SWIFT:
FAA Industry Collaboration Workshop #13

SWIM Services & SWIFT
(SWIM Industry-FAA Team)

Presented to: User Community

By: FAA SWIM Program Communications, Information and Network Programs

Date: February 18, 2021

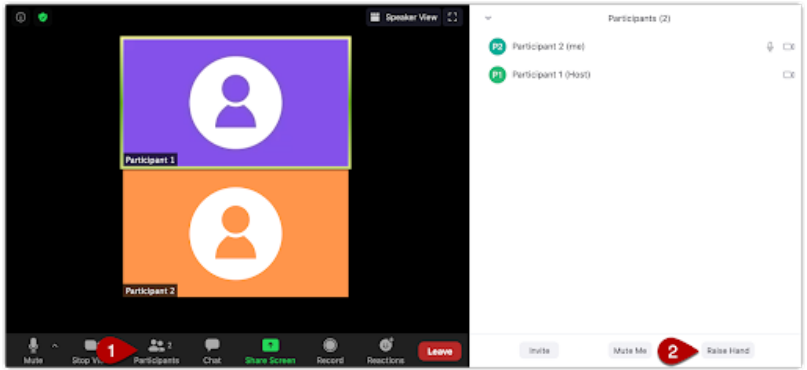
Federal Aviation Administration

“Airwave Procedures”

- **Please note during the session all attendees will have full control… “Hot Mics” and cameras.**

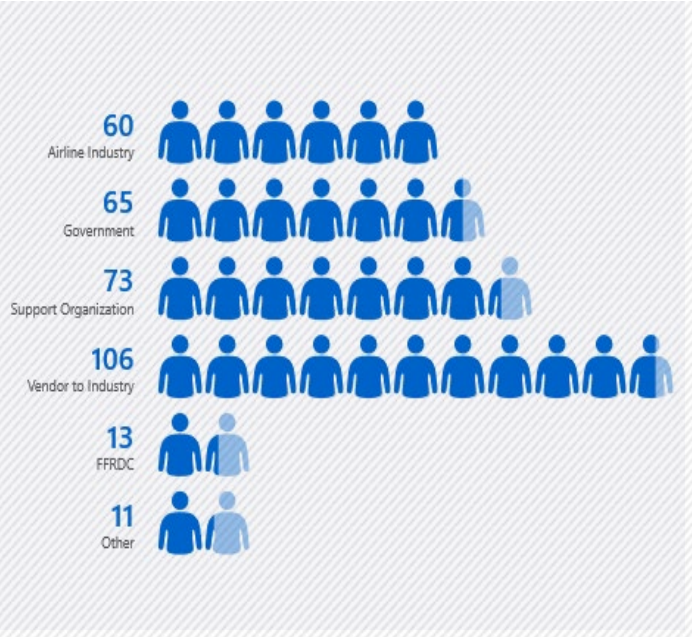
- **Please be mindful to mute mics and turn off cameras when not interacting during the presentation.**

- **The “Chat & Raise Hand” feature will also be available.**
  - During the presentations to ensure you are recognized for an opportunity to voice comments/questions please leverage the “raise hand” feature.



Who is in the “Zoom Room” at SWIFT #13?

Attendee Organizations



- **Other defined as**: Consultant, Operator, Researcher, Safety, USAF OSF, Academia, ATM Vendor, Association, ANSP

Data Point Timestamp 02-18-21 1125

Attended a SWIFT Meeting Before?

I’m a Veteran: 246

No, I’m New: 82

328 attendees

SWIFT

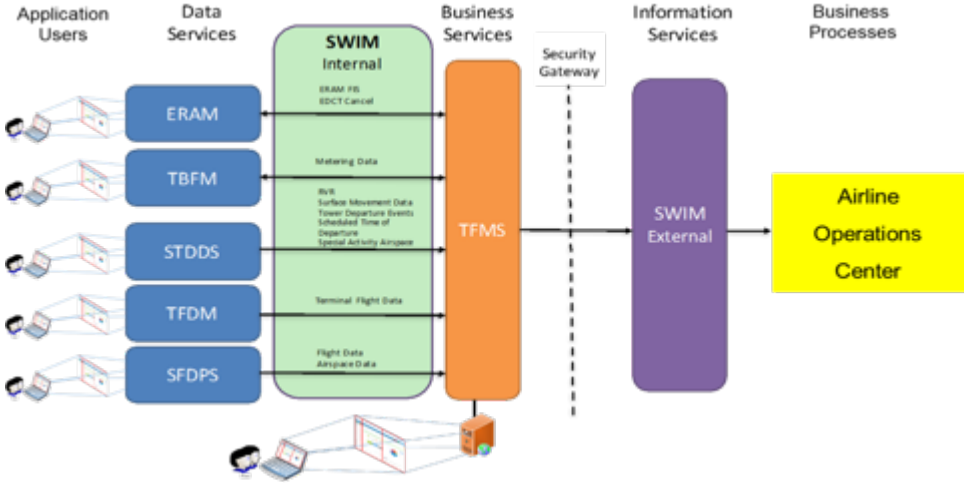
FAA Collaborative Workshop #13

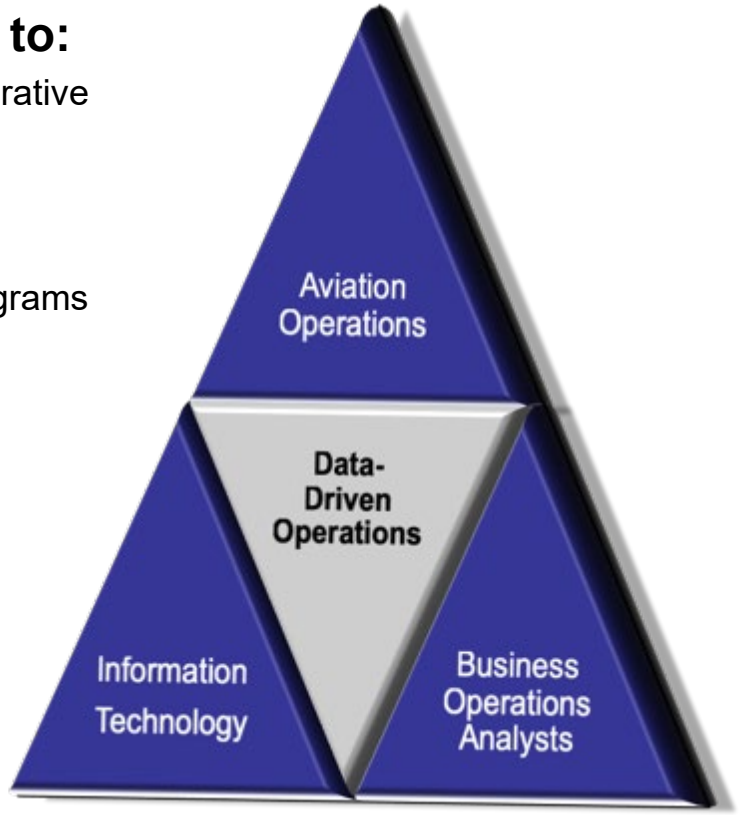
- **On-line Virtual Conference Starts Promptly 12:30pm**
- **Welcome and Introductions**
  - David Almeida (LS Technologies)
- **Opening Remarks**
  - Kris Burnham (FAA)
- **Focus Group General Updates**
  - Operational Context
  - Operational Issues (Ops Issues)
  - Development & Analytics
- **NAS Program: Time Based Flow Metering (TBFM) Update (Ops Issue #1)**
- **Special Topic: Early Planning for Disruptions (Ops Issue #3) Tabletop Exercise**
  Note: References to MITRE Research SWIFT 9 & 10 Prototypes (aka, Honeycomb) & NAS Common Reference (NCR)
- **Flight Planning Modernization (Ops Issue #2)**
- ***NASA Presents*: NASA Fuser, Data Analytics & Emerging Concepts**
- **SWIFT Widgets**
- **Close out**

SWIFT Stakeholders

SWIFT: At the Intersection of Operations, Technology & Data

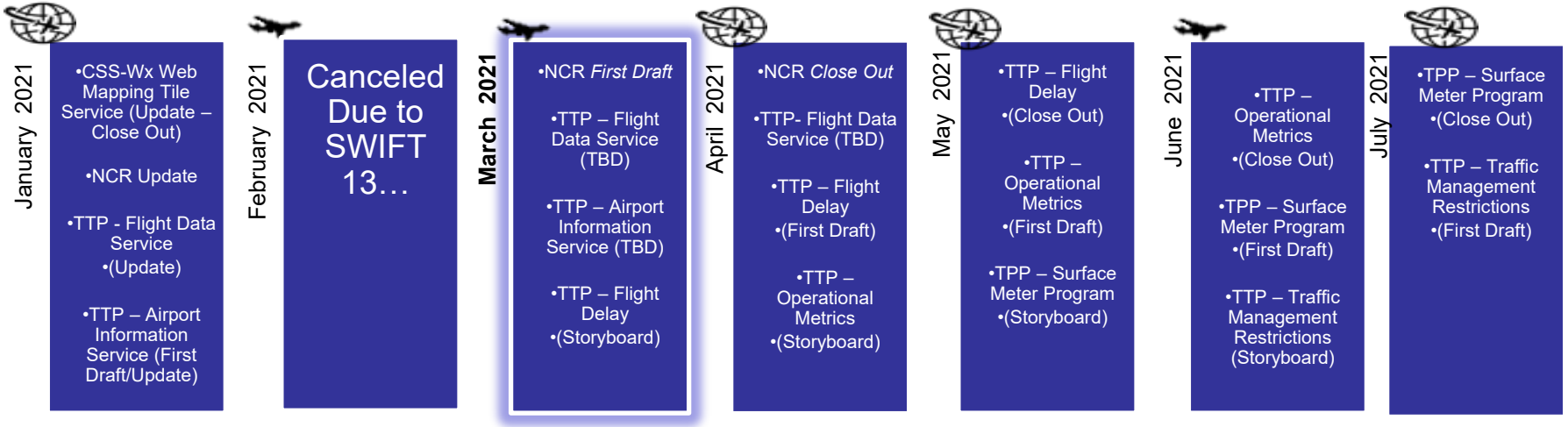
- **SWIFT addresses industry recommendation to:**
  - A community forum that acts as a clearinghouse for collaborative engagement around NAS information and data sharing
  - **Educate**: Synchronize community on information services
  - **Collaborate**: Discuss issues most relevant to community
  - **Communicate**: Inform community about SWIM & NAS programs





Focus Group Status Updates

Operational Context Focus Group: Document Updates



- **No meeting this month – Next session will be in <u>March</u> – See you there!**
- **TFDM Use Case and TTP Ops Context**
  Comments received on Use Case, team currently incorporating updates and working TTP Context Docs
- **Schedule subject to change**
- **https://connect.lstechllc.com/index.cfm/main/opconfocusgroup**

Contact Us:

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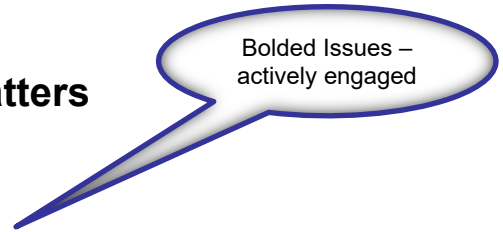
Operational Issues Focus Group Update

SWIFT 13 Update

Operational Issues Focus Group

- **Lead:** Chris Gottlieb, JetBlue
- **Goal:** Address NAS-wide operational issues that might benefit from information sharing between organizations
- **Current Prioritized Issues:**
  - **TBFM delays (United) who, what, why it matters**
  - **Flight planning over IP (SWA)**
  - **Early planning for disruptions**
    - **Early Detection Deviation over Fix (JBU)**
    - **Early Detection for Airport Surface Delays (JBU)**
  - Taxi Out Return to Gate (Delta)
  - TBFM/TFMS double delays
  - Long taxi issues (JBU) at JFK



Recap SWIFT 12… Aviation Case Study

- **Environment:**
  - En route environment with flight departures from Fort Lauderdale (KFLL) crossing Jacksonville and Miami Center boundary (ZJX, ZMA)
  - Airways and Atlantic routes impacted by Traffic Management Initiatives (TMI) events
    - M201 and M202 occasionally shut down
    - L453, L454
- **Problem Statement:**
  - No clear way to readily identify or record aircraft deviation causes (e.g., due to traffic volume or weather). Without this capability, we lack the means to anticipate traffic route closures or aircraft reroutes during en route & surface operations. Currently, we **have limited analytical approaches for gauging how well airspace is managed or utilize data.** Such a tool or capability would provide a more unified operational view of ATM metrics that are often disjointed or difficult to interpret.
- **Goal:**
  - Record tolerance of aircraft deviation on initial leg of KFLL departure gates to better identify/predict constrained routes and minimize TMI delay impacts to surface operations.

Relevant SWIM Information Services

En Route Flight & Airspace Data Query Services

ERFDQ is a feature of the SFDPS service providing flight plan, track, and other flight-related data from ERAM via HADDS.

- Retrieve data from the SFDPS database based on filtering criteria specified by consumers
- Flight Plans, Updates & Amendment Information, Hold Status & Handoff Information, Converted Rout, Cancellations, etc.

ERADQ is a feature of the SFPDS service providing airspace assignment, status, and other airspace-related messages from ERAM via HADDS.

- Retrieve data from the SFDPS database based on filtering criteria specified by consumers
- Sector Assignment Status Information, Route Status Information, Special Activities Airspace Information, Altimeter Setting Information

NAS Common Reference

NCR is a NAS Program that provides SWIM Services for parsing, storing, and correlating NAS data.

- Ingests multiple SWIM products from several NAS producers
- Aeronautical (e.g., Aeronautical Common Services (ACS))
- Weather Information

NCR enables dynamic queries for NAS data

- Route of flight or airspace geometry
- Any combination of geospatial, temporal, and attribute filters – like a database query

Notional Widget Application Approach

Honeycomb Features

- Monitor Deviation from given geometric boundary (i.e., ATC preferred route on this widget).
- Deviations greater than 25NM from departure fix or route are recorded.

NCR Features

- Query NCR to see if area of airspace or route of flight intersects any TFMS reroute advisories or TMI restrictions (TFMData)
- Real Time Early Alert using query as a subscription (Based on NTML logs)

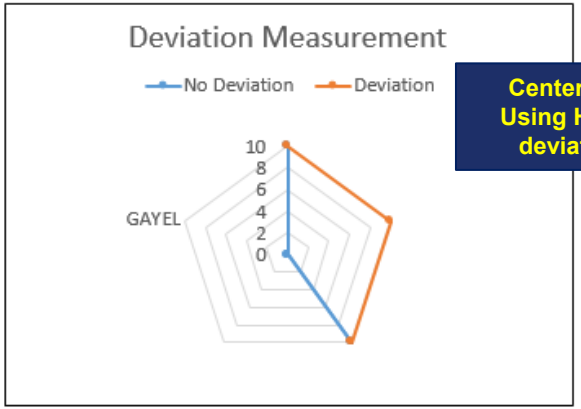
Combining applications will provide...

- **Post Ops Analysis on key drivers for reroutes.**
- **Real time alerting to dispatchers of possible delay (MIT, Route Closure) derived from NTML Log.**
- **Use Honeycomb deviation data to record tolerance of deviation on the initial leg of Jet Route.**

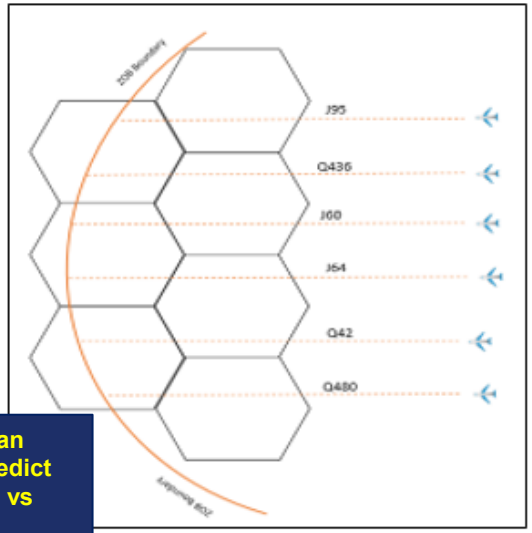
***Note: Can apply Honeycomb/NCR widget for tracking FCA volumes**

Honeycomb Notional Application

- Establish a baseline to track relevant data for N90 TRACON departure fixes and airways



Centered at 0 is the DEP fix GAYEL. Using Honeycomb, we could detect a deviation from 0 with a geo-fence.

