
Project Overview

October 24, 2016

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NASA Ames Research Center
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
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)

~60 min to MF

~90 min to MF
MFCR User Interface
MFCR Architecture Diagram

- Dispatch or Traffic Management Coordinator
- AOC or ARTCC
- MFCR
- TFM Data (via SWIM)
- CIWS
- Rapid Refresh Wind Model (NOAA)
- TFR System (FAA)
- SUA System (FAA)

SWIM provides access to aviation information through a single connection.
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

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

Freeze Horizon

(20 min to MF)

~60 min to MF

~90 min to MF

Dep

Dest
TASAR User Interface
Traffic Aware Strategic Aircrew Requests (TASAR)

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

Navigation Database

Aircraft Performance

Optimization Engine

Pilot Interface

Real-time Aircraft Data

Integrally sourced data

NASA Technology

Greater flight efficiency en route

Operational Outcomes

Crew Request

ATC Response

Traffic

Weather

Airspace

Dispatch

Externally sourced data

Tool leverages networked connectivity to real-time operational data

Increased ATC approval of requests
**ATD-3 Integrated Concept**

**Current Flight Plan Route**

- **TASAR** - Flight-deck based automated continuous searches for efficient reroutes during flight.
- **MFCR** - Ground-based automated search for efficient high value reroutes for individual flights and common reroutes for multiple flights - delay recovery from stale TMLs.

**Air/Ground Integration**

Leverage capabilities of both TASAR and MFCR systems to maximize potential benefits of dynamic reroutes.
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

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

**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

Current Flight Plan Route

Suggested reroute

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

Freeze Horizon

DRAW Efficient Reroute

Adjusted times of arrival and metering impact

Meter Fix 1

Current scheduled times of arrival and delay

AC1 1

AC2 2

AC3 3

AC4 3

AC5 3

MF1

MF2
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.
Meter Fix Demand Balancing (future capability)

Current Flight Plans

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

Freeze Horizon

DRAW Offloading Reroute

AC6 - MF1

AC6 - MF2
### DRAW Advisory List

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

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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

Capture Waypoints

Updated Trial ETA, STA, Delay

Capture Waypoints
DRAW Trial Planning: Alternate STAR
# DRAW Trial Planning: Transition Fix

## Transition Fixes

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**Diagram Description:**

- The diagram illustrates a trial planning scenario focusing on transition fixes.
- Key points include waypoints and flight paths.
- The image highlights specific flight paths and transition fixes within the terminal area.
- The NASA logo is visible in the top right corner, indicating the context of the trial planning exercise.

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**Note:** The diagram contains various flight paths and waypoint markers, essential for understanding the flow of trial flight planning and transition fixes.
DRAW Trial Planning: DRAW List Activation

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

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