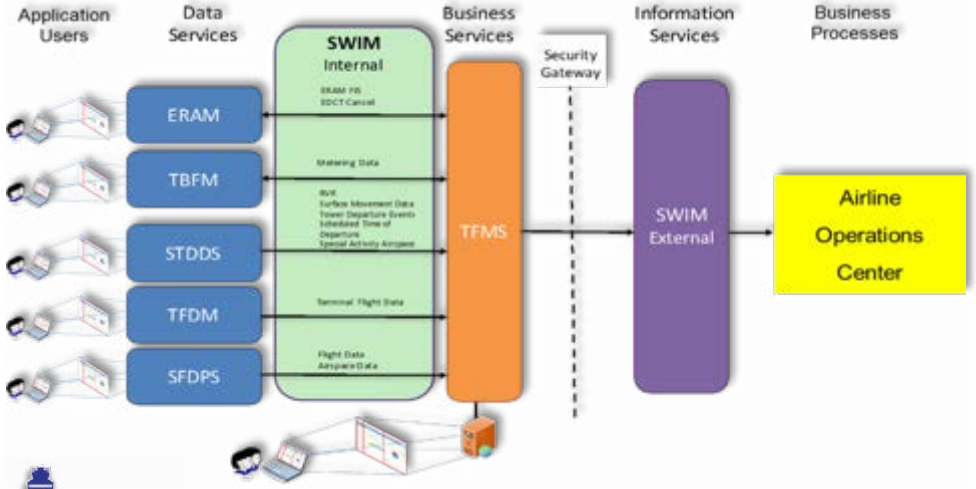
SWIFT: SWIM Industry-FAA Team

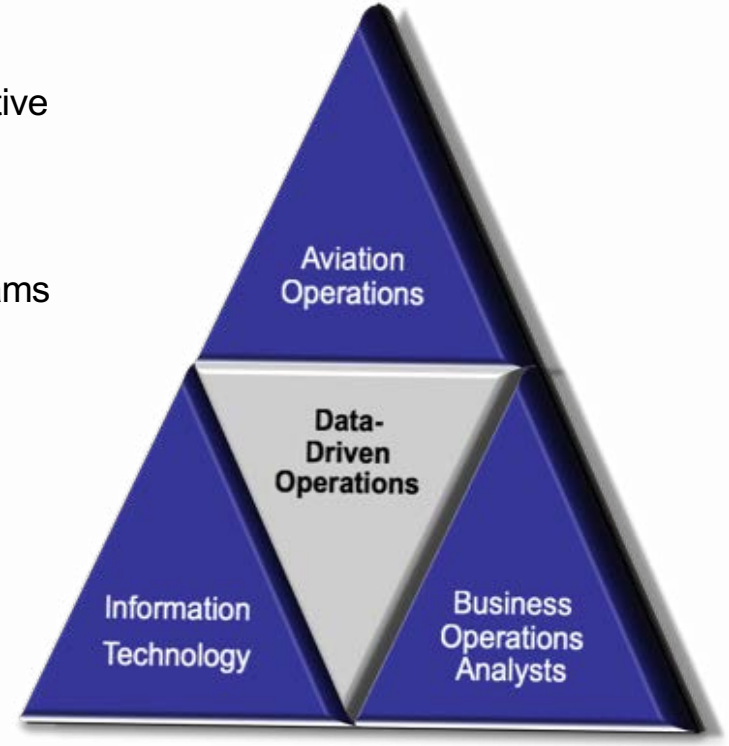
SWIFT #17 Collaboration Workshop

Date: 03/03/22

SWIFT: 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





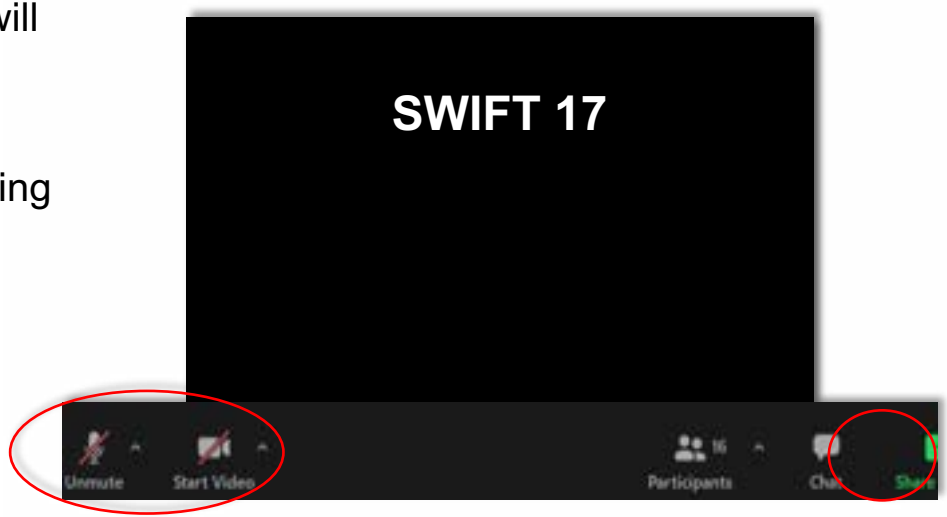
FAA Collaborative Workshop #17

- **Welcome and Introductions**
  - Introductions: David Almeida (LS Technologies)
  - Mark DeNicuolo, Vice President Program Management Office (FAA)
  - Rebecca Guy, Deputy Vice President Program Management Office (FAA)
- **Special Topics: The Information-centric National Airspace System (NAS)** – Steve Bradford & Diana Liang (FAA)
  - Impacts to 4-Dimensional Trajectories (4-DT) & Trajectory-Based Operations (TBO)
  - Information to the EFB: The Connected Aircraft
- **NAS Programs: Extensible Traffic Management (UTM, UAM & ETM)** – Biruk Abraham (FAA)
- **Western Regional Partnership (WRP): Airspace resiliency for DoD, UAS integration & policy**
  - Rob Lowe (FAA) SW Regional Administrator, Lorne Cass (Aero NowGen Solutions) & Amy Duffy (WRP)
  - Senior policy setting collaboration of Federal, State & Tribal leadership, WRP subcommittee on Military Readiness, Homeland Security, Disaster Preparedness & Aviation serves as a forum for aviation users to share information.
- **NAS Programs: Commercial Space & Space Data Integrator** – Crystal Toney & Duane Freer (FAA)
- **SWIFT Focus Group Updates** – Ray Mitchell & Xavier Pratt (LS Technologies)
  - NASA's Digital Information Platform (DIP) – Mirna Johnson & Jeremy Coupe (NASA)
  - Widget Case Study: Fix Conformance Analysis Use Case using SWIM Data – Greg Feldman, Tim Myers, & John Fergus (Cavan)
- **SWIFT Topics:**
  - Information Services Roadmap: Applying the Roadmap – Xavier Pratt (LS Technologies)
  - SWIFT Portal – Mark Parra & Lucas Curns (Noblis)

“Airwave Procedures”

- Please note during the session all attendees will have full control… “Hot Mics” and cameras.
- Please be mindful and mute when not interacting during the presentation.

