival and delay

- AC8  6  1
- AC7  6  1
- AC6  3
- AC5  3
- AC4  2
- AC3  2
- AC2  1
- AC1

Adjusted time of arrival and delays

Draw Offloading Reroute

Freeze Horizon
## DRAW Advisory List

### Current Arrival Route

<table>
<thead>
<tr>
<th>TL</th>
<th>TP</th>
<th>GP</th>
<th>ACID/TYP Ex</th>
<th>DEP/TRN/STAR.DEST</th>
<th>SAV</th>
<th>TRANS/STAR/AUX</th>
<th>STATUS</th>
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<tbody>
<tr>
<td>DEBB</td>
<td>GREGS</td>
<td>KOAK/STNLI.JFRYE3.KDAL</td>
<td>0.1</td>
<td>GREGS.JFRYE3</td>
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<td>FEVER</td>
<td>BOOVE</td>
<td>KNEAD</td>
<td>VRD878/A320</td>
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</tbody>
</table>

### Proposed Arrival Route

**DRAW Status**

- **OK**: Weather Deviation Route
- **ALT**: Alternate STAR

**Grouped By Meter Fix**

**Individual Advisory**

- DEBB
- FEVER
- AAL2402
- AAL606
- AAL1547
- AAL2207
- AAL2228
- AAL2195
- ASQ2789

**Group Advisory**

- GREGS
- BOOVE
- KNEAD

**Current Arrival Route**

- DEBB: KOAK/STNLI.JFRYE3.KDAL
- FEVER: VRD878/A320
- AAL1184
- AAL2533
- AAL2402
- AAL606
- AAL1547
- AAL2207
- AAL2228
- AAL2195
- ASQ2789

**Time Savings**

- DEBB: 0.1
- FEVER: -0.8
- AAL2402: 0.0
- AAL1547: 0.9
- AAL2207: 2.3
- AAL2228: 1.6
- AAL2195: -1.7
- ASQ2789: -6.1

**Proposed Arrival Route**

- DEBB: GREGS
- FEVER: BOOVE
- AAL2402: BOOVE
- AAL606: BOOVE
- AAL1547: BOOVE
- AAL2207: BOOVE
- AAL2228: BOOVE
- AAL2195: BOOVE
- ASQ2789: HNKER

**Status**

- OK
- ALT
DRAW Integrated Route and Schedule Trial Planner
DRAW Trial Planning: Trial Plan Activation

Flight Data Block
(Current Flight Plan)

Trial Planner Window
DRAW Trial Planning: Capture Waypoint

Updated Trial ETA, STA, Delay

Capture Waypoints
DRAW Trial Planning: Auxiliary Waypoint

Auxiliary Waypoint (Click & Drag)
DRAW Trial Planning: DRAW List Activation

DRAW List Activation (pre-defined route)
DRAW Trial Planning: Multi-flight Trial Planning
Questions

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