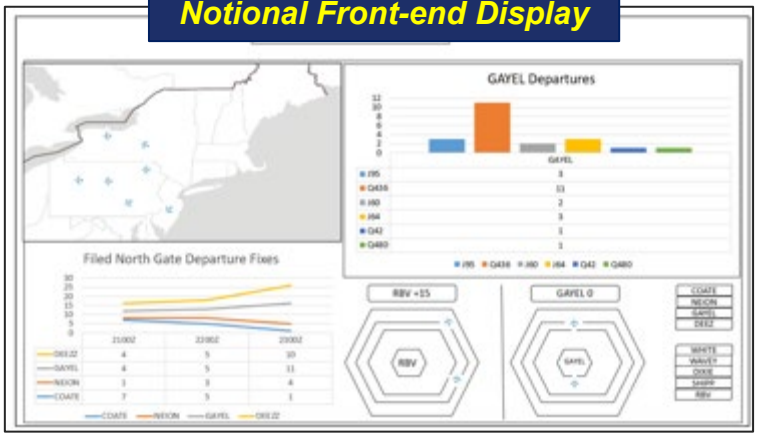


With geospatial indexing, we can determine airway efficiency or predict route closures by tracking MITs vs Demand

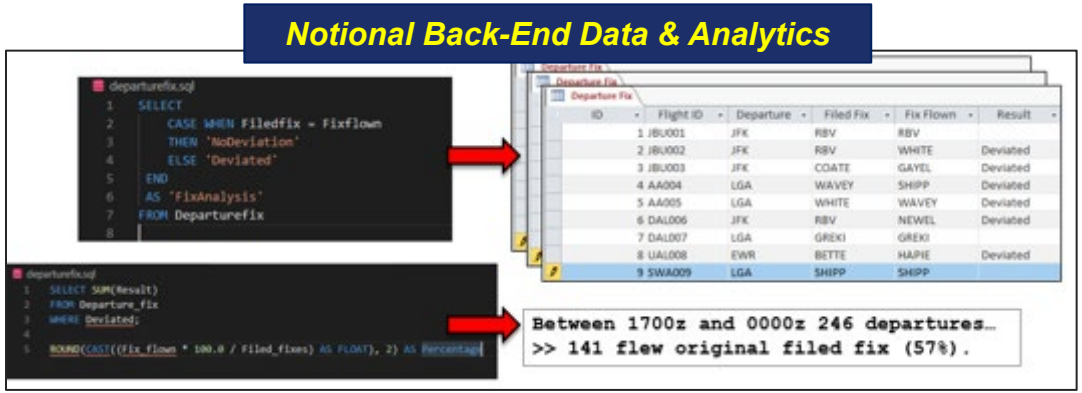
Honeycomb Notional Application

- A report can be printed for Post Ops analysis
- Glean planning efficiency, irrespective of current volume

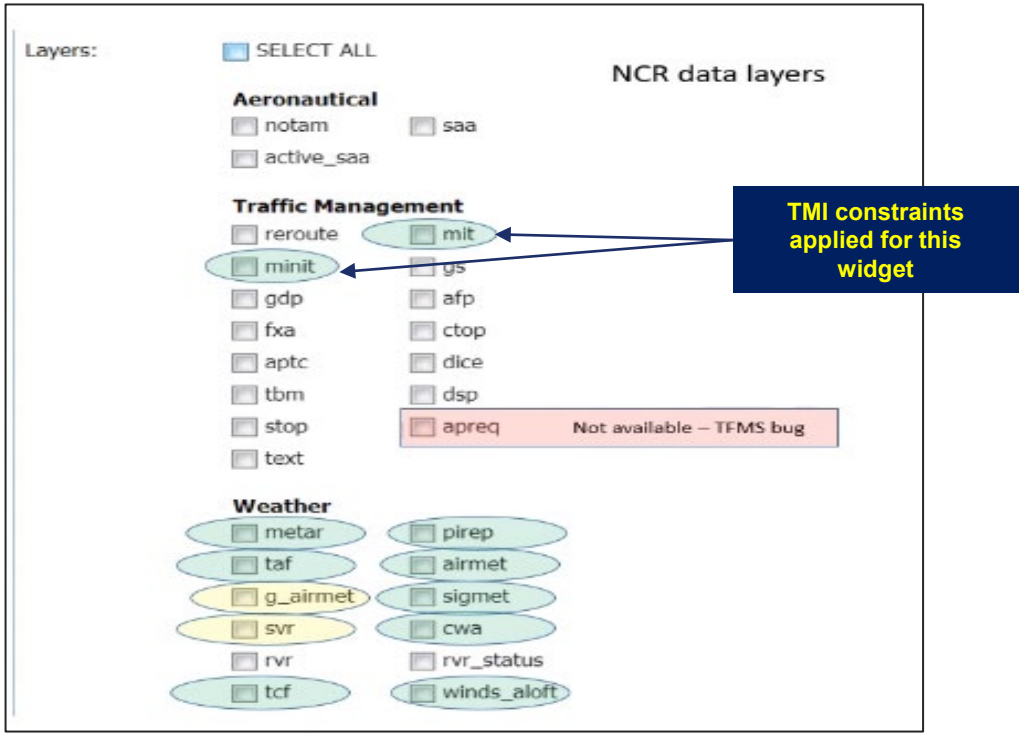
Notional Front-end Display



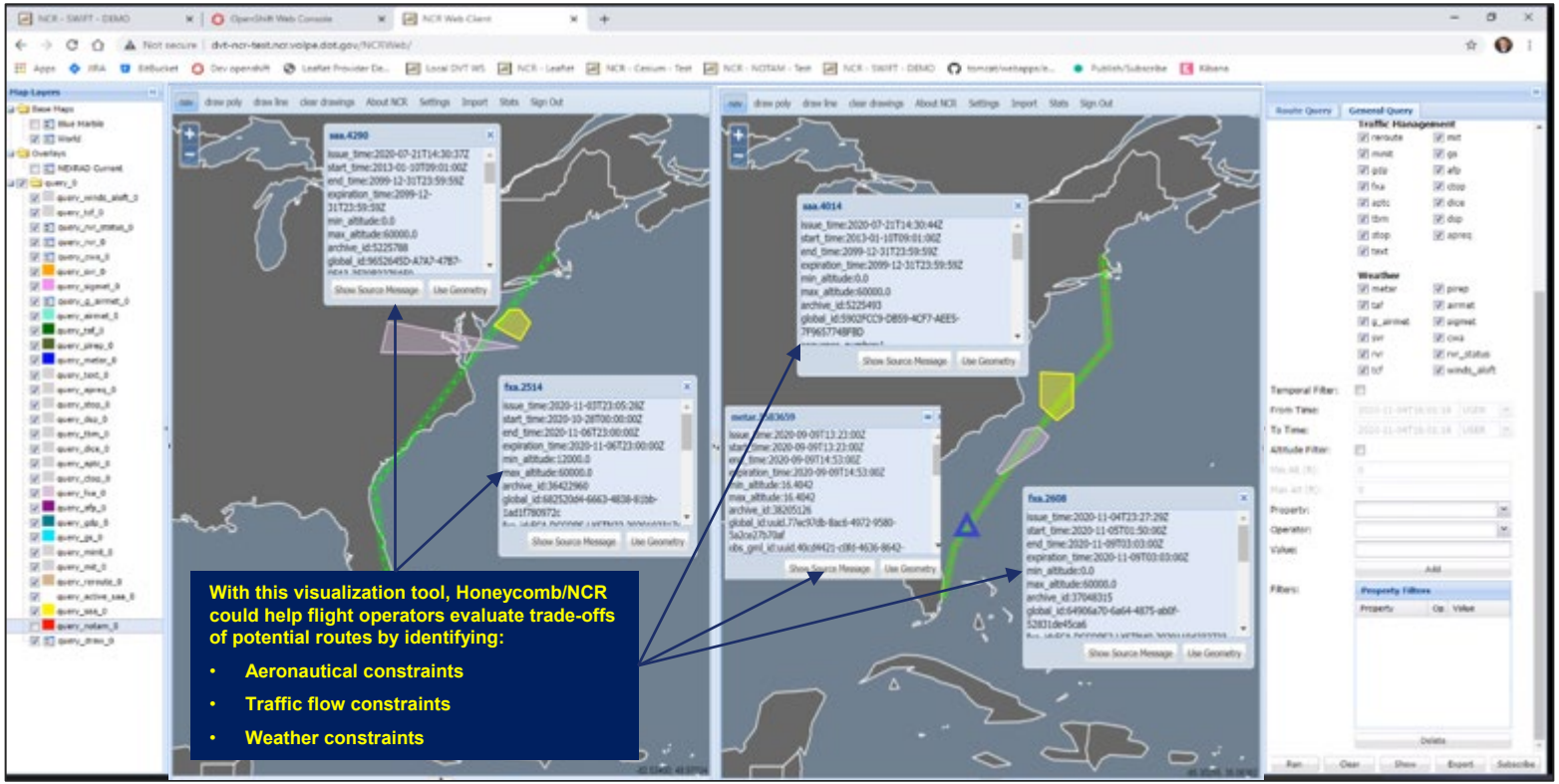
Notional Back-End Data & Analytics



Notional NCR Functionality



Notional Widget User Interface



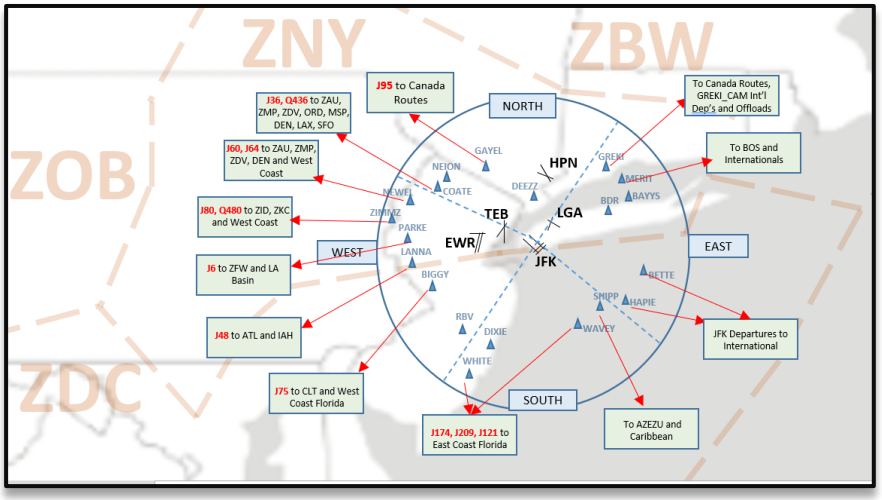
Ops Issue 3: Early Planning for Disruptions

Goal

- Identify drivers and key indicators that would inform disruptions to airspace user operations earlier
  - *Vignette #1: Weather Impacts to Flight Routes in Northeast Region*
  - *Vignette #2: NBAA – Circumventing New York Metro Area Flow Restrictions*
  - *Vignette #3: Impacts of Airport Configuration Change at LGA*

Status

- Typically meet semi-monthly to flesh out Ops challenges when encountering Northeast disruptions
- Engage FAA reps to understand current SWIM services that can address “information gaps”
  - *E.g., NCR, En Route Airspace Date Publication (SFDPS)*
- Seek to leverage open-source tools to visualize solutions for the community
  - *E.g., Uber H3 Hexagonal Hierarchical Spatial Index “Honeycomb”*



Ops Issue 3: Early Planning for Disruptions

Current & Planned Activities

- Walkthrough Tabletop Exercises with operational community to identify “information gaps” (Now)
- Explore SWIM Business Services that provide relevant data to improve Ops decision-making (Spring 2021)
- Demo widget application to model real-world disruptions during convective weather season (Summer 2021)
- Leverage Post Ops analysis and Ops decision-making results to mitigate disruptions (TBD)

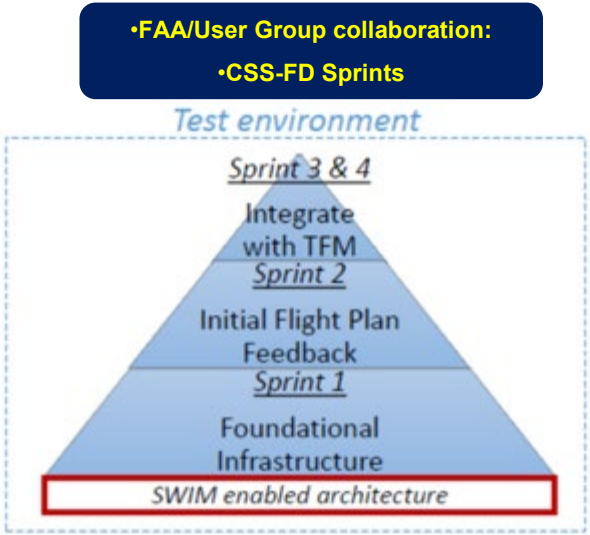
Ops Issue 2: Flight Planning over IP

Goal

- Align FAA Flight Plan Modernization efforts with Flight Operators' needs under the new SWIM information exchange environment
  - *Understand operator systems' technical needs for Flight Planning, Filing and Data Sharing through CSS-FD*
  - *Better foresight into NAS constraints and impacts to Ops planning and decision-making*
  - *Improve service through increased reliability of operations*

Status

- Meet periodically to discuss CSS-FD/SWIM Flight Planning with commercial airline and flight vendors reps
  - *Level-set timeline, community participation and expectations*
  - *Activities divvied into "Sprints" that builds upon SWIM FP capabilities and information management*
- Established Microsoft Teams space for information sharing between FAA and Ops community



Ops Issue 2: Flight Planning over IP

Next Steps

- **Continue participant engagement:**
  - Hold CSS-FD System development Kickoff meeting for Sprint 1 (Q2 2021)
  - Share Flight Planning documentation on Teams Group site (On-going)
  - Request user group feedback on Sprint 1 constraints (Q1-Q2 2021)
- **Project planning:**
  - Prepare for user group Sprint 1 use case reviews (Early Q2 2021)
  - Refine Sprint 1 schedule and identify relevant interdependencies (Ongoing)
  - Align resources to milestone dates and work action plans, accordingly (Ongoing)

Want your Ops issues to be heard?? Join us!

Next OIFG scheduled for March. Invites coming soon…

- Discuss SWIFT 13 Tabletop Exercises and CSS-FD findings
- Refine Ops Issues tasking for 2021:
  - Incorporating NCR & Honeycomb functionality into Early Disruptions Planning
  - Learning more about CSS-FD Risk Reduction Sprint 1 objectives

Contact Us:

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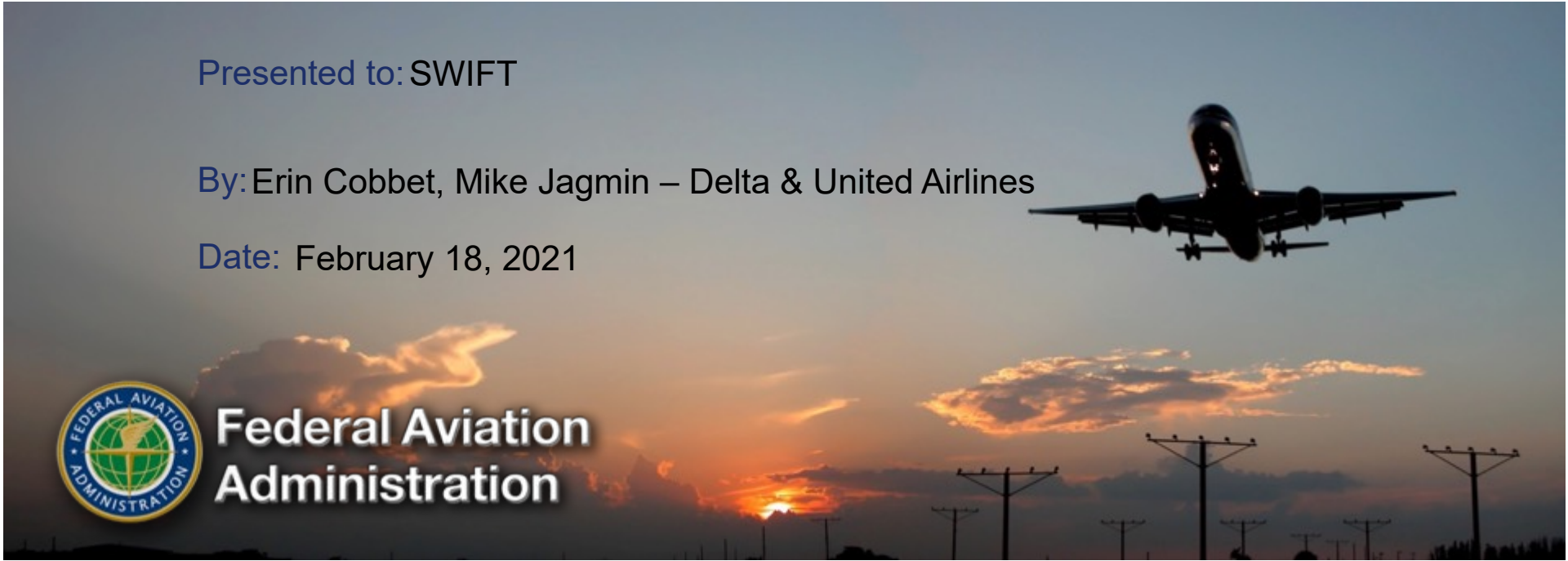
Xavier Pratt- Xavier.Pratt@lstechllc.com

Development & Analytics Focus Group

SWIFT 13 Update



Presented to: SWIFT

By: Erin Cobbet, Mike Jagmin – Delta & United Airlines

Date: February 18, 2021

Federal Aviation Administration

Development & Analytics Focus Group

Leads: Erin Cobbett, and Mike Jagmin – Delta & United

Background & Purpose Recap:

- Collaborate with Operational Issues Focus Group
- Leverage the expertise of participants to present solutions using SWIM data
- Identify top community priorities via SWIFT meetings and by the Operational Focus Group

Status:

- Sprint 2 Closeout Activities Continue
- SWIM ETA Full Timeline Data Sample Collection/Scrub Continue

TBFM Delays Sub Team Sprint 2

Goal remains the same – determine the departure delay given to a flight by TBFM

- Delay should be the difference between aircraft ready time and the scheduled departure time
- CTM / ETD fields initially set as ready time, but can be updated for many reasons, not transparent to the end SWIM user

Current Activities & Status

- Efforts continue with Bi-weekly Meetings to achieve longer term solution
- TBFM team has captured 5 issues/enhancement areas on MIS. Currently assessing these issues internally, are seeking to develop a plan that will both improve the MIS and meet the constraints of the program
  - ***TBFM Producer Program will provide more details here today stay tuned!***

SWIM ETA Full Timeline

Problem Statement:

- Airlines lack the ability to easily see downstream impacts on the NAS from their modifications to the ETA (and other data points) submitted to the FAA. Currently this leads to ambiguity between input and output data, and no insight into the full impact on ETA. Aggregating and analyzing a full set of inputs and outputs from the FAA systems will provide a better understanding of how these changes impact flights, as well as foster change to benefit the industry as a whole.