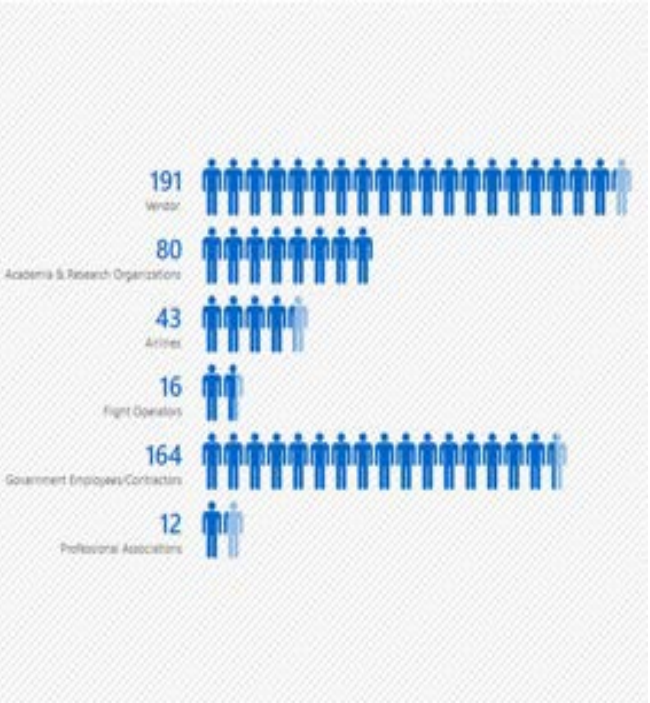
Zoom Controls: Mic and Camera identified via red circles



- The “Chat & Raise Hand ” features 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 found under reactions.

Who is in the “ZOOM Room” at SWIFT #17?

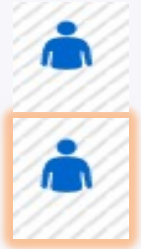
Attendee Organizations



Attended a SWIFT Meeting Before?

I’m a Veteran: 322

No, I’m New: 80



402 attendees

SWIFT Stakeholders

What is Coming Next?

Presented by: Steve Bradford

Presented on: March 3, 2022

The Future of The NAS
Operationalizing NextGen and The Path to Info-Centric NAS

- **Operationalizing NextGen**
  - ✓ NextGen Foundational Infrastructure is in place to support the path to Trajectory Based Operations the ability to manage aircraft based on time and future location
  - ✓ Moving from NextGen as *the future* to NextGen as the new *status quo*

- **Path to Info-Centric NAS (Advancing the NAS beyond NextGen)**
  - ✓ Will build on the NextGen foundational infrastructure
  - ✓ Will leverage NextGen and industry investments to provide additional capabilities to users beyond the Core-30
  - ✓ Will address the key drivers of change in a manner that respects our principles of aviation while taking advantage of opportunities brought on by innovation and societal change.
  - ✓ Will provide in-time safety analytics across all operations means safer skies for everyone
  - ✓ Users will be more connected and information readily available to support decision making.
    - Information will be made available based on each participant's needs and access level

What We Promised

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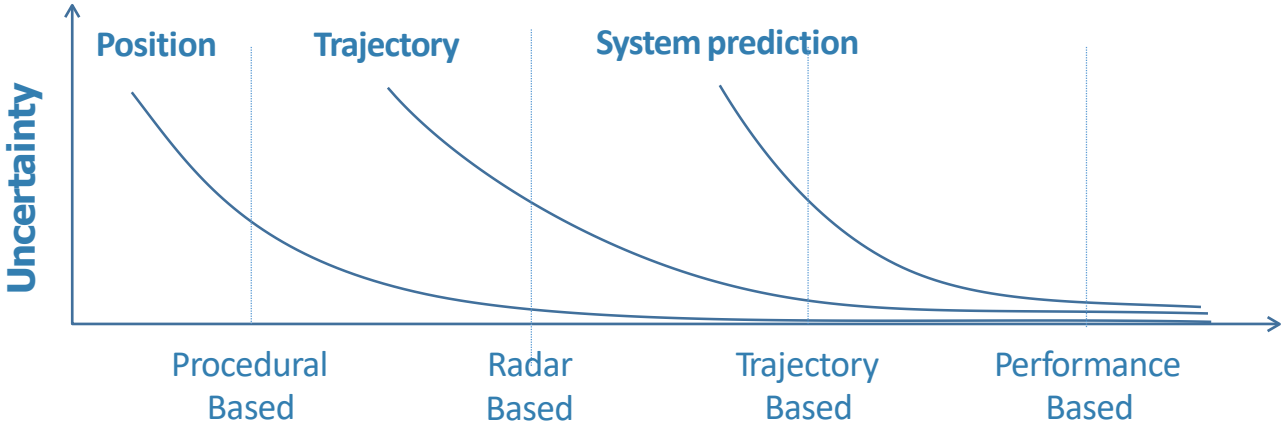
Moving Towards Performance-Based (NAS 4.0)



NextGEN

Charting Aviation's Future: Operations in an Info-Centric NAS

Video

Diverse Collaborative Traffic Management Services

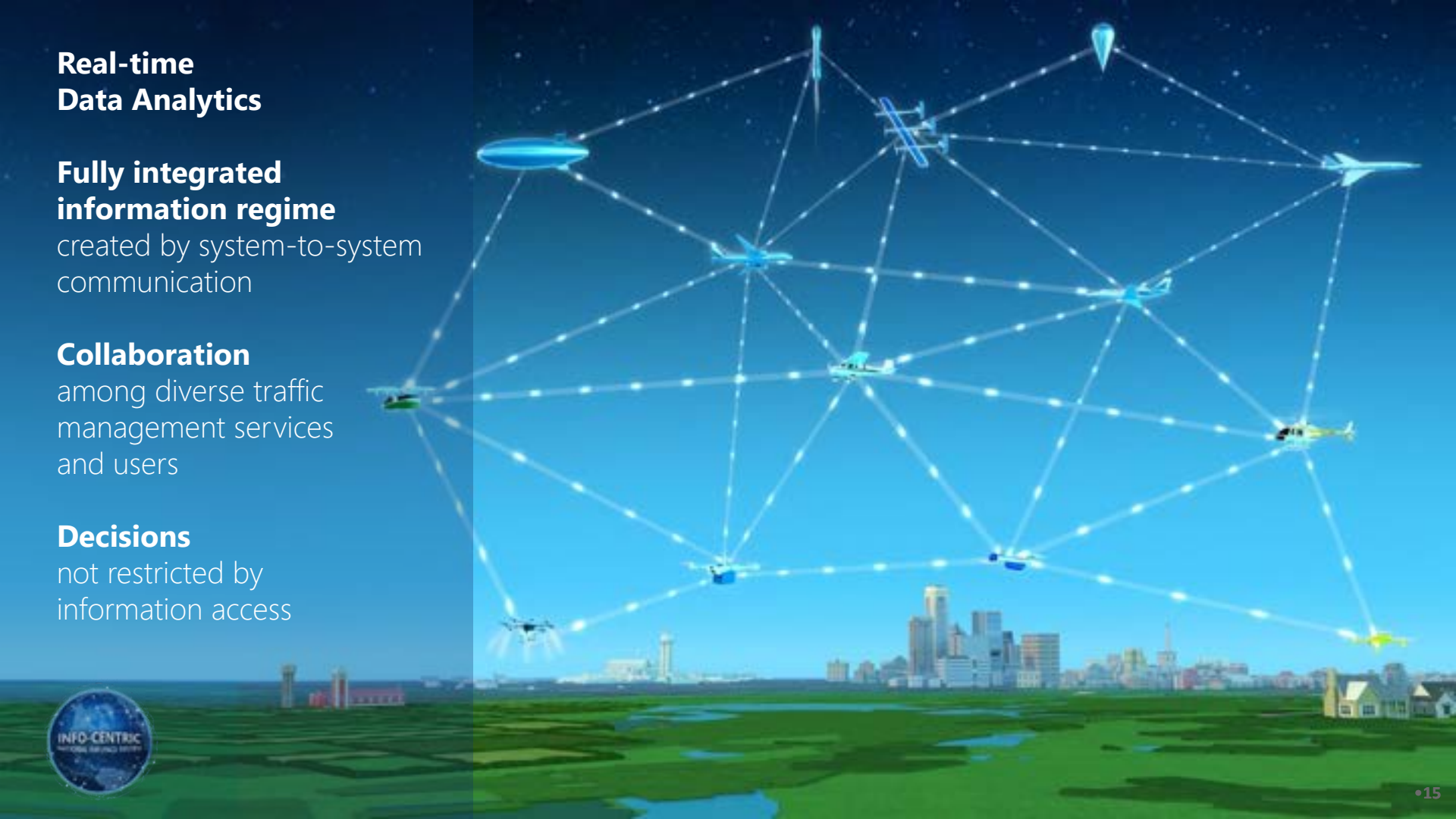

Transit to Space
Higher Airspace Service
Air Traffic Separation Services
Urban Air Traffic Services
Unmanned Traffic Services
INFO-CENTRIC

Real-time
Data Analytics

Fully integrated information regime
created by system-to-system communication

Collaboration
among diverse traffic management services and users

Decisions
not restricted by information access

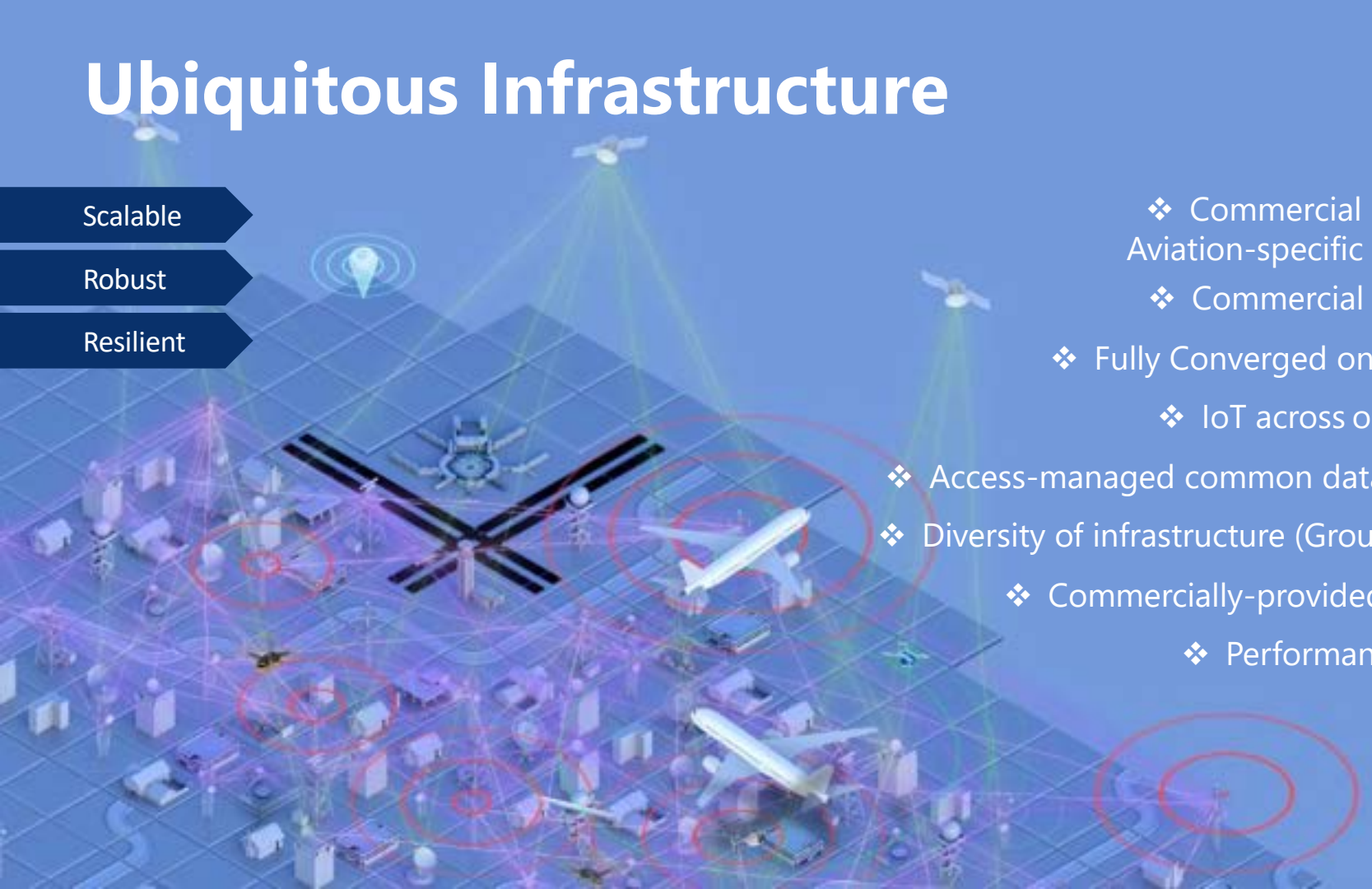


Evolving Infrastructure

- Shared Infrastructure
- Adaptive software
- Edge Computing
- Scalable

Ubiquitous Infrastructure

- Scalable
- Robust
- Resilient



- Commercial providers
  Aviation-specific spectrum
- Commercial spectrum
- Fully Converged on IP w/ IPS
- IoT across operations
- Access-managed common data services
- Diversity of infrastructure (Ground & Air)
- Commercially-provided services
- Performance-based

In-Time Safety Risk Management


The Future
of the
NAS Starts Here
INFO-CENTRIC

Thank You!

Connected Aircraft and Electronic Flight Bag

Presented by: Diana Liang

Presented on: March 3, 2022

Background

- An **ICAO global concept** describes the ability for aircraft and ground to exchange information for use in non-safety critical and safety critical applications

- **Performance-Based construct** to enable data exchanges between stakeholders to support future operations such as TBO

- **Leverages population of equipped aircraft** with additional automation (i.e., EFB) and communication links available to enhance collaboration with flight deck

Evolution of Commercial Telecom Infrastructure

Commercial providers

Aviation-specific spectrum

Commercial spectrum

Diversity of infrastructure (Ground & Air)

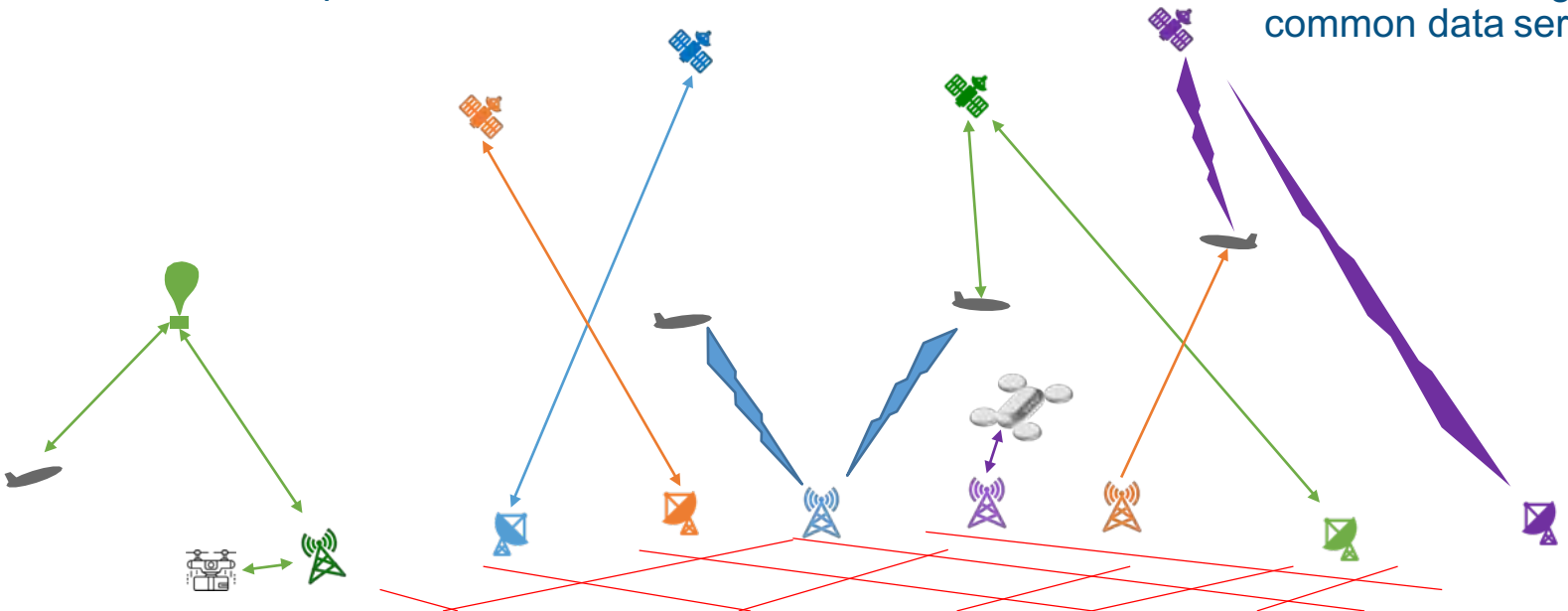
Commercially-provided services

Performance-based

Fully Converged on IP w/ IPS

IoT across operations

Access-managed common data services



Scalable

Robust

Resilient

MITRE Projection of EFB with Two Way Connectivity to Avionics

Note: There is some current equipage for EFB with two-way connectivity to Avionics

4DT Live Flight Demonstration

- The FAA partnered with key industry participants to conduct two live flights in the NAS that used data communication for controller-pilot negotiations and sharing aircraft intent information.

- The project leveraged a connected aircraft with an Internet Protocol (IP) data link that enabled Air-to-Ground (A/G) SWIM and IP-based Clearance connectivity as the aircraft traversed the NAS.

Project Overview – Envisioned Environment

Envisioned Environment

4D Trajectory

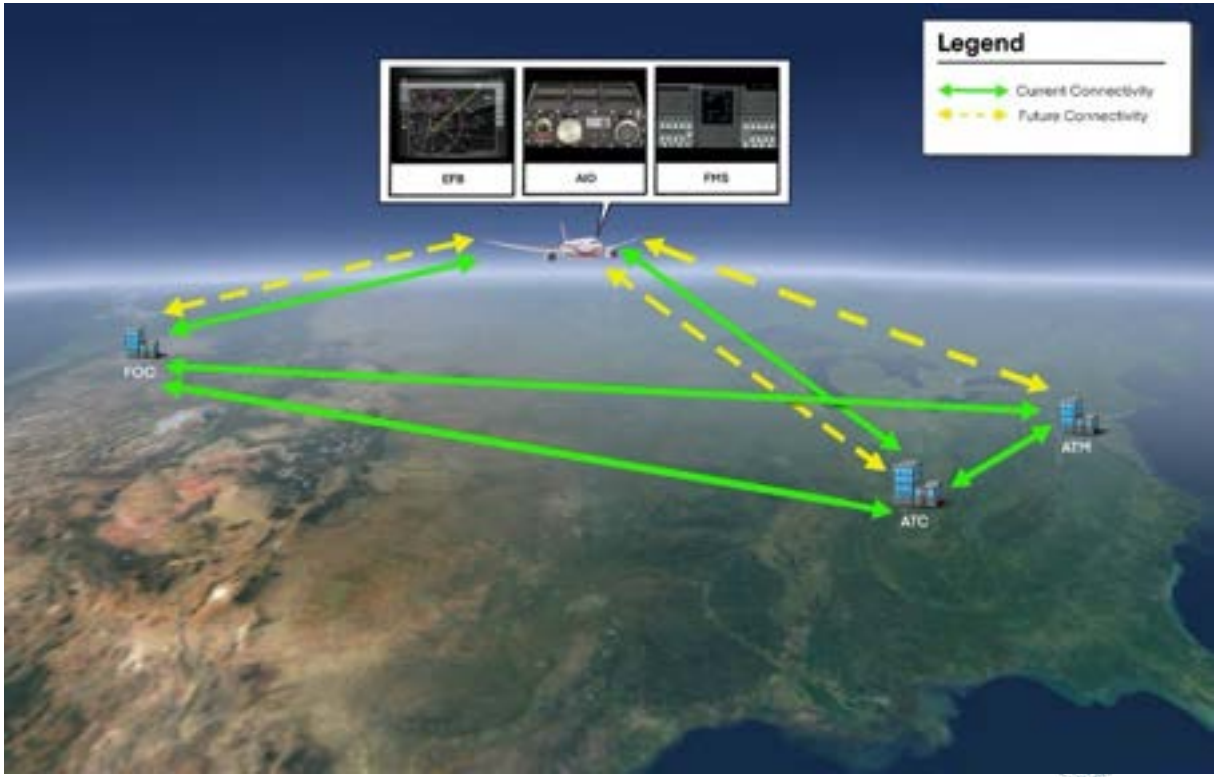
- Latitude, Longitude, Altitude & Time
- Negotiations based on more information
- Clearances

Connectivity

- Air-to-Ground Connectivity via IP Data Link
- DataComm (CPDLC)
- Voice Communication
- G / G SWIM

Automation

- Flight Plan Filing
- Automated Negotiations
- EFB for trajectory negotiation and clearance



Project Overview – Demo Environment

Demo Environment

4D Trajectory

- Latitude, Longitude, Altitude & Time
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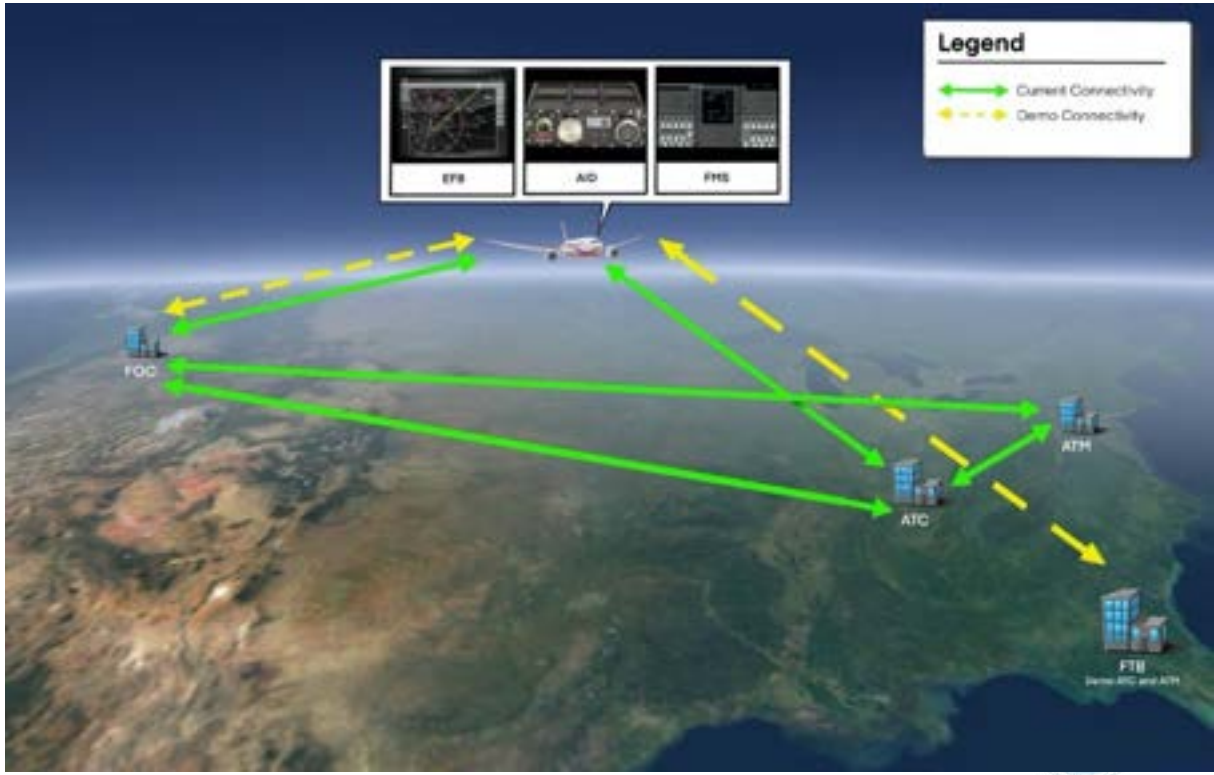


World ATM Congress 2021 Recognition

The Innovation Award recognizes new ideas, technologies, and concepts that challenge current ATM norms with the potential to significantly advance performance, operations, or capabilities.

This year's winner is the Four-Dimensional Trajectories (4DT) Live Flight Demonstration (LFD) Team, a collaboration between FAA, Boeing, Embry-Riddle Aeronautical University (ERAU), three airlines, and several other partners. The project was a sixteen-month cost-shared partnership that leveraged FAA NextGen investments in SWIM, data communications, PBN, FF-ICE, etc., and included novel live flights using 4DT-based operations.

Thank You!

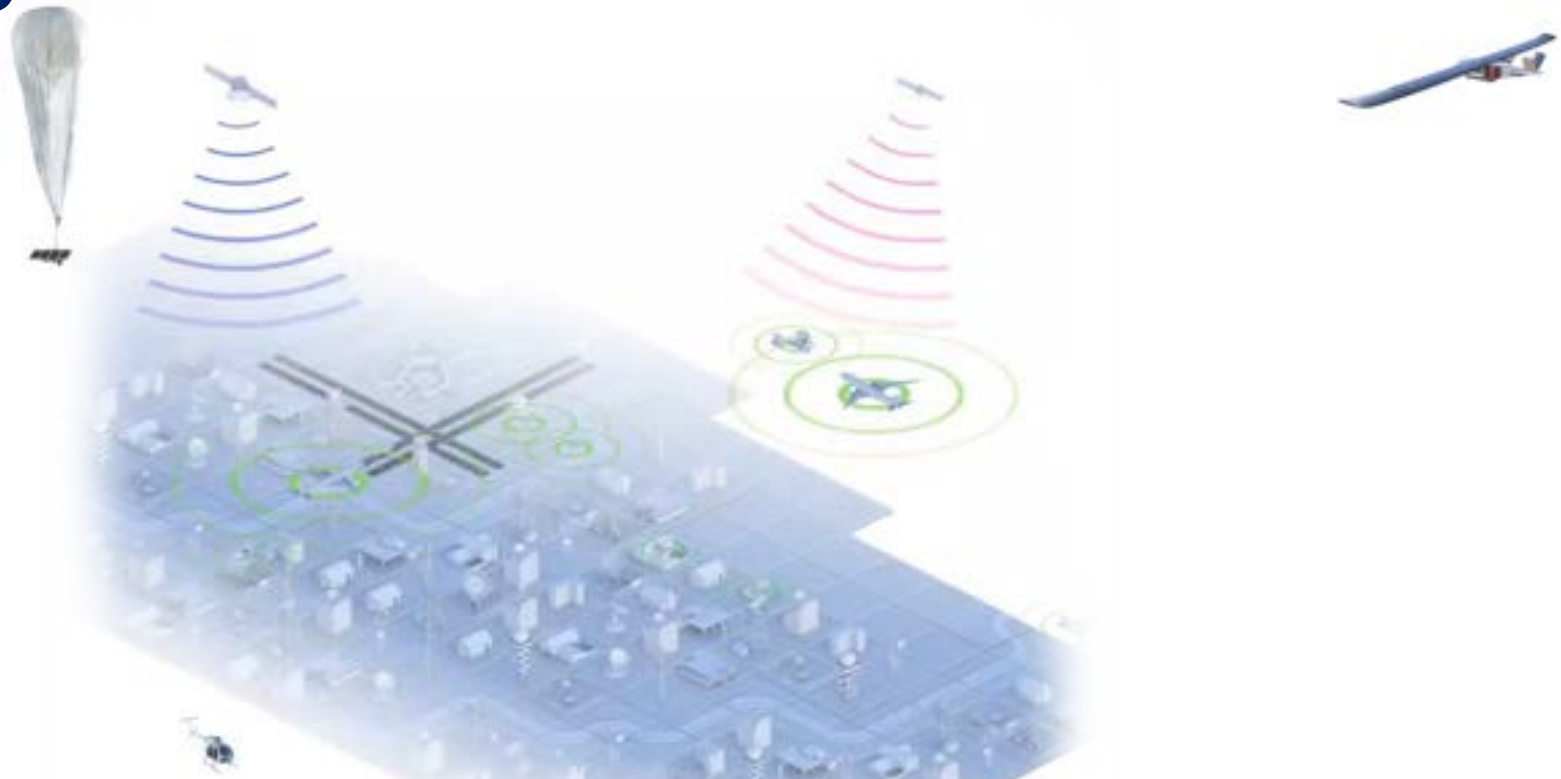
The Future of the NAS Starts Here

Extensible Traffic Management

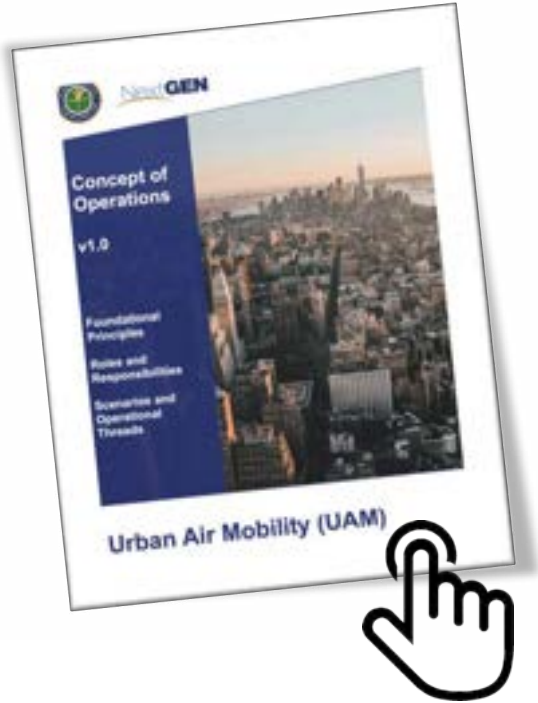
Presented by: Biruk Abraham

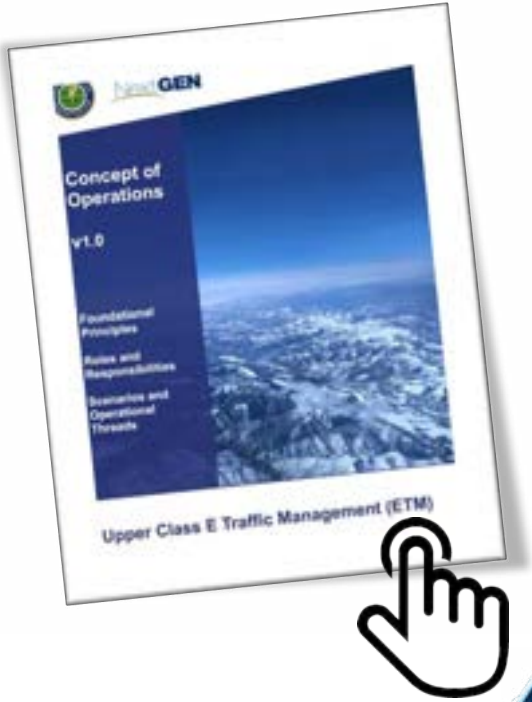
Presented on: March 3, 2022

Background



Concepts of Operations






Extensible Traffic Management
Upper Class E Traffic Management
FL600
FL180
Urban Air Mobility
400 FT AGL
UAS Traffic Management

Extensible Traffic Management (xTM)

- Traffic management approaches, operations, and/or associated services that address the operation of select new entrants within airspace that is flexibly allocated
- Based on cooperative operating practices (COPs) among operators rather than Air Traffic Services (ATS)
- Includes UAS Traffic Management (UTM), Urban Air Mobility (UAM), and Upper-Class E Traffic Management (ETM)

Common Principles and Assumptions

Operator Responsibilities

- Coordination, execution, and management of their operations
- Compliance with a set of stakeholder-developed Cooperative Operating Practices (COPs)
- Use airspace as efficiently as practical and do not knowingly impede other operators' use of airspace
- Share intent information with other relevant stakeholders as required
- Comply with applicable performance and regulatory requirements for the airspace within which they are operating
- Maintain conformance to the intent communicated to other stakeholders
- Share contingency information with other potentially impacted operators, supporting entities, and ATC (as needed) in a timely manner to support planning of safe, conflict-free operational responses

Common Principles and Assumptions (cont'd)

Regulator Responsibilities

- Maintain regulatory authority over airspace and operations
- Provide guidelines and approves or acknowledges COPs in accordance with agency statutory responsibilities for equity, safety, and security
- Qualify third-party suppliers of services that are used by xTM operators to meet applicable regulatory requirements
- Establish performance requirements framework for airspace where cooperative operations occur
- Approve operator-defined performance requirements
- Issue operational approvals to the operator that confirm the operator meets the standardized level of performance in a given airspace

Common Principles and Assumptions (cont'd)

Airspace organization.

- The FAA designates airspace where cooperative operations can occur *
- Structure may be utilized for coordination between operators and is informed by the use and needs of the operator community
- Structure of cooperative operations designated airspace informed by the use and needs of the operator community
- Cooperative operations designated airspace may cross or span airspace classes, air traffic facilities, and Flight Information Regions (FIRs) as approved
- Performance requirements for cooperative operations designated airspace may vary over time

***This Designation Does Not Make The Airspace Exclusive Use For Cooperative Operations**

Common Principles and Assumptions (cont'd)

Fully integrated information environment

- xTM operations are conducted in a highly automated, information-centric environment
- Operators are expected to be continuously connected to this information environment to facilitate timely information transfer among stakeholders
- Qualified third-party service suppliers may support operators in meeting part of their regulatory requirements
- Information shared using common standards and messaging protocols to ensure interoperability
- Information management consistent with established performance and security requirements as appropriate
- Stakeholders have on-demand access to information sufficient to support their roles and responsibilities (e.g., operators, ATC)
- ATC has the capability to issue advisories and constraints as the need arises

Common Principles and Assumptions (cont'd)

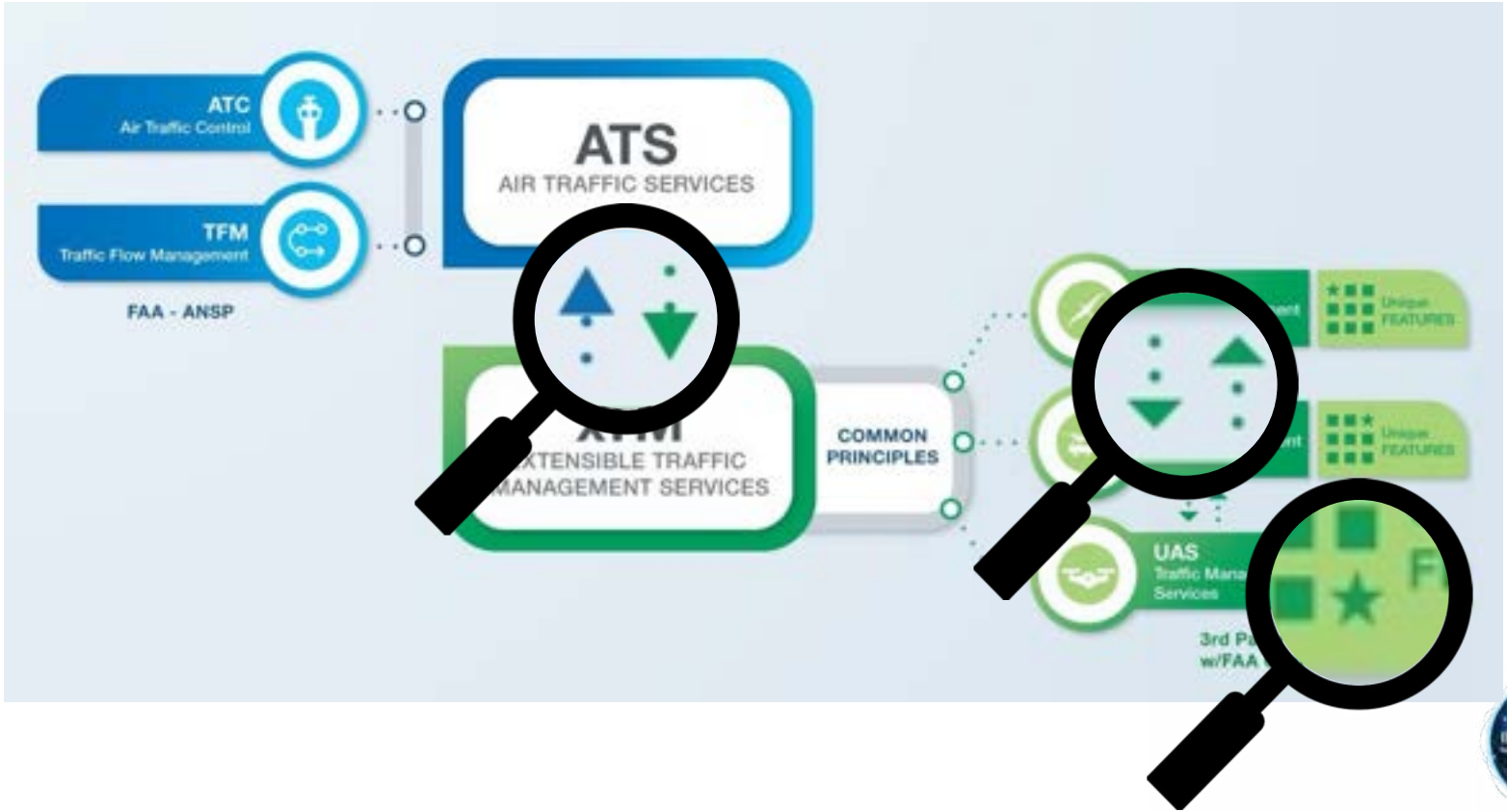
Scalability

- flexible and scalable xTM environment to support the types of operations envisioned and their anticipated growth
- FAA may intervene to address demand and capacity issues when COPs are not supporting the requirements for equity of airspace access and use

Unique Features

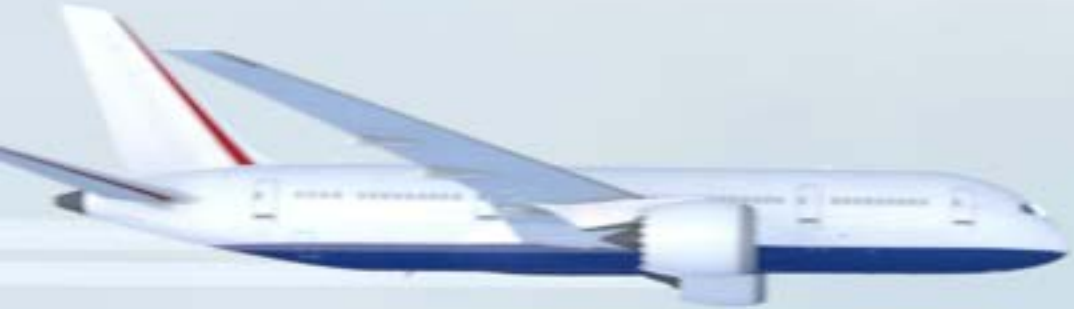
- Autonomy level
- Aircraft equipage
- Aircraft performance
- Operational profiles
- Etc…

xTM Work Areas



Next Steps

- Continue collaboration with Industry and other stakeholders to mature individual and collective xTM concepts
- Develop an integrated xTM strategy
- Continue to test and advance technologies and standards
- Support development of tailored flight rules
- Continue incremental implementation of applicable FAA capabilities



Thank You!

Western Regional Partnership

Resiliency of Airspace

Presented to: SWIFT #17

By:
Rob Lowe, Regional Administrator, FAA Southwest Region

Lorne Cass, Member of the FAA Advanced Aviation Advisory Committee (AAAC)

Amy Duffy, Western Regional Partnership (WRP) Coordinator

Date: March 3, 2022

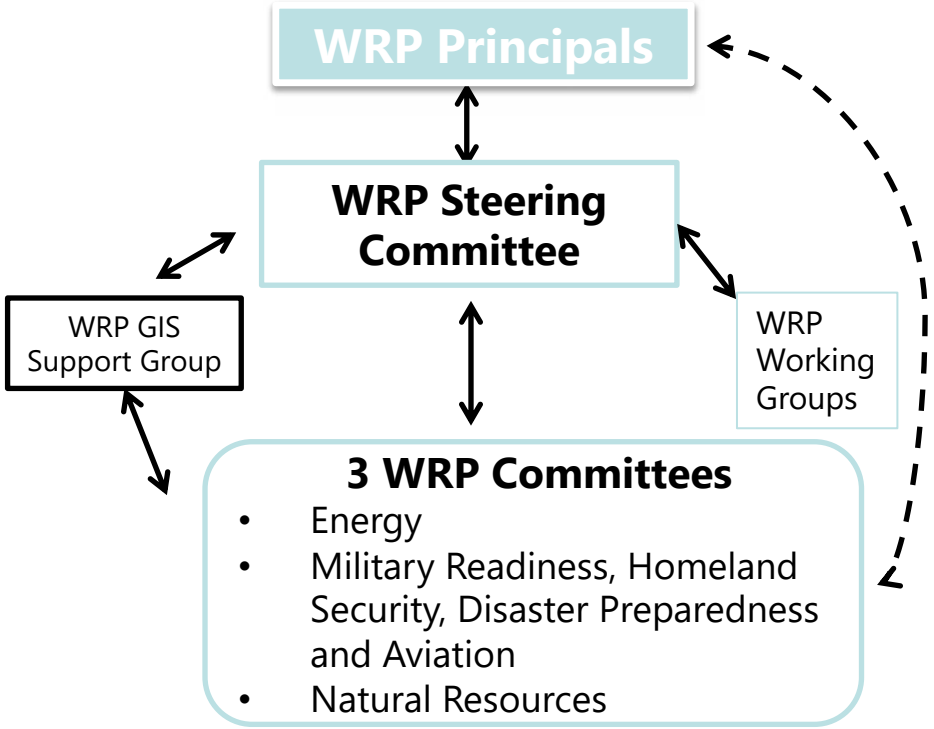
Western Regional Partnership (WRP)

- **WRP Mission:** WRP provides a proactive and collaborative framework for **senior-policy level Federal, State and Tribal leadership** to identify common goals and emerging issues in the states of **Arizona, California, Colorado, Nevada, New Mexico and Utah** and to develop solutions that support WRP Partners and protect natural and cultural resources, while promoting sustainability, homeland security and military readiness.
- **WRP Tagline:** Reliable Outcomes for America's Defense, Energy, Environment and Infrastructure in the West
- **WRP Website:** wrpinfo.org

WRP Structure

WRP Co-Chairs:

- **Honorable Spencer Cox**
  Governor of Utah
- Ron Tickle *for* Office of the **Assistant Secretary of Defense for Sustainment**
- **TBD,** Assistant Secretary for Land and Minerals Management, DOI



WRP Steering Committee

- Representatives of each of the six WRP States:
  - Arizona, California, Colorado, Nevada, New Mexico and Utah
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Reclamation
- Customs and Border Protection, U.S. Border Patrol
- Department of Homeland Security, HQ
- **Federal Aviation Administration**
- Federal Emergency Management Agency
- Federal Highway Administration
- National Park Service
- Natural Resources Conservation Service
- National Oceanic and Atmospheric Administration
- Office of Secretary of Defense
- U.S. Air Force Headquarters
- U.S. Army
- U.S. Army Corps of Engineers
- U.S. Department of Energy
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- U. S. Geological Survey
- U.S. Marine Corps Installations West
- U.S. Navy
- Native American Leadership:
  - Navajo Nation, Inter-Tribal Council of CA, Inc.
- Western Governors Association Liaison

WRP Goals

Per the Charter

- **Serve as a catalyst** for improved regional coordination among State, Federal and Tribal agencies
- **Address common goals**, identify and solve potential conflicts and develop solutions that protect our natural and cultural resources, while promoting sustainability and mission effectiveness
- Provide a **forum for information exchange, issue identification, problem solving and recommendations** across the WRP region
- At annual Principals' meeting, **adopt strategic priorities** to complete in the subsequent year
- **Leverage existing resources and linking of efforts** to better support key projects
- **Identify** geospatial requirements and leverage existing tools and resources to support WRP priorities.

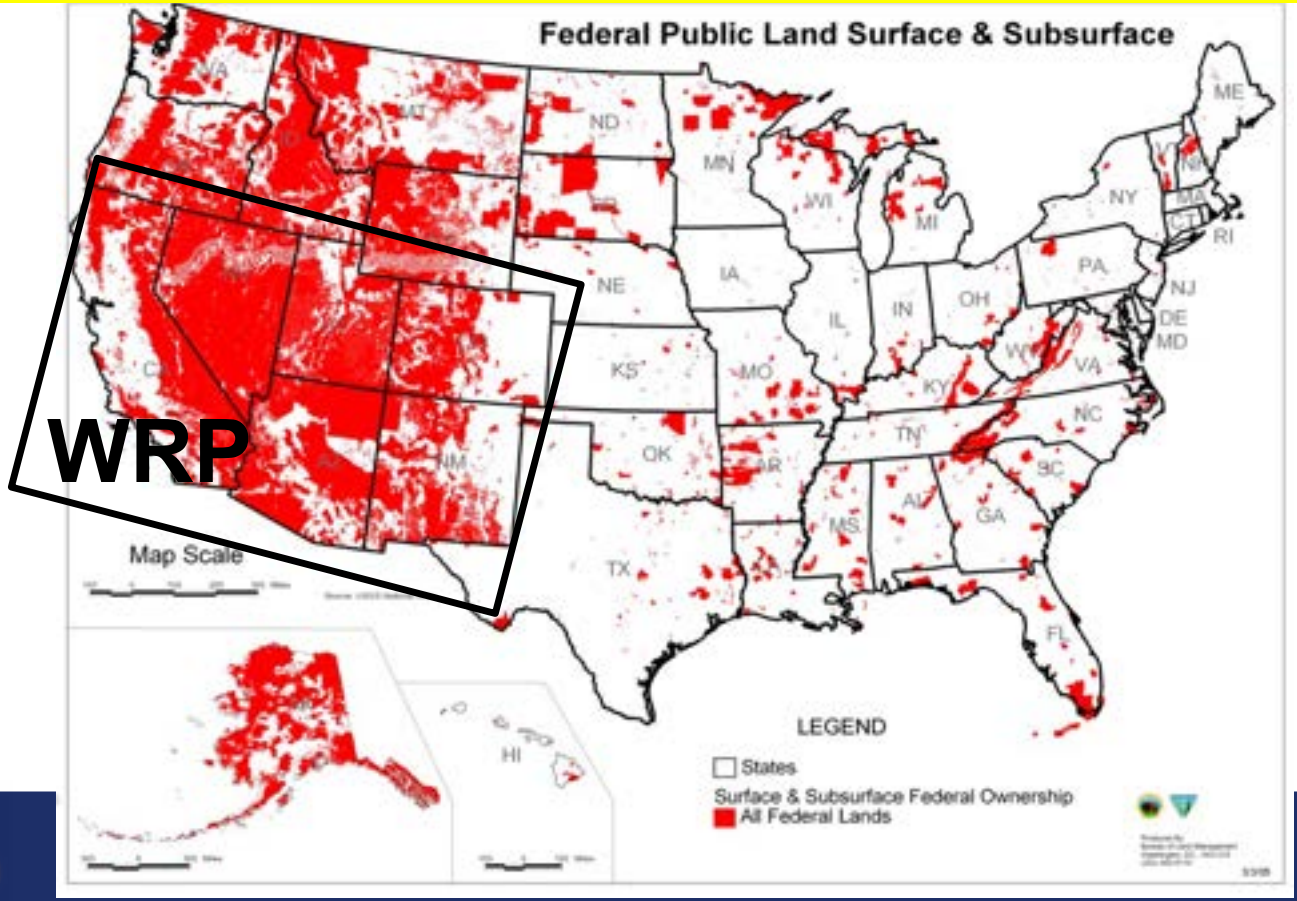
WRP Region's Uniqueness

- **Importance to the Military: Extensive Training Ranges, Premier Testing Facilities, Unmatched Military Air Space**
  - **Army**: ~55% of the Army's landholdings
  - **Navy**: Over 33% of Navy's landholdings
  - **Marine Corps:** 67% of Marine Corps' airspace
    85% of Marine Corps' Live Fire Ranges
  - **Air Force**: Includes four of the largest USAF range complexes - Edwards, Nellis/Creech/NTTR; Luke/Goldwater; and UTTR
  - 75% of DoD Special Activity Airspace is located within the WRP Region
- **Significant amounts of Federally managed land**
  - In WRP states, Federal land ranges from 34.1% - 84.9% of total state
- **Significant State Trust Landholdings**
- **Approximately 172 Federally recognized Tribes**

State	% of Federal Public Land (not including DoD managed lands)	% of DoD Managed Land	% of Indian Trust Land	Private Land	State Trust Land	Size of State in square miles and ranking by area
Arizona	35.5%	6.6%	27.6%	17.5%	12.7%	114,000; 6th largest state
California	40.2%	4.0%	0.5%	50.3%	2.5%	160,000; 3rd largest state
Colorado	38.9%	0.7%	1.1%	54.9%	4.4%	104,100; 8th largest state
Nevada	78.8%	6.1%	1.42%	13.03%	0.15%	110,561; 7th largest state
New Mexico	29.7%	4.4%	10.2%	43.9%	11.6%	121,593; 5th largest state
Utah	63.6%	3.4%	4.5%	21.0%	7.5%	84,904; 13th largest state

These six states are home to 18% of the U.S. population and constitute 19% of the total land mass.

88% of Federal Public Land is in the 12 most western states



WRP Survey Results:

Words that describe WRP

WRP Priority

- ***Building Resilience in the West for America's Defense, Energy, Environment and Infrastructure through Enhanced Collaboration among Federal, State and Tribal Entities.***
  - Exploring tools and resources needed to build resilience to support the diverse missions of Federal, State and Tribal entities in the WRP Region

WRP Deep-Dives	
Committee	Deep-Dive
Energy	• Resilient Energy Infrastructure
Military Readiness, Homeland Security, Disaster Preparedness and Aviation (MRHSDP&A)	• Resiliency of Airspace in the WRP Region • Disaster Mitigation
Natural Resources	• Water Security

Resiliency of