Status:

- Team continues to scrub data sample and identify stakeholders from producer programs to continue engagements for problem statement refinement and issue resolution
- Next SWIM ETA Sub Team meeting - TBD

What's that... you want more Data & Analytics?? Join us!

Next full D&A scheduled for March 23rd @1pm EST Invite coming soon…

Provide out brief on Sprint 2 & SWIM ETA Full Timeline

- Revisit Project List for 2021:
  - Double delays
  - Gate Returns
  - NE SWAP Routing issues
  - FFICE
  - Demand over an Entity
  - Estimated Times

Contact Us:

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Ray Mitchell - Ray.Mitchell@lstechllc.com

Time Based Flow Management (TBFM) – Status and Opportunities

SWIFT 13 Update

Presented to: SWIFT

By: Bob Tyo – FAA

Date: February 18, 2021

Federal Aviation Administration

Agenda

Engagement Background and History

TBFM within TBO Approach

COVID-19 Impact

MIS Departure Delay Analysis

Engagement Background and History

No Engagement (2014-2020)

- **Voluminous Data and Lacking Problem Definition**

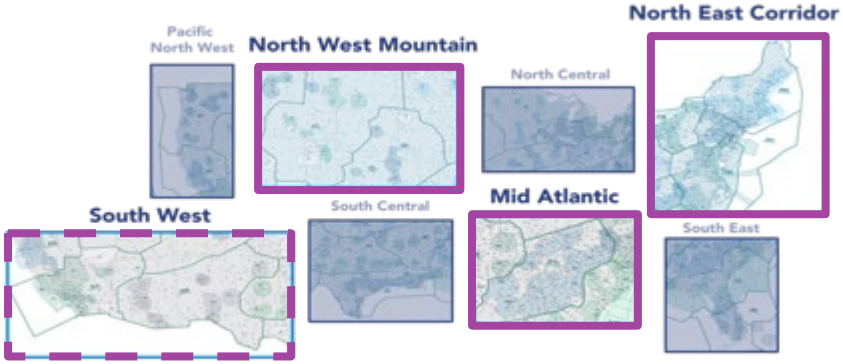
Current Engagement (2020)

- **SWIFT Development and Analytics Group identified area of focus**
- **FAA – increased opportunity for engagement due to COVID-19 bottleneck**
- **Bi-weekly meeting to establish and reinforce habitual teaming**

Operating Areas

North West Mountain
- ✓ DEN Metroplex
- • Integrated Departure Arrival Capability (IDAC) - 2021
- ✓ Extended Metering to DEN
  - ✓ Infrastructure
  - ✓ Dep Scheduling
  - ✓ Arrival Metering
- • DEN Terminal Sequencing and Spacing (TSAS) – 2022
- • DEN TFDM - 2023

South West
- • LAS Metroplex - 2021
- • Update airspace/procedures infrastructure - 2021
- ✓ IDAC
- • Extended Metering for LAX - 2022
  - • Infrastructure
  - • Dep Scheduling
  - • Arrival Metering
- • LAX TSAS – 2023
- • LAX/LAS TFDM - 2023



NAS-Wide
- ✓ En Route Departure Capability (EDC)
- ✓ Pre-departure reroute & Airborne reroute (except ZNY)
- ✓ Tower CPDLC Services
- • Initial En Route CPDLC Services – 2021
- • Full En Route CPDLC services – 2023
- • TFDM (89 locations) - 2028

All implementation dates subject to change due to COVID impacts, budget, sustainment needs, workforce training, and other constraints

North East Corridor
- ✓ IDAC
- • Extended Metering to PHL (2022)
  - ✓ Infrastructure
  - • Dep Scheduling
  - • Arrival Metering
- • Extended Metering to EWR (2023)
- • Atlantic Coast Routes - 2021

Mid Atlantic
- ✓ Adjacent Metering for ATL
  - ✓ Dep Scheduling
  - ✓ Arrival Metering
- ✓ IDAC
- • Airspace/procedures infrastructure update
- • Evaluate extended metering for ATL
- • TFDM - 2022

COVID-19 Impacts

Test and Implementation Bottleneck

- Very limited WJHTC access
- No NAS Facility Access
- Very limited travel
- Recovery to Normal – dimmer switch with lag

Opportunities

- Virtual meetings
- Virtual labs (TSAS assessment – FAA Capability Lab)
- Virtual/hybrid lab (TBFM assessment – Leidos English Creek)
- Selected regional integration (T2T via SSM)
- Virtual site surveys (pursuing concept)
- SWIFT Engagement – address problem set with slight deviation from current FAA work products

MIS Departure Delay Analysis

SWIFT 13 Update

Presented to: SWIFT

By: Yong Li – FAA

Date: February 18, 2021

Federal Aviation Administration

Background

Industry is looking to determine the amount of departure delay that TBFM allocates to a departure when scheduling

The definition of ground based departure delay is the difference between the aircraft ready time (when the tower specifies the aircraft can depart) and the STD (scheduled time of departure provided by TBFM)

Capturing effort under Leidos SIG TBFM-37104

Background, cont'd

To alleviate ambiguity among commonly used scheduling time elements currently provided and new elements that will be added, in order to provide a means of determining TBFM allocated delay, a baseline will be created to include:

- **Meaning**
- **Source**
- **Usage in pre/post scheduling**

Elements under Review:

- **CTM**
- **ETD**
- **ETA**
- **STA**
- **STD/SDT**
- **EDCT/ETM**
- **ADT/ATD - new**
- **ART - new**
- **Ptime**

Approach

Address notes/questions from List of SWIFT Development & Analytics Group Related Requests

1. **Publish separation matrix, separation buffer, and occupancy time for each runway as configured by TBFM**
2. **Identify ready and scheduled times used to determine scheduled departure delay**
3. **Provide TRACON group identifier with all category “air” messages: flt, eta, sta, sch, STD. tra already provided in mrp group**
4. **Indicate how TRACON runway assignment/scratch pad entries are utilized for MIS publication.**
5. **Indicate how landed status is set**
6. **Publish ETA at time of scheduling: Aircraft Ready Time + TTF**
7. **Investigate messages in Group “flt” for completeness and accuracy**
8. **Seek to provide new crossing time for meter fix, display fix, runway.**

Approach, cont'd

Doc-only updates to JMSDD:

1. **How the MIS updates are expected in the various operational methods of scheduling (IDAC, TGUI, ACM, T2T, different departure times provided when scheduling, etc.)**
2. **The setting of ETD from TFDM into the ETD field**
3. **Initial ETA to the MRE (MFX, THD, XMP, OA). Provides insight to why delays are being allocated at the CSP for departures**
4. **Application of delay elements based upon multiple scheduling events**
5. **How ETA is set to STA once scheduled, and respective update for each deconfliction point.**

Break

See you back here at 1:50 PM EST

SWIFT Aviation Case Study:

Early Planning for Disruptions in NAS Northeast Region

Tabletop Exercise

Setting the Stage: User Community Representation

Panel:

- Chris Gottlieb (Lead)
- Rob Goldman (Pilot)
- Mark Hopkins (Airline Ops/ATM)
- Ralph Tamburro (ATC/Airports)
- John Haman (ATC/TFM)
- Ernie Stellings (Business Aviation)
- Erin Cobbett (Data Analyst)
- Kevin Long (Prototype Development)
- Sandie Steele (Airline Ops)

Operational Condition:

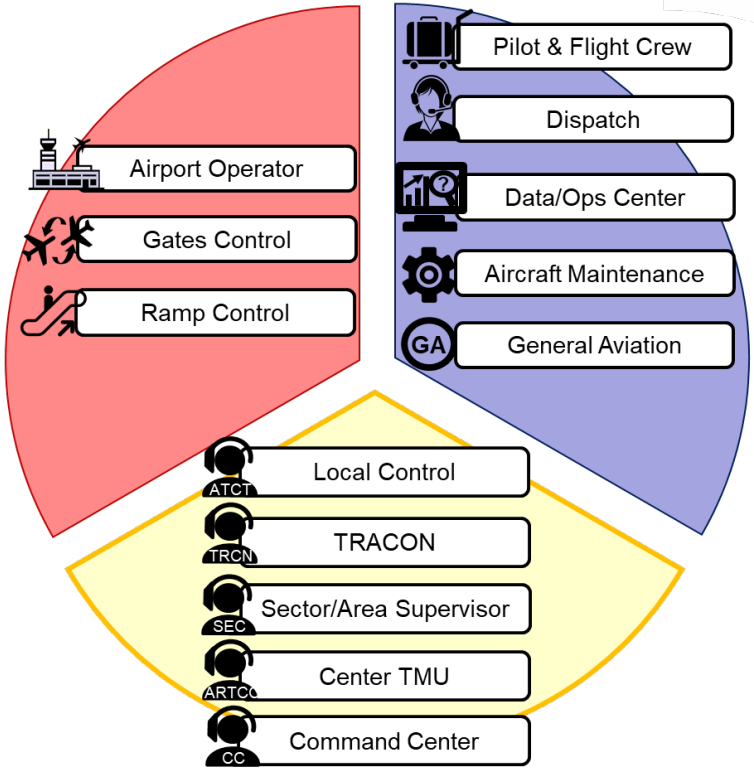
- **NAS Operational Improvement Goals:**
  - Identify drivers and key indicators that would inform disruptions to airspace user operations earlier
  - Apply SWIM Information Services to improve operational decision-making through advanced planning
  - Use Tabletop exercise to capture key procedures, operational processes and relevant information to study application of data analytics and machine learning to improve operational decision-making
- **Operational Problem Statement:**
  - Traffic Management Initiatives (TMI) and related delays resulting from Aircraft deviations over fix
    - There is no clear way to readily identify aircraft deviation indicators (e.g., weather, traffic volume) and anticipate enroute delays
    - There is a lack of available post-ops data analysis to determine threshold boundaries for traffic deviation and where disruptions are severe
    - This limits the operational community from effectively planning or implementing work-arounds for airspace condition changes and resource constraints
- **Environment:**
  - NAS Northeast Region Centers: ZNY, ZOB, ZBW, ZDC
  - New York metro and Vermont airports: LGA, JFK, EWR, TEB, HPN and BTV
  - Airways and jet routes impacted by Traffic Management Initiatives (TMI) events or closures

Applying SWIM information services to improve operations

- **State of aircraft deviation assessment on operational impacts**
  - Lack visibility into TMI triggers and resulting effects on air traffic delays
  - Inability to fuse/correlate TMI restrictions to impacted flight plan filings, active trajectories
  - Missing earlier aircraft deviation detection on departure routes, surface traffic management
  - Inability to measure key drivers for reroutes to better inform FAA-airline collaboration
  - Lacking ability to store and leverage data for post Ops analysis to assess accuracy of delay estimates and recovery times

- **SWIM Data & Information Services…what is needed?**
  - How can airspace users and ATC better anticipate and plan for disruptions earlier?
  - Can data analytics help accurately correlate NAS constraints to airspace user operations?
  - What automation systems are required to provide value added data for improved decisions?
  - What indicators (i.e., airport surface, aircraft movements, etc.) can help make decisions earlier?

Stakeholder Perspectives



FAA Perspective

- Maintain safe separation flights
- Effective & efficient sequencing of flights operations
- Ensure updates to NAS operating plans, scheduled configurations, and other airspace constraint information is disseminated to NAS users

Airspace User Perspective

- Operate flights with required and necessary information
- Flight intent information
- Maintaining flight plan data and processes for business operations

Airport Ops Perspective

- Coordinating airport conditions impacting surface Ops
- Maintain and communicate airport surface schedule (e.g., taxiway construction and equipment outages)

Vignette #1: Weather Impacts Fixes in Northeast Region

Weather events impact airspace capacity. What are the implications to flights Ops for New York metro airports? What is needed to help mitigate early disruptions?

Drivers to Account for:

Weather Location & Intensity Alerts

- Alerts for when Wx over specific fixes *or any point along the flight trajectory)* would typically *cause flights to deviate off track)* or throw flights into holding stacks.

Sector Thresholds

- Alert when sectors become saturated (configurable scale). Dispatch/crew have more time to estimate fuel needs and diversion alternates

Planned Taxi Times

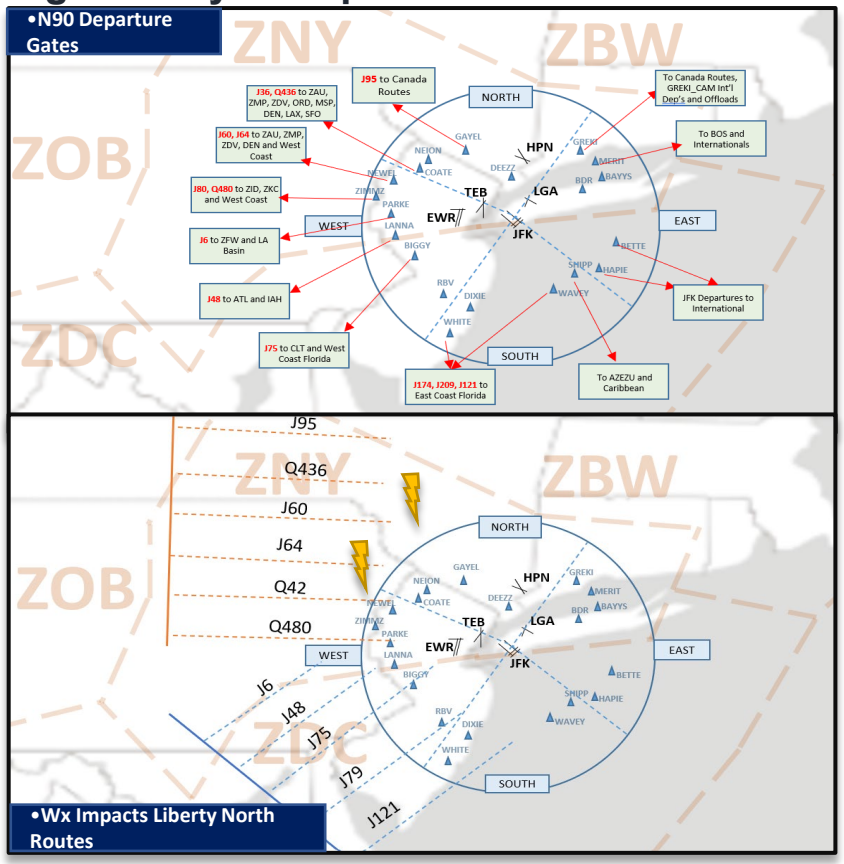
- Alerts to minimize taxi times. Data inform increased gate hold times; fuel revision needed

Prevailing RWY Configs

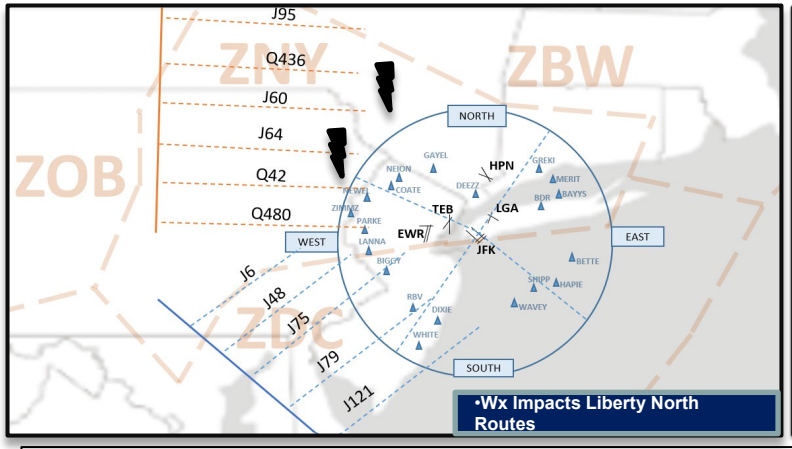
- Alerts for extra time to anticipate RWY changes. Dispatch/crew can use time to rerun performance numbers (may be overweight for shorter runways)

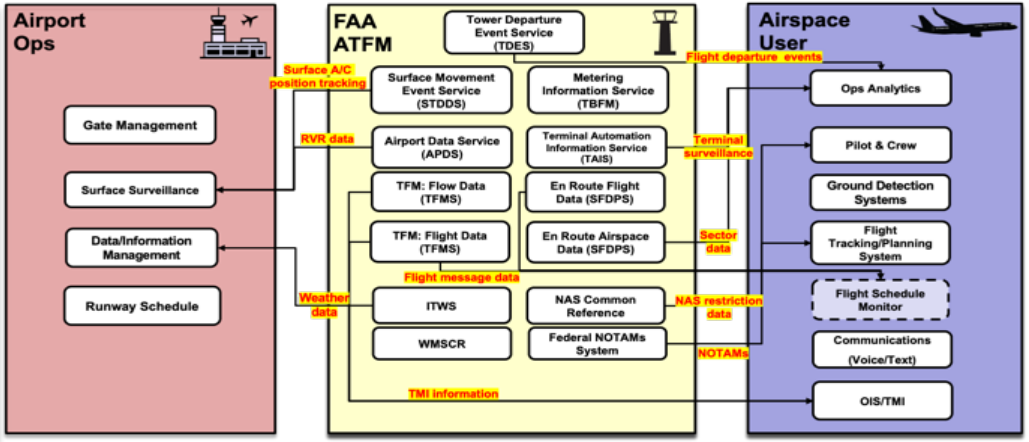
Flight Scheduling

- Pre-emptive alert or data that assists crew scheduling and aircraft router/planner



Vignette #1 Discussion: Weather Impacts Fixes Northeast Region





- **Pilot's perspective: what is happening and what are you communicating to ATC?**
  - **What information & how far ahead are weather data from Airline Ops Center (AOC)?**
- **From ATC perspective, seeing requests for deviations, what actions are you taking?**
  - **What other indicators affect these requests? What are implications to Terminal & Airports?**
- **In the Ops center, what are the various types of data you are looking for to prevent congestion? What data do you need from ATC, and how does it impact decisions?**

Vignette #2: NBAA – Circumventing ZNY Flow Restrictions

Requesting FAA to consider lower FCA ceiling restrictions to assist GA flights with flyover to BTV. What coordination is needed for minimal disruptions?

Drivers to Account for:

Resource Availability

- Data sharing that alerts aircraft/crew availability
- Gate space at diversion airports
- Fix and sector demand/capacity levels
- Diversion airports AAR

Flight Scheduling

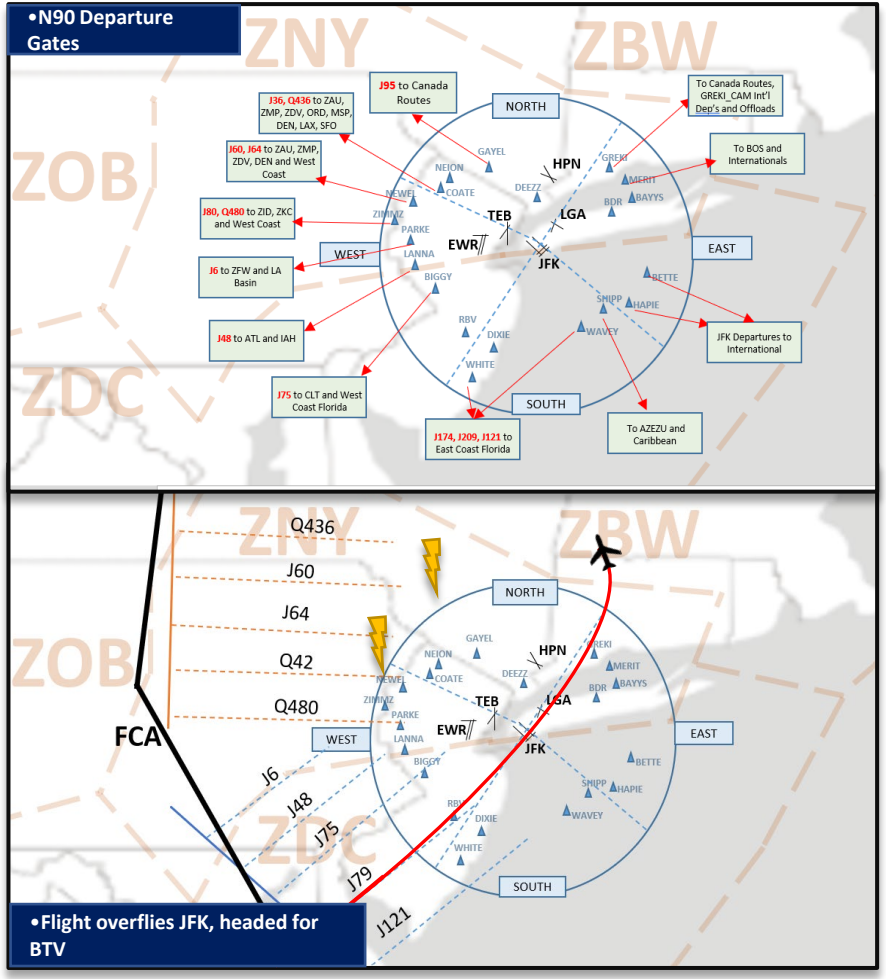
- Alert for AOC scheduling (pre-emptive cancels beneficial earlier in the day); Earlier heads up for Command Center demand

Sector TMU coordination with AOC

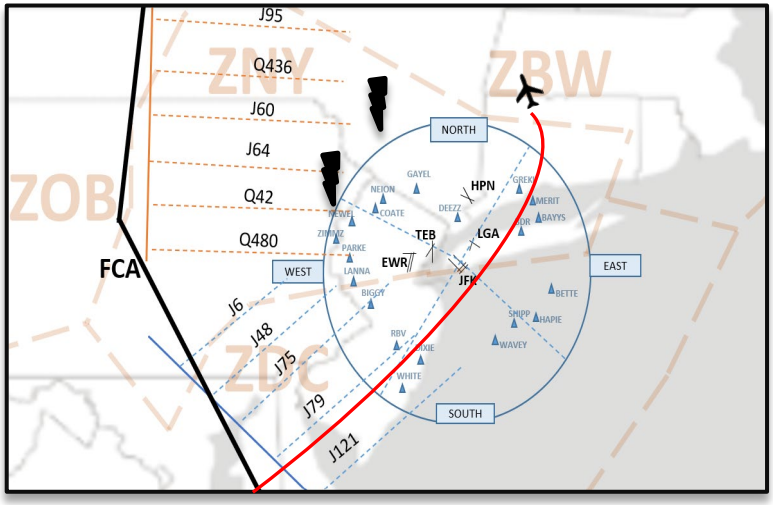
- Alert to assist controller coverage/coordination with TMUs and AOCs
- TMUs/ATCSCC earlier evaluation of raising floor or lowering ceiling of FCA – possibly during FCA planning

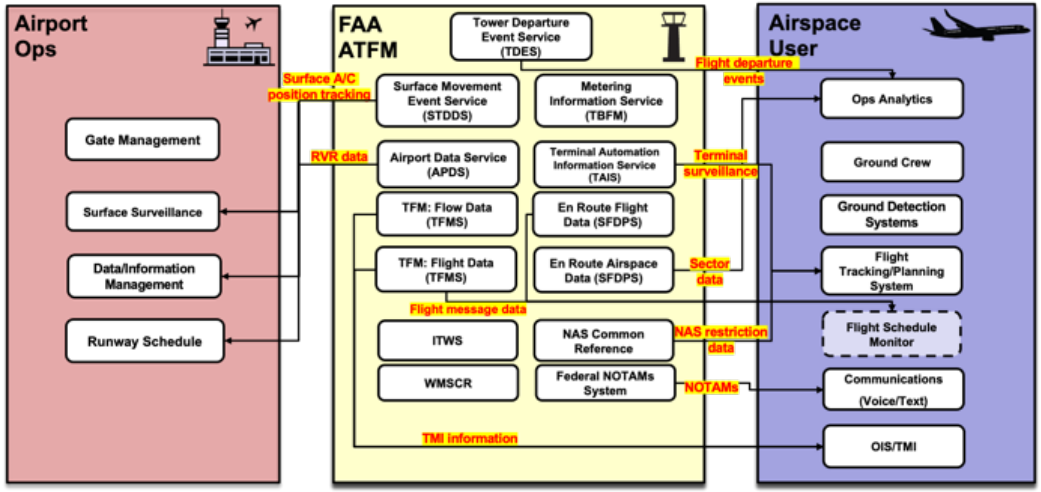
Weather Location & Intensity Alerts

- Alerts for when Wx over specific fixes would typically throw domestic flights into holding stacks



Vignette #2 Discussion: NBAA – Circumventing ZNY Flow Restrictions





- As airspace fixes become constrained triggering an irregular operation (IROP), and air traffic moves to available fixes, what does the business aviation (BGA) operator see?
- What type of decisions need to be made, given this type of operational environment?
- What information would enable the BGA operator need to make decisions to optimize their flight operation and customer service?

Vignette #3: Airport Configuration Change at LGA

Weather has moved to the East and surface winds are creating dangerous conditions, prompting runway change at LGA and EWR. What early information alerts, or traffic flow data would help airspace users of pending RWY changes to New York metro Ops?

Drivers to Account for:

Weather Location & Intensity

- Alerts for speed and wind direction at fixes or airspace (i.e., access to Wx data near LGA)

Enroute Traffic

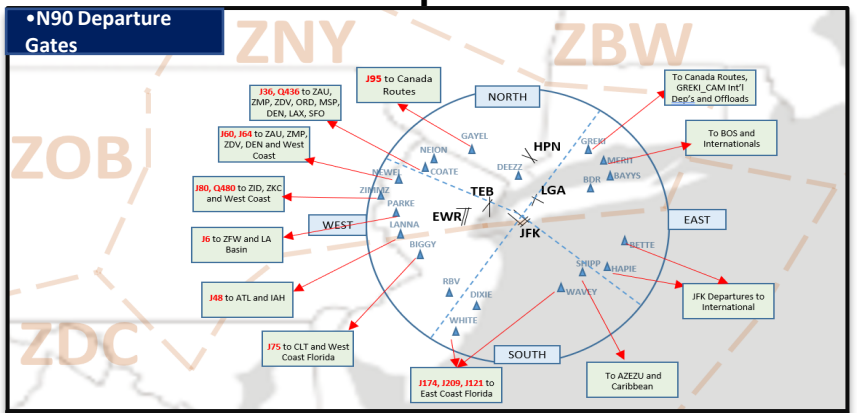
- Alert for dispatchers to minimize airborne diversions; crew/dispatcher have more time to evaluate bingo fuel and alternates; perhaps stay higher to conserve fuel to avoid diversion

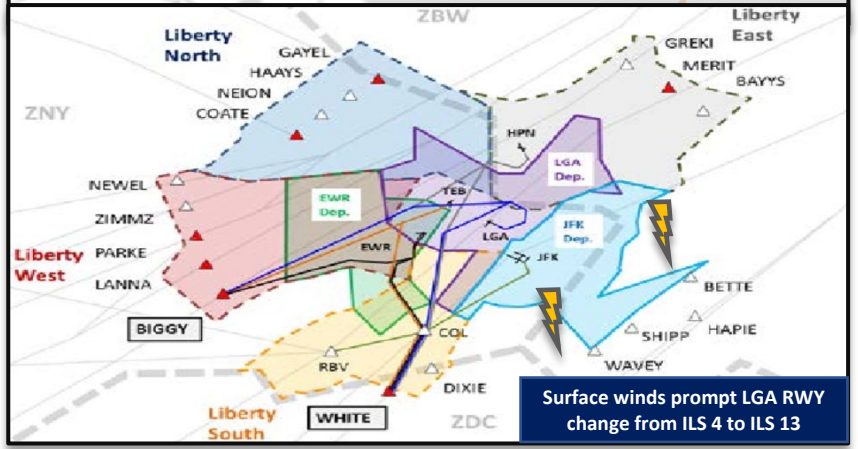
Gate & RWY Assignments

- Alerts/Data that provide insight for reevaluating runway assignments

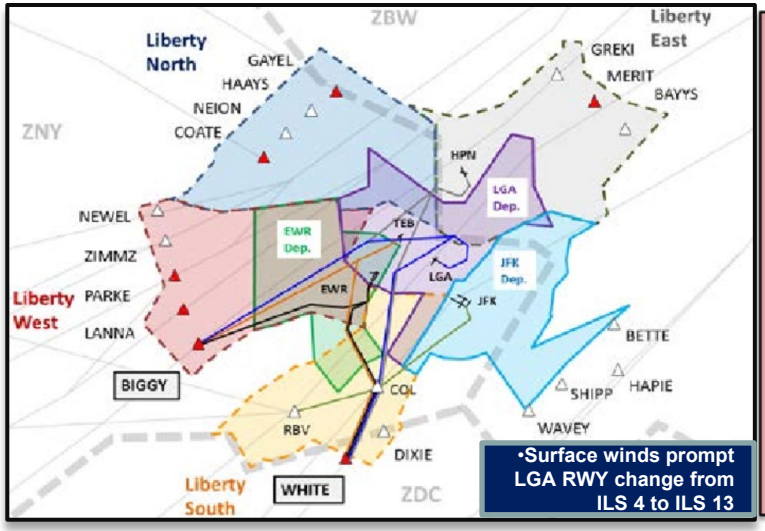
Airport Status

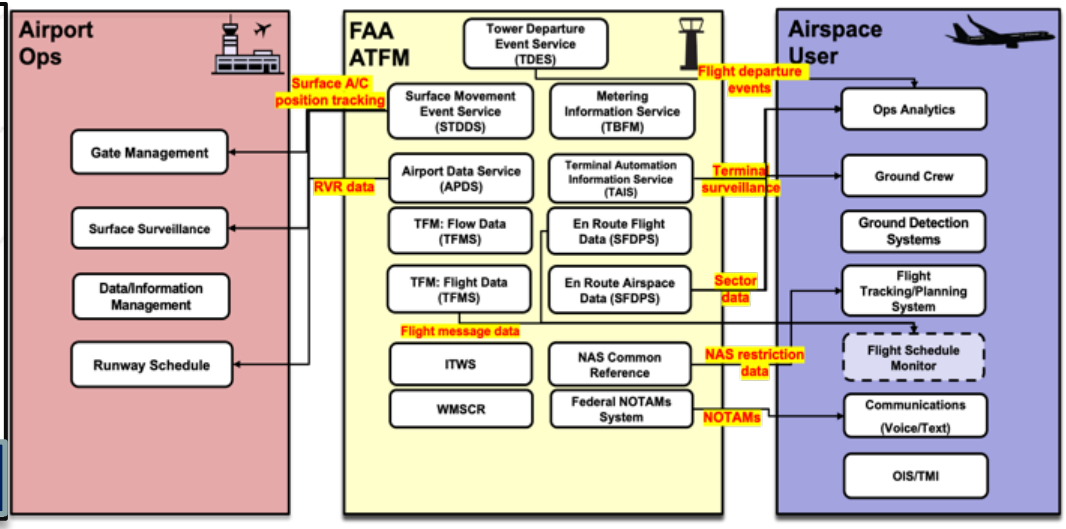
- AOC would need airport information to resolve potential crew time outs, potential aircraft unavailability; gate scheduling





Vignette #3 Discussion: Airport Configuration Change at LGA





- What are the impacts when LGA & EWR airport configurations change to BGA into TEB?
- What are the implications to changing airport configuration to the airline operation?
- How & when would knowing airport configuration or flow to airport help inform decisions
- How could airspace users become more informed on these types of

Next Steps for Early Planning for Disruptions in NAS

- **Use tabletop discussion items to model the *Early Planning for Disruption* to model study during Convective Season**
- **Identify potential data services that can provide advanced insights into the impact and magnitude of irregular operations**
- **Evaluate technical strategies and approaches for predictive analytics to and evaluate impact on operational decision-making**
- **Expected benefits resulting from improved prediction of irregular operations**
  - Visibility into route closure and recovery time to reduce vulnerability to SWAP
  - Route availability situational awareness for better reroute planning and fuel savings.
  - Improved TRACON/Tower/AOC clearance coordination and workload management to reduce gate returns, gate utilization, extended taxi and cancellations caused by crew timeouts

Common Support Services Flight Data (CSS-FD)

SWIFT 13 Update

Presented to: SWIFT

By: Atousa Ghafouri – FAA

Date: February 18, 2021

Federal Aviation Administration

Common Support Services – Flight Data (CSS-FD)

CSS-FD will deliver modern flight information management and facilitate transition of new applications to the new information exchange environment

CSS-FD has two main components:	
Flight Planning & Filing (FPF)	**Flight Data Sharing (FDS)**
A standards-based flight planning & filing environment. To be used by flight operators and the FAA to negotiate preliminary and filed flight plans. Constraint sharing/feedback will enable the flight operator to receive and address constraints early in the planning phase.	**Provide a single common reference** for legacy and FF-ICE capable users facilitating operational flight data sharing across the NAS ecosystem in accordance with centralized and managed business rules.

CSS-FD will support & facilitate			
Enhanced Collaborative decision-making	Additional flight data for **Trajectory Based Operations (TBO)**	**International data exchange standards** *(i.e. Flight Information Exchange Model (FIXM))*	International Civil Aviation Organization (ICAO) provisions for **Flight and Flow – Information for a Collaborative Environment (FF-ICE) and mixed-mode**

CSS-FD Risk Reduction Activity (RRA) Goals

- **Understand integration needs with operator systems**
  - Validate technical interfaces between FAA and operators
  - Ensure data reconciliation needs with operator data
- **Leverage capabilities of operators' modern analytics and SWIM interfaces**
- **Feedback on capabilities and NAS constraint information**

The RRA will consist of Sprint exercises in a test environment in order to evaluate CSS-FD capabilities and system performance

November SWIFT Meeting Re-Cap

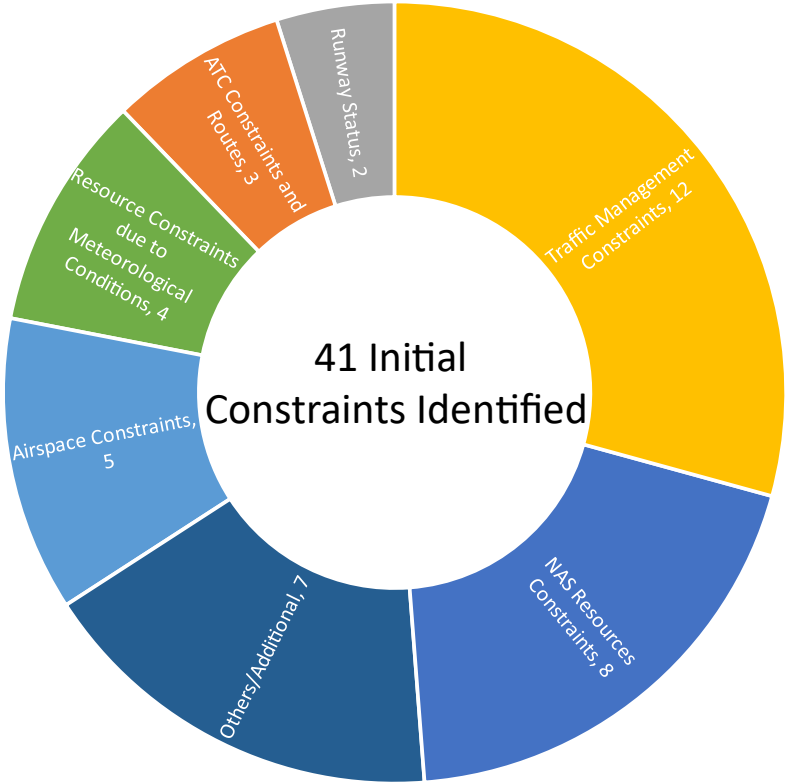
- **Briefed CSS-FD Overview and RRA Sprints**
- **Received interest in the project and specific questions with respect to:**
  - Timeline and minimum requirements to participate
  - Architecture and Interface
  - Scope of the sprints
- **Received feedback on need to further investigate constraints**

CSS-FD Updates since last SWIFT Meeting

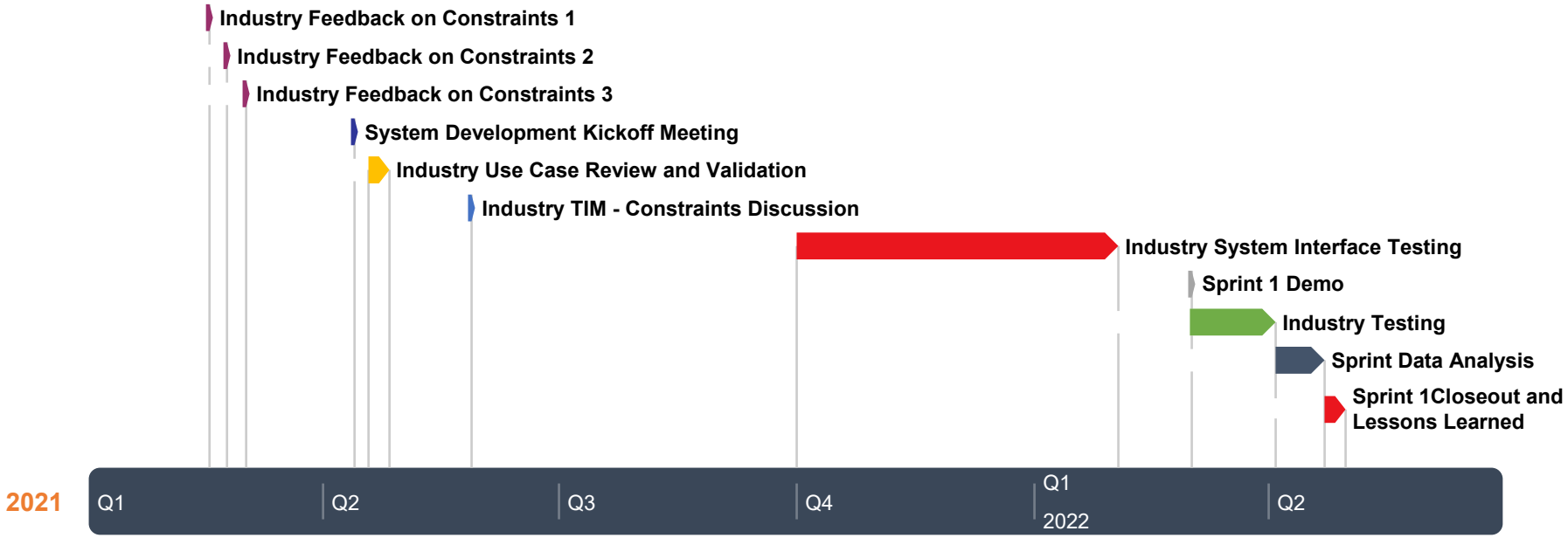
- **Finalized Risk Reduction Activity (RRA) Sprint 1 scope and activities**
- **Initiated onboarding process for Volpe Center (US DOT R&D organization) for Sprint 1**
- **Initiated internal Constraint Evaluation Working Group in preparation for industry engagement**
- **Published CSS-FD Teams collaboration site**

Constraint Working Group

- **Work with Stakeholders and Industry to identify and prioritize constraint information that would impact the Flight Planning process**
  - Initial focus on RTCA recommended constraints
- **Identify feedback that would have the greatest value in Flight Planning decision making**
- **Industry to provide feedback via CSS-FD Teams Channel**



Sprint 1 Timeline



*Note: Timeline in Calendar Year

CSS-FD Teams site

- **CSS-FD Teams site setup is complete. If you are not on the list and would be like to be added please send an email to Xavier Pratt : xavier.pratt@lstechllc.com**
- **Site will be used for:**
  - Announcements and News Feed
  - Document sharing (background, technical, presentations and meeting minutes)
  - Polls, Surveys and Lessons Learned
  - Industry Feedback and Community Supporting Documentation

NASA ATD2, Data Fuser Updates & the Digital Information Platform

SWIFT 13 Update

Presented by:

- Jeremy Coupe – NASA
- Shawn Gorman – Mosaic ATM
- Mirna Johnson – NASA

Federal Aviation Administration

NASA ATD2/DIP SWIFT Update - Agenda

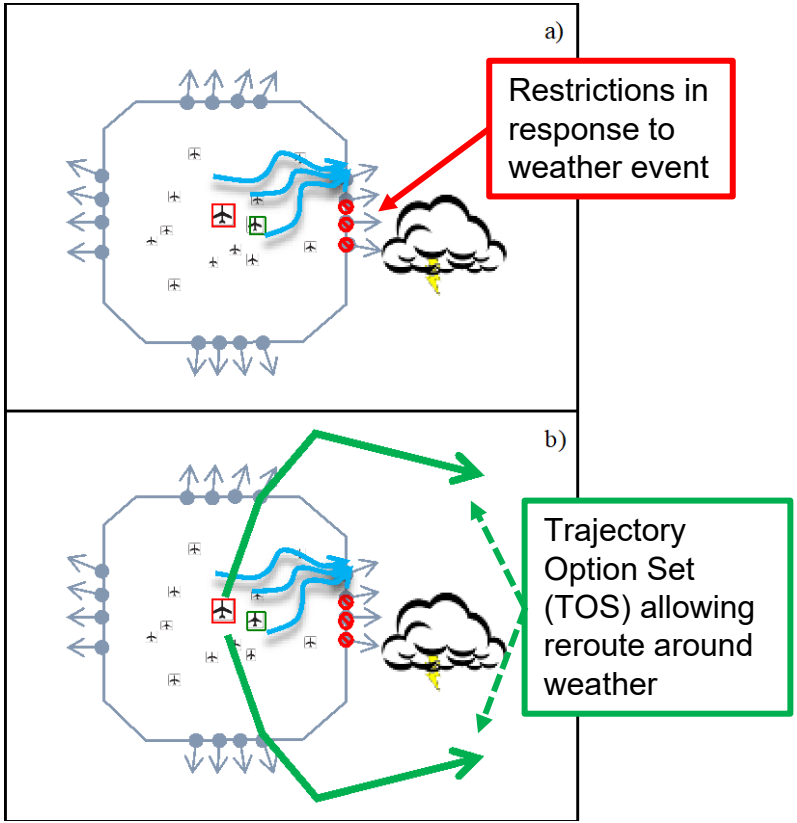
- Real-time machine learning based services – powered by SWIM
- Opportunity to engage in NASA's Digital Information Platform

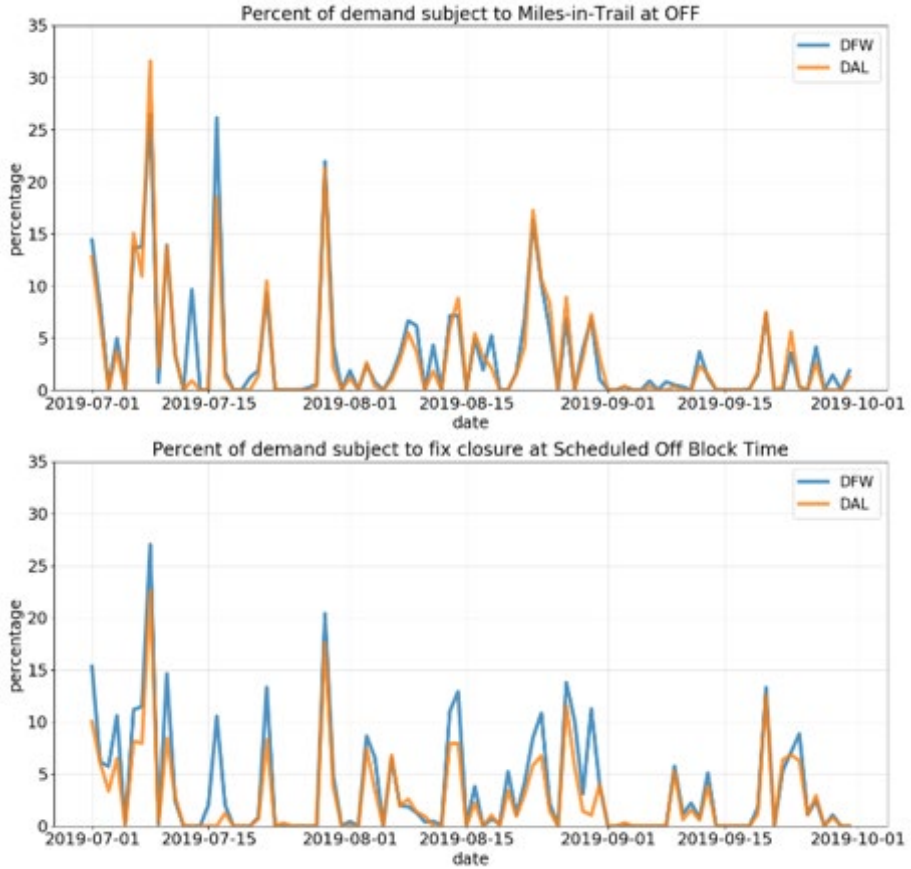
ML Airport Surface Model

ML Airport Surface Model Outline

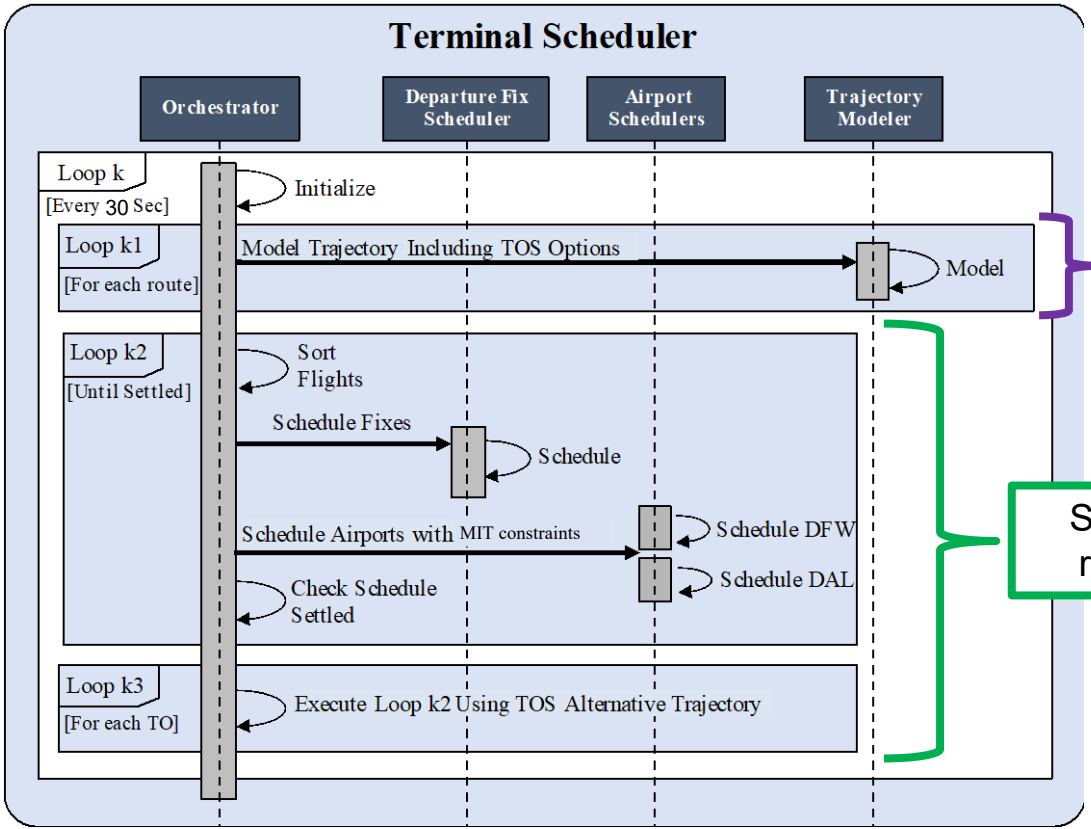
- What?
- Why?
- How?

ATD-2 Phase 3 Trajectory Option Set (TOS) Reroute Capability Currently Running in North Texas Metroplex





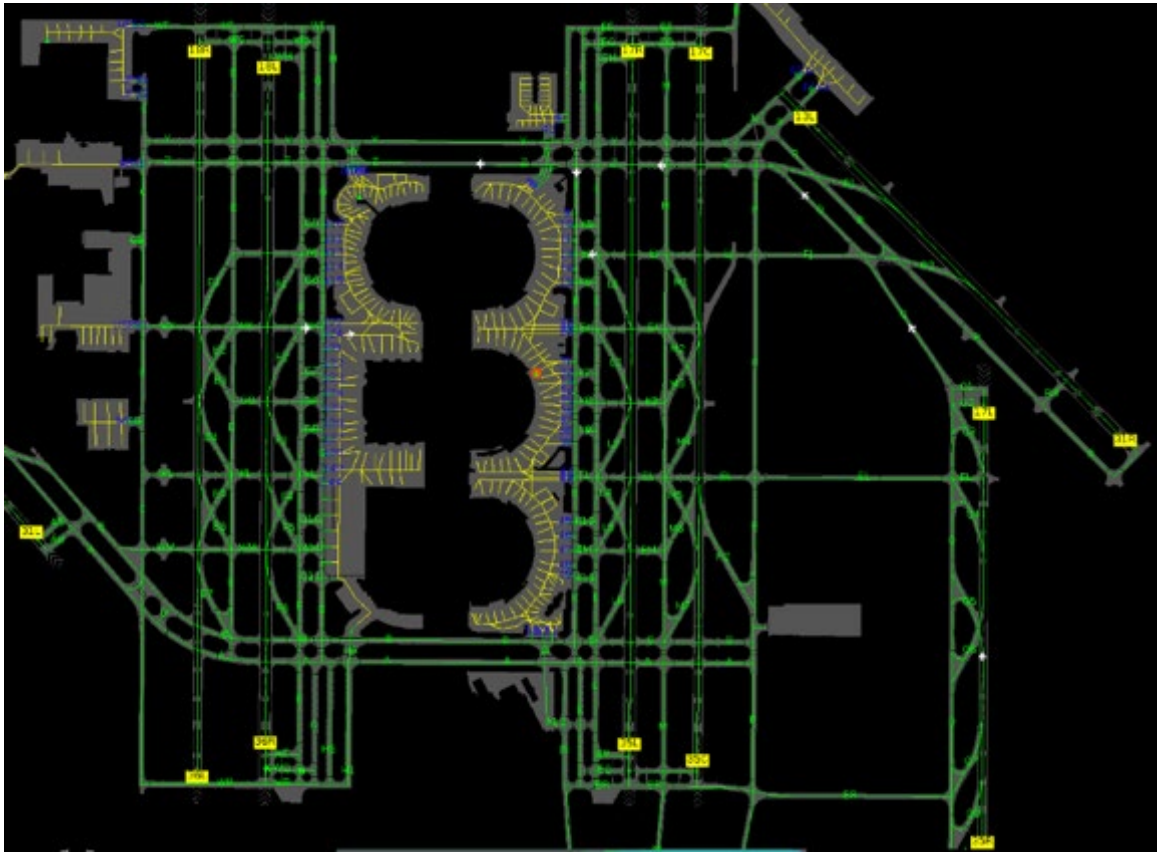
ATD-2 Phase 3 Metroplex Scheduling Algorithm



Modelling unimpeded trajectory requires significant adaptation

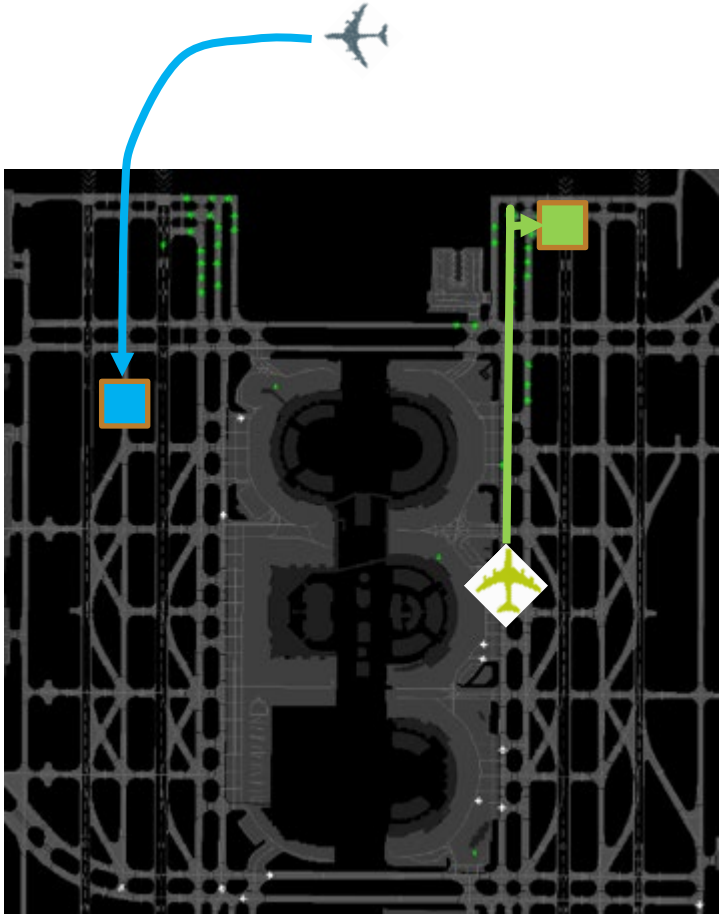
Scheduling at constraint points requires little to no adaptation

DFW Airport Adaptation Example



- Detailed link node network defines the airport surface structure including gate locations, runway locations, and taxi routes
- Adaptation goes beyond physical structure to include SME knowledge encoded in decision trees (for example the fix to runway mappings)
- Requires significant time and effort to build and maintain for each airport

Machine Learning Airport Surface Model



- Airport configuration
- Departure
  - Runway
  - Unimpeded Take OFF Time
  - Unimpeded Fix Crossing Time
- Arrival
  - Runway
  - Estimated ON Time

ML Airport Surface Model Outline

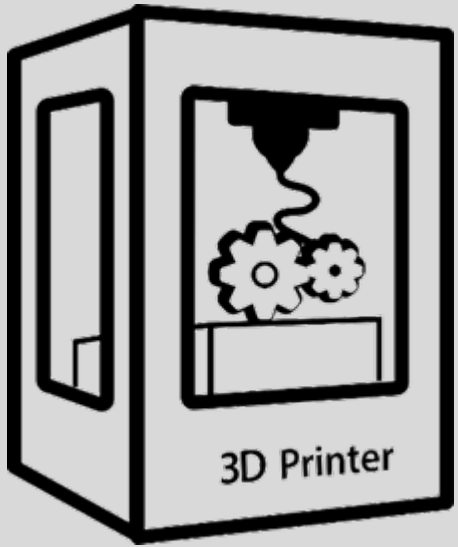
- What?
- Why?
- How?

Machine Learning Provides Scalability

Traditional Methods

- Good at specific tasks (airports)
- Requires detailed knowledge
- Continuous maintenance

Machine Learning

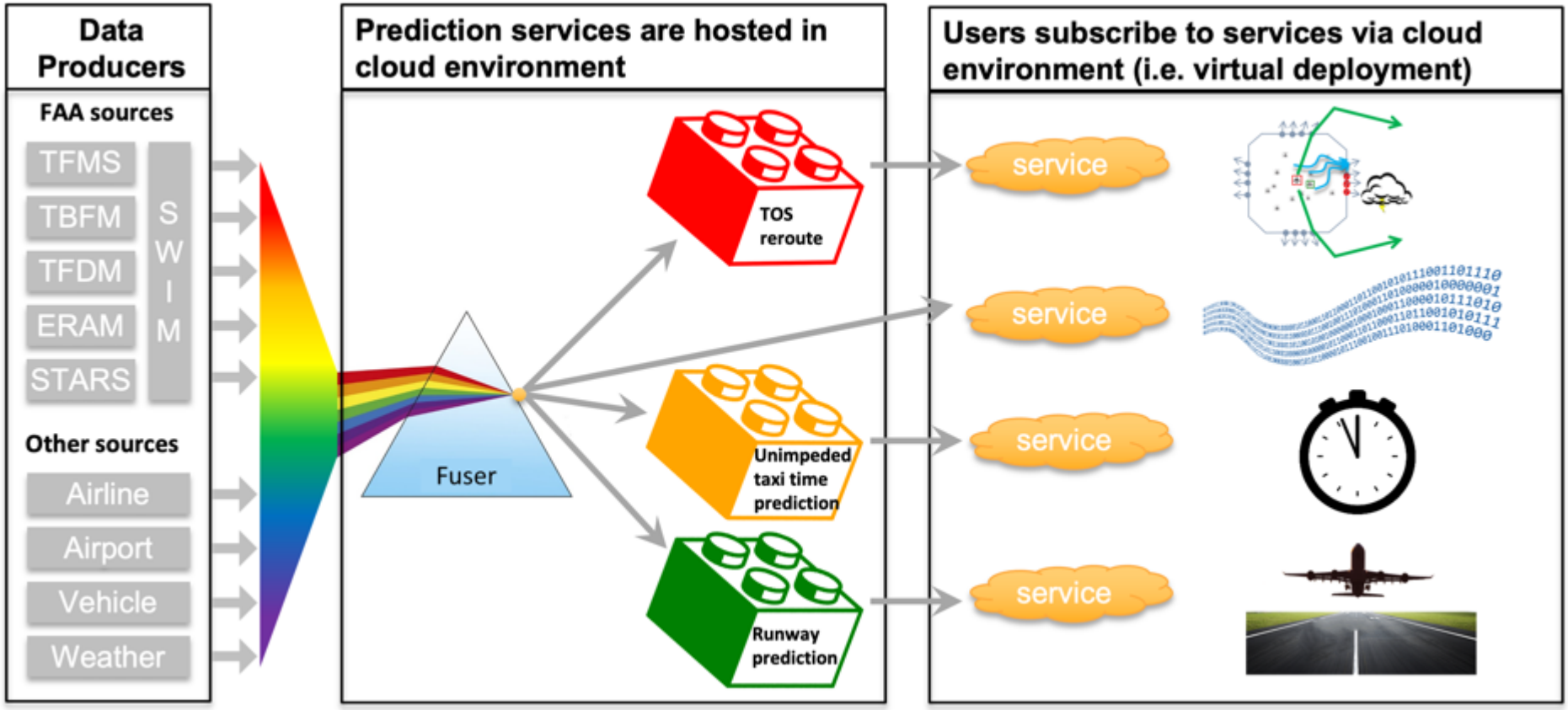


- Flexible to new tasks (airports)
- Learns detailed knowledge
- Semi-automated maintenance

ML Airport Surface Model Outline

- What?
- Why?
- How?

Real-time ML Services Powered by SWIM



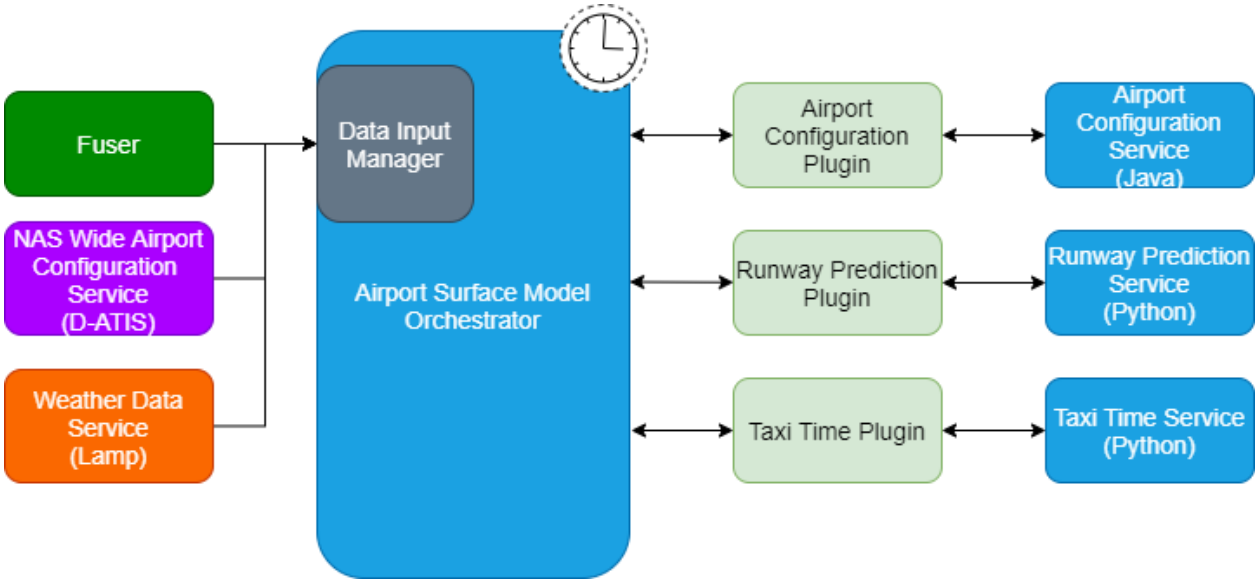
Fuser Enabling Services

- Fuser is enabling faster development of data driven services
- Providing data to leverage services in real time
- ATD-2 Fuser Data Warehouses used for model training

https://github.com/nasa/atd2-fuser

Airport Surface Model Orchestration

- Services run independently
- We are using a mix of Java and Python Services
- Airport Surface Model Orchestrator gathers inputs and controls the order of execution



NASA ATD2/DIP SWIFT Update - Agenda

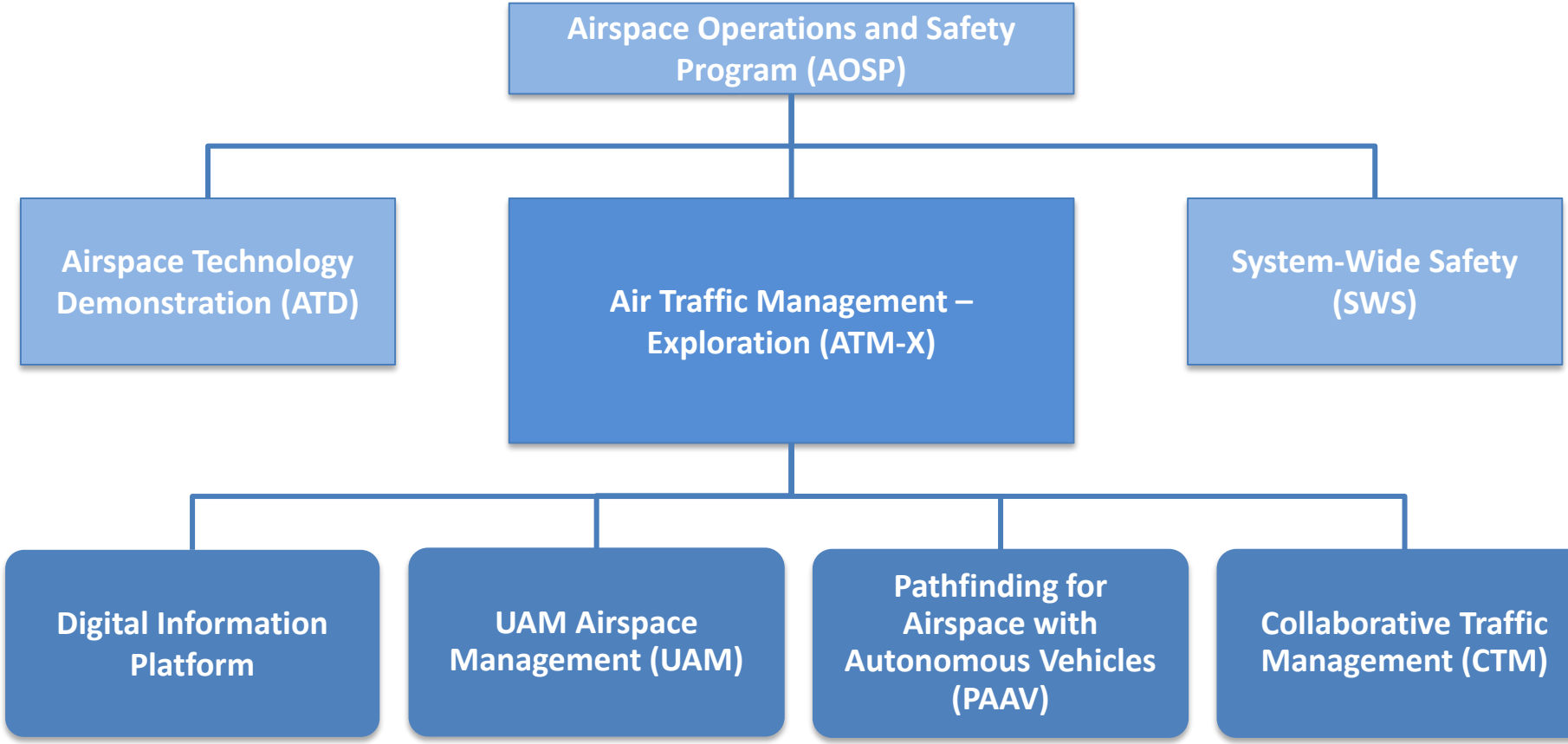
- Real-time machine learning based services – powered by SWIM
- Opportunity to engage in NASA's Digital Information Platform

Digital Information Platform

Jan 15, 2020

Mirna Johnson, DIP Sub-Project Manager
William N. Chan, ATM-X Project Manager

AOSP Project Organization



DIP Vision

Accelerate transformation of the NAS through the development of a **foundation** for advanced, **data-driven, digital services** from **traditional operations and new entrants** to promote **cohesive decision making**

Formulation Input

From Sep-Nov 2019, NASA collected substantial formulative input from airline operators, airport operators, NBAA, FAA and vendor groups.

- Establish an **environment to rapidly innovate** toward wholesale upgrades to NAS efficiency and safety
- Create an **architecture that allows high reuse of solutions** and serves as a building block for advanced capabilities
- Align NAS data assets to **leverage the explosion in data science technologies** to create an oasis of innovation (i.e. – create clean datasets for training)
- Change the solution evaluation paradigm from large-scale field-based testing requirements to **smaller footprint cloud-based demonstrations**
- Pave the way for a **commercialization methodology for digital services** to be more quickly obtained from the cloud via trusted sources
- Evolve the use of cloud-based computing within the aviation system while increasing the ability to **rapidly collaborate across aviation development teams**

High Interest Data Assets

Getting key data out of ATC's and Operators brain

Important information from ATC and Operators is emerging in digital form such as the System Wide Information Management (SWIM) system.

Additional effort is required to fully extract and utilize this information for greater benefit to the aviation community.

- Specific examples of high interest digital assets (from community interviews)
  - Provide a capability that integrates key flight information from multiple sources for an accurate and reliable nation-wide stream of data in the cloud
  - Create objective measures of data quality that are shared with the community
  - Reduce data access right limitations that prevent broader community innovation

Digital assets are the building blocks of future game changing services

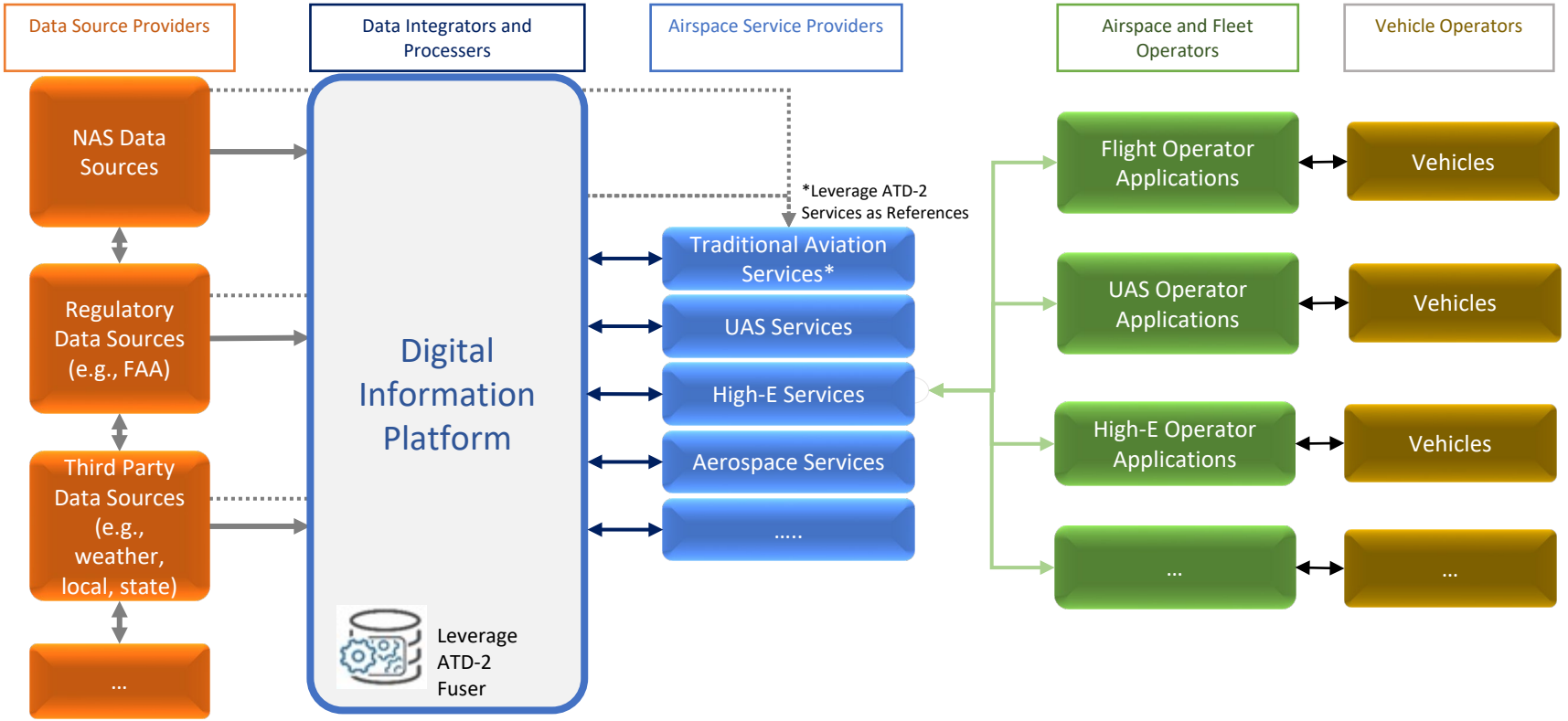
High Interest Services*

*listed services are subject to change based on stakeholder input

- From Sep-Nov 2019, identified highly reusable services that can be leveraged as building blocks for more advanced capabilities for both traditional and new entrants:
  - **Digitize the re-routing process (TOS)** to make better use of existing capacity
  - Provide a multi-system, multi-domain view of **impacts to their flights from gate-to-gate**
  - Create services **that promote system-wide safety (SWS)** related to new entrants
  - Provide services to help **reduce impact of space launch** (current day problem)
  - Create **disruption management services**. Faster recovery to nominal operations
  - NAS-wide **wind miles prediction** service
- Opportunities to apply Machine Learning and develop core data sets

Continue Partnership Input to prioritize services to enable for innovation

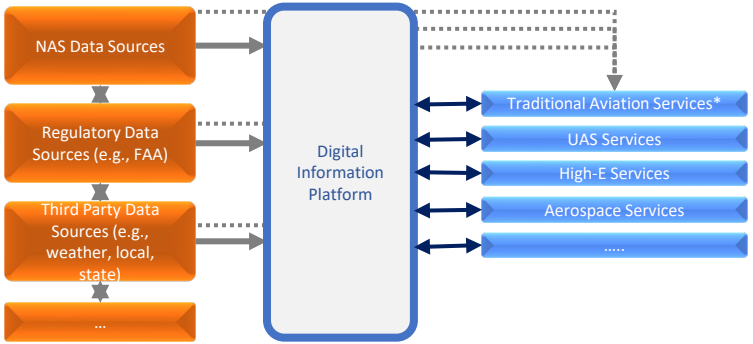
Notional Digital Information Platform



Common, simplified interface to integrated, processed information of high-interest

Benefits of Digital Information Platform

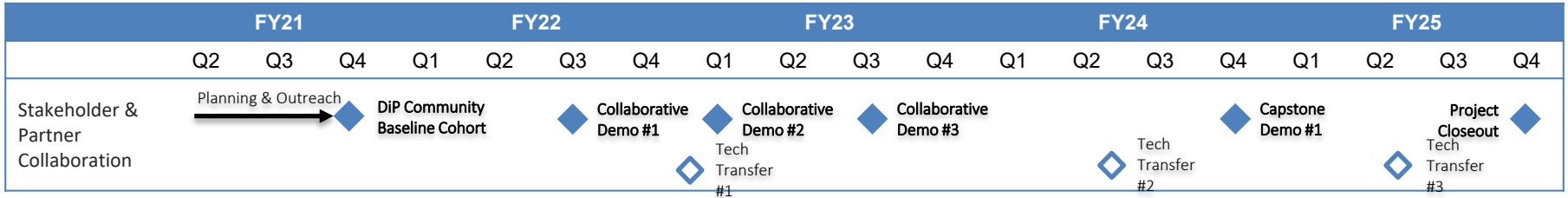
- Enable more and new types of operations by creating a scalable and resilient airspace system
  - Market place of digital services ecosystem open to all
- Increase the use of NAS Information powered by Advanced Technology
  - Integrated and fused data from FAA, airlines and other sources
  - Common, simplified API to access the fused information
- Improve Operational Flexibility with the development of user-informed Airspace Management Services
  - NAS-wide available services using high quality information from DIP
  - Establish new partnerships with solution providers with the goal of industry building the technologies
- Leverage Third Party Services and continue progress towards a service-oriented architecture



DIP Sub-Project Objectives

- **Stakeholder-Informed Platform:** Create a stakeholder informed requirements for a digital data platform to improve the deployment and access of services.
- **Validated Reference Implementation:** Develop a reference implementation of DIP to validate stakeholder-informed requirements
- **Data Needs for Services:** Evaluate a variety of services to identify data needs for the DIP architecture.
- **Demos with Partner Collaboration:** Coordinate demonstration with stakeholders of reference technologies, new service(s) and DIP framework
- **Recommend Processes:** Share best practices for sharing data and data handling among stakeholders in the DIP community

Collaborative Approach*



- Currently, DIP is under project planning, team formulation and initial concept development
- Minimal Viable Products - quicker turnaround, quicker feedback, increasing capability
- Stakeholder outreach to create a DIP community to participate in architecture feedback and standardized interface requirements between data sources, DIP, and services
- Partnerships to contribute and participate in multiple collaborative demonstrations to validate concept and mature requirements
- Next Steps: Community Input to reassess highly desired data assets and services

*schedule is subject to change

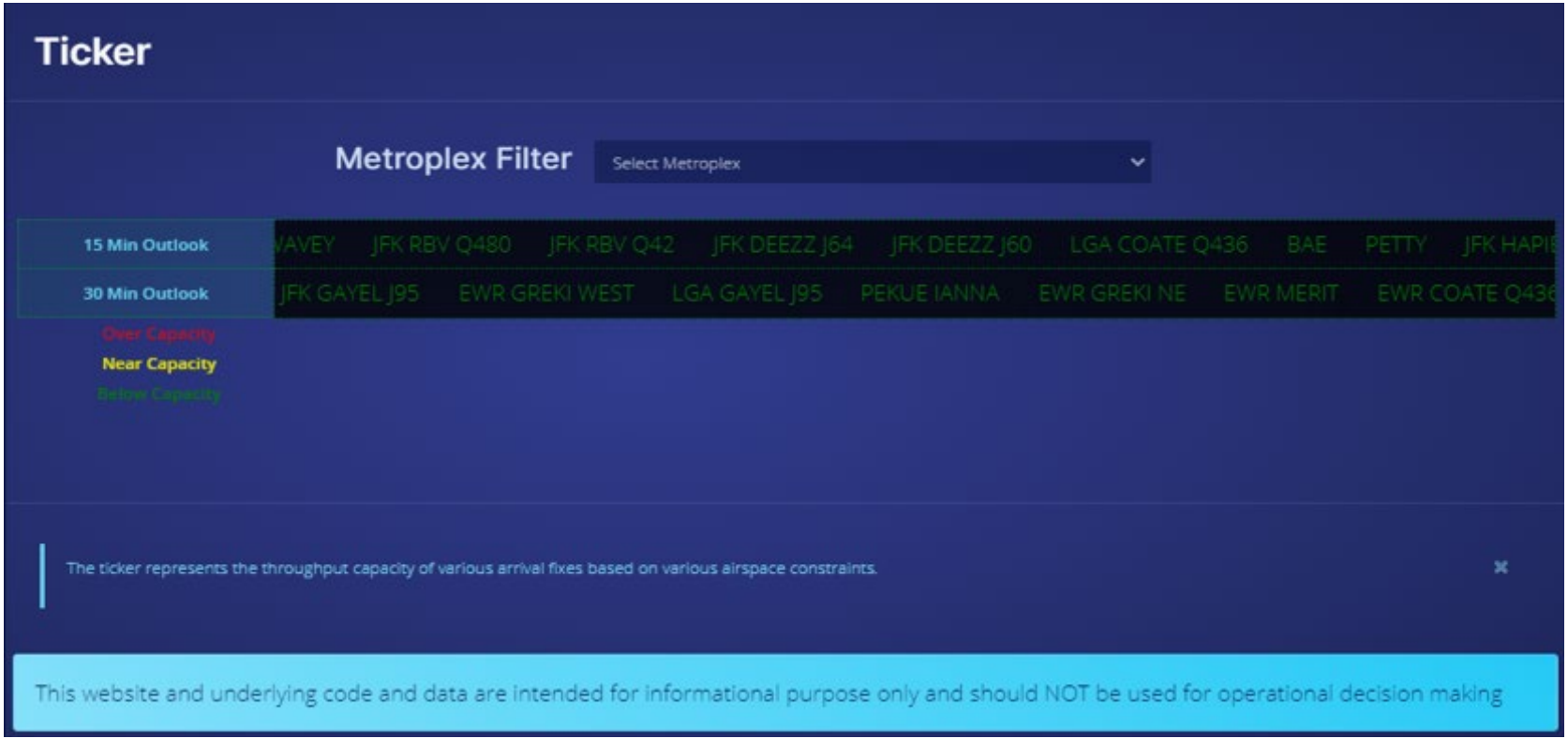
Seeking Information and Feedback

- Challenges and Pain Points:
  - Problems, challenges, benefits, priorities, scenarios, and use cases related to data feed usage, data availability and accuracy, types of services.
  - Identify things to consider when further defining the notional architecture (previous figure).
- Operational Concept:
  - Partner's operational view regarding the integration and use of DIP framework
  - If known, identify and define metrics that would be valuable to measure effectiveness and performance.
- Concept Adoption Feedback:
  - Information outlining opportunities and anticipated obstacles (business and technical) to adopting DIP, other considerations for investing and prioritizing DIP or related services
- Data and Services Needs:
  - Data sources that would be beneficial to fuse and mediate. Services that are of high priority that face data integration challenges and would be of high value to traditional and emerging fleet operators to build more advanced services.

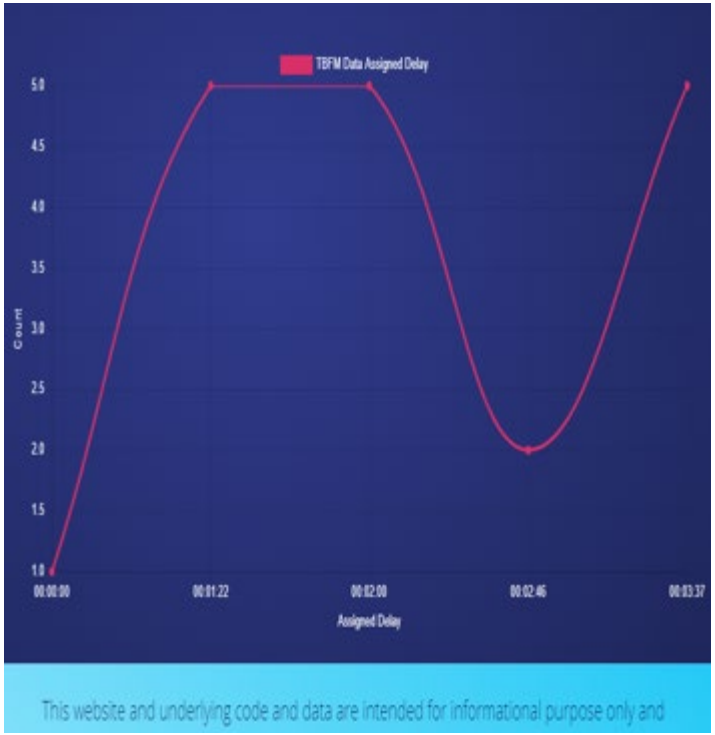
SWIFT Widgets

SWIFT 13 Update

Fix Availability Ticker



TBFM Assigned Delay – SPRINT 2 Visualization



Flight Restrictions

FLIGHT RESTRICTIONS

Display records per page

Search:

Airports	Element	Restriction	Start	Stop	Exclusions	Reporting	Providers	Type	Action	Remarks
ALL	WAVEY	15 MIT	07/2145	08/0000	ZDC LTFC	DCC	N60	DEP	EXTEND	
ALL	WAVEY	15 MIT	07/2145	08/0000	ZDC LTFC	DCC	ZNY	ENR	EXTEND	
ALL	WAVEY	15 MIT	07/2145	08/0000	NORMAL EXCLUSIONS	N90	JFK	DEP	EXTEND	
ALL	WHITE	5 MINT	07/2025	08/0000	NORMAL	N90	TEB, REQ	DEP	EXTEND	
ALL	WHITE	7 MINT	07/2025	08/0000	NORMAL	N90	EWR	DEP	EXTEND	
ALL	WHITE	5 MINT	07/2025	08/0000	NORMAL	N90	LGA	DEP	EXTEND	
ALL	WHITE	10 MIT	07/2025	08/0000	ZDC LTFC	ZNY	N90	ENR	EXTEND	WORK INTO IT PLEASE
ALL	J174	30 MIT	07/2030	08/0000	ZDC LTFC	DCC	ZBW	ENR	EXTEND	STRAT AOB FL350/ADA
ALL	NGATES	15 MIT	07/2200	08/0030		DCC	N90	DEP	INITIATE	

En Route Fix Load View

Final Announcements

#14 Virtual Workshop

- **Date**
  - **May 20th, 2021**
  - **12:30-4pm EST**
- **Location**
  - **Online Session**

SWIFT Site Information

SWIFT@faa.gov

- Any SWIFT-related questions
- Sign up for SWIFT mailing list

https://www.faa.gov/air_traffic/technology/swim/swift

- Register for future SWIFT meetings
- Stay up to date with SWIFT
- Past meeting slides

SWIFT Contact Information

SCAN ME

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- Communications, Information & Network Programs
- Email: Joshua.Gustin@faa.gov

Stefanie Calabrese, SWIFT Chair & FAA Lead

- Email: Stefanie.C.Calabrese@faa.gov
- Email: SWIFT@faa.gov

David Almeida, SWIFT Community Moderator

- Phone: (321) 735-2774
- Email: David.Almeida@LSTechLLC.com

Back Up

Acronyms

Abbreviations

- TBFM- Time Based Flow Management
- CTM- Coordination Time
- ETD-Estimated Time of Departure
- ETA-Estimated Time of Arrival
- STA- Scheduled Time of Arrival
- STD/SDT- Scheduled Time of Departure
- EDCT/ETM- Estimated Departure Clearance Time
- ADT/ATD- Actual Time of Departure
- ART- Aircraft Ready Time
- Ptime- Proposed Departure Time
- TTF- Time to Fly
- MIS- Metering Information Service
- JMSDD- Java Messaging Service Description Document
- IDAC- Integrated Departure and Arrival Capability
- TGUI- Timeline Graphical User Interface
- ACM- Adjacent Center Metering
- T2T- TBFM to TBFM Communcation
- TFDM- Terminal Flight Data Management
- MRE- Meter Reference Element
- MFX- Meter Fix
- THD- Threshold
- XMP- Extended Meter Point
- OA- Outer Arc
- CSP- Constraint Satisfaction Point

Talking points for problem statement

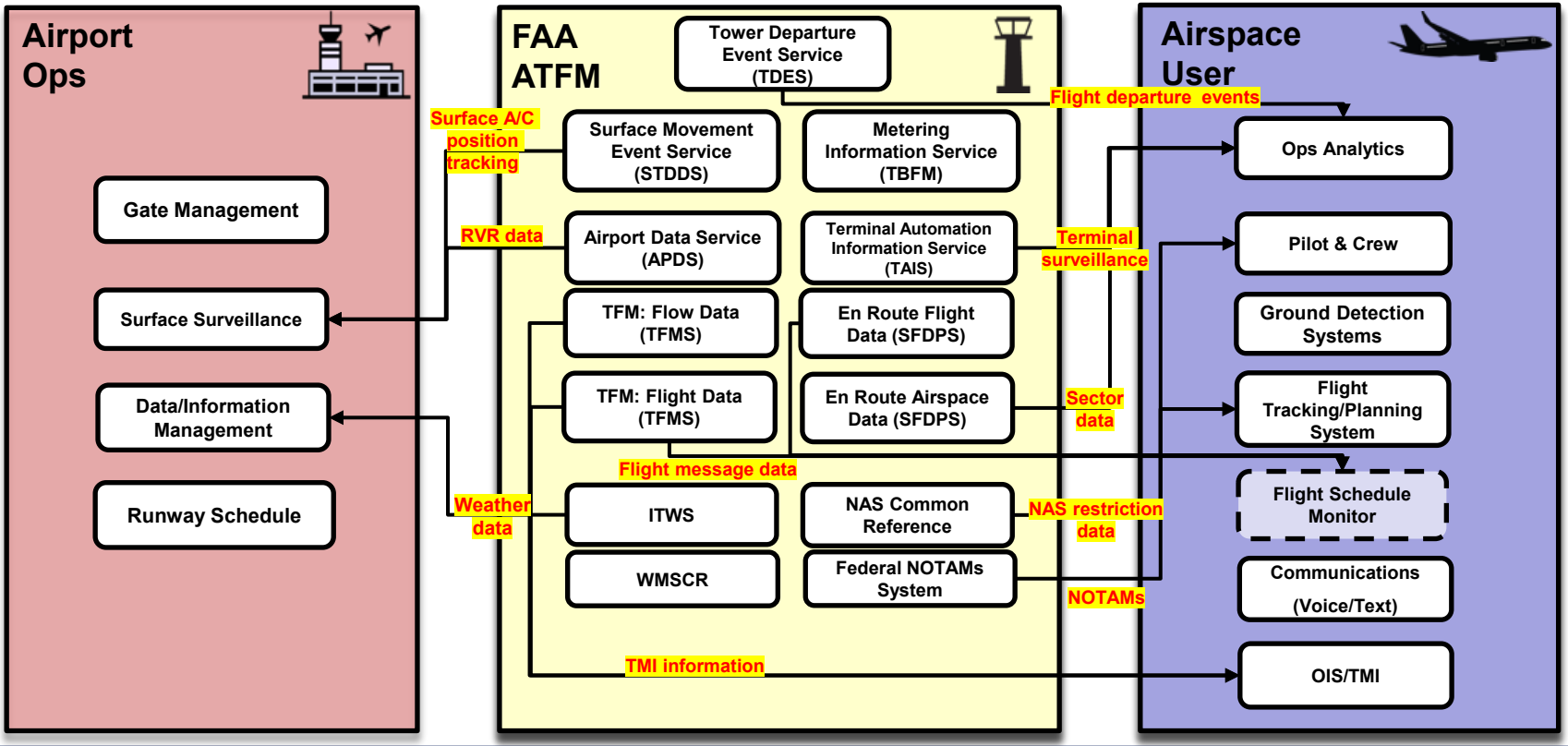
- **Stakeholders Priorities**
  - Understand responsibilities for all stakeholders during event
  - Communicate priorities and interests of stakeholders
  - Establish/Enable TMI operations that may support user exemptions

- **Current Work-Arounds for Tactical Coordination**
  - Optimize coordination between FAA and airspace user
  - Improve airspace user look-ahead time into NAS constraints
  - Understand impacts of adjusting Ops during airport runway change

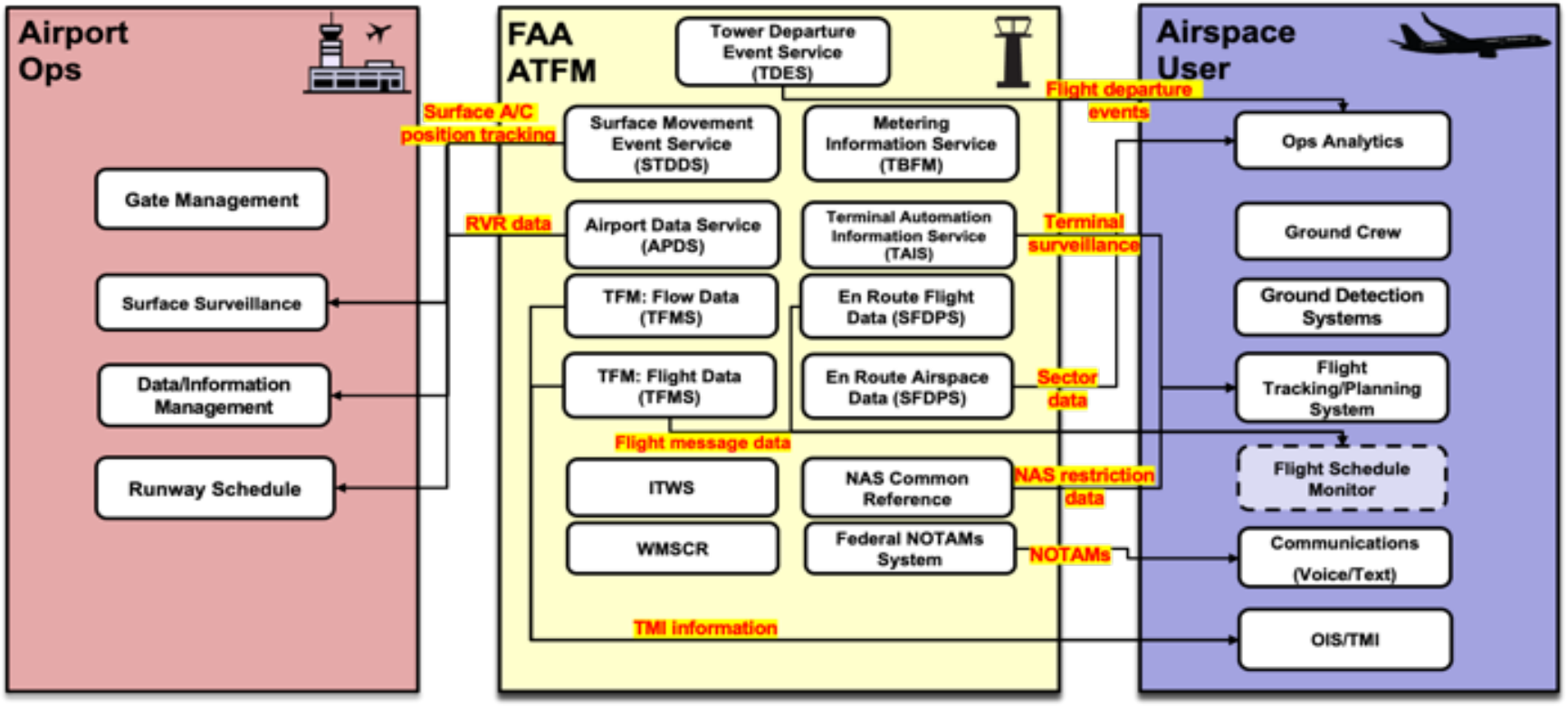
Operational Impacts

- **Visibility into TMI triggers and resulting delay effects**
  - Cascading effects from unpredictable delay (e.g., customer service, crew scheduling, aircraft swaps, gate changes)
- **Inability to fuse/correlate TMI restrictions to impacted flight plan filings, active trajectories**
  - Missing accuracy on impacted flights which would better inform tactical decision-making for work-arounds. Missing some airline performance metrics, customer satisfaction rating and block time variance reductions.
- **Missing earlier aircraft deviation detection on departure routes as well as surface traffic management opportunities**
  - Improved TRACON/Tower/AOC clearance coordination and workload management to reduce gate returns, gate utilization, extended taxi and cancellations caused by crew timeouts.
  - Visibility into route closure and recovery time to reduce vulnerability to SWAP
  - Route availability situational awareness for better reroute planning and fuel savings. Improve safety through better workload management and reducing error probability.
- **Inability to measure key drivers for reroutes to better inform FAA-airline CDM such as:**
  - Assess center boundary route efficiency
  - Reduce overly- or under- prescriptive TMI implementation
- **Lacking some ability to store and leverage data for post Ops analysis to assess accuracy of delay estimates and recovery times such as:**
  - Reference playbooks utilizing real historical data on route diversions to plan and update accordingly

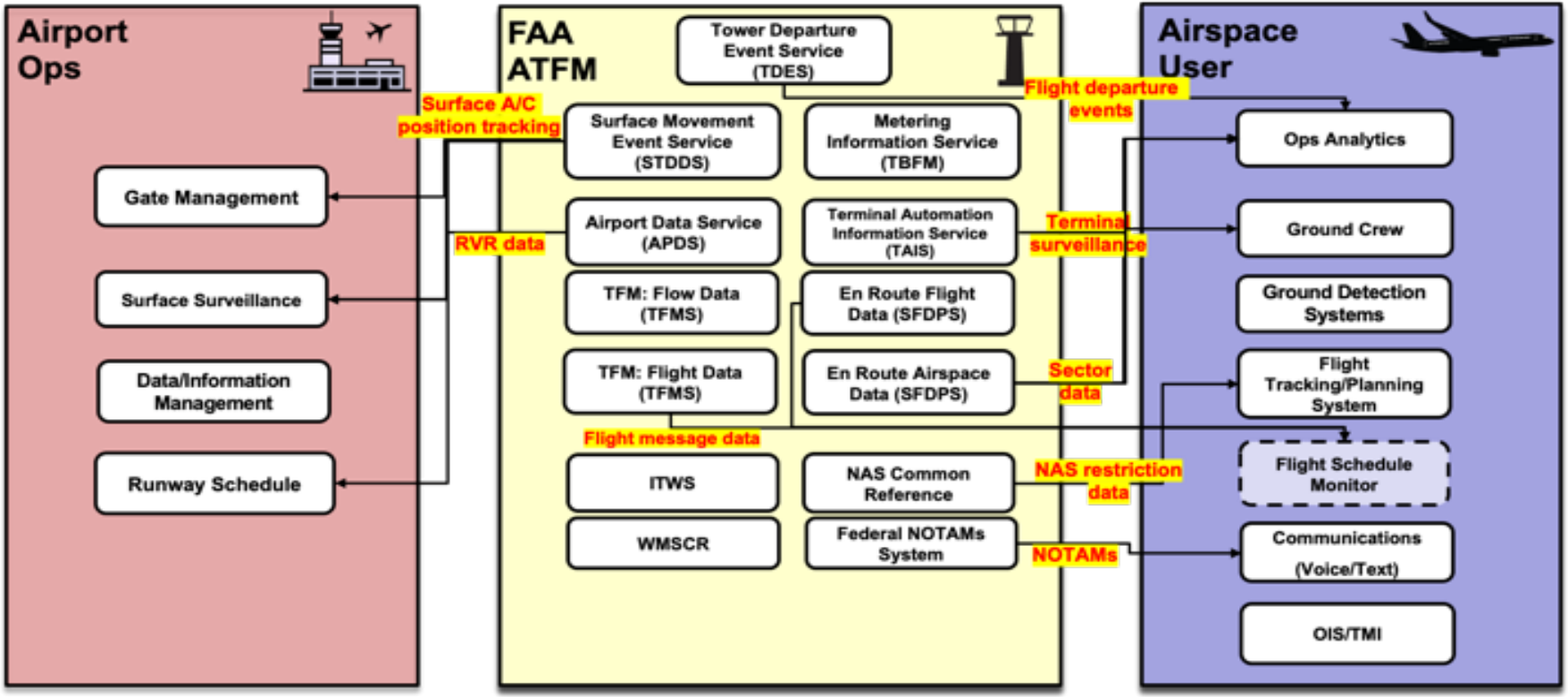
Vignette #1: Information Systems View



Vignette #2: Information Systems View



Vignette #3: Information Systems View

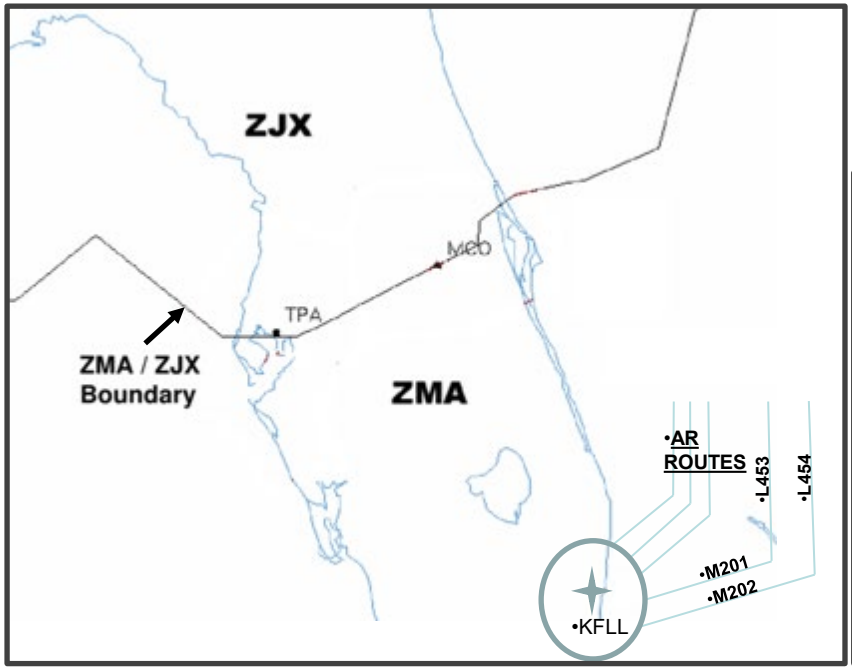


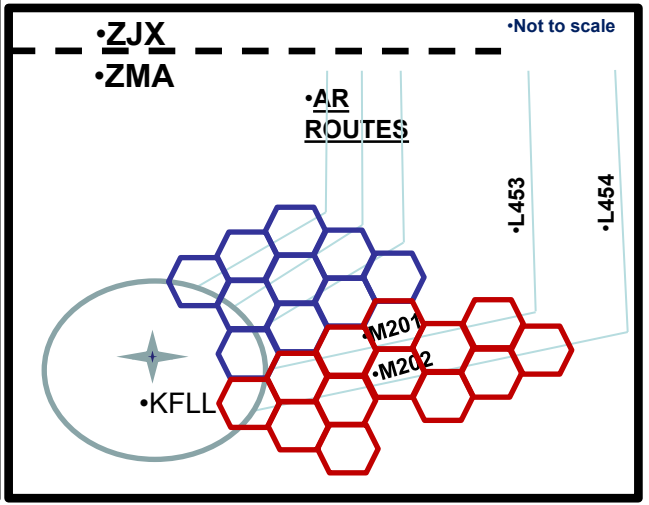
Case Study Objectives

Solicit industry feedback…

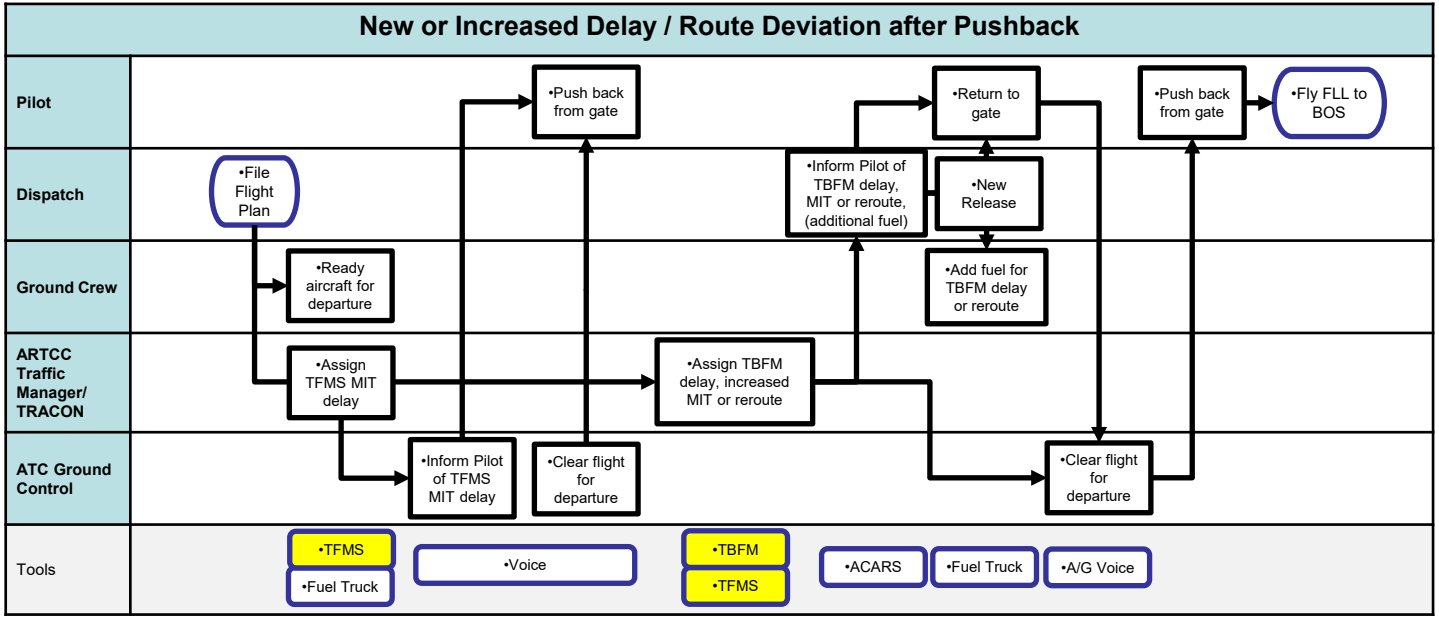
- Is there interest in this problem?
- Is there interest in the data driving this?
- How should we demo this problem space?
- Deep-dive in Ops Issues Focus Group
  - Investigation timeframe (~ 6-month effort)
  - Industry/Community resources
  - Industry information availability and sharing

KFLL Atlantic Routes and Airways





As-Is Operational Business Process



What has been your experience with work-arounds for route deviation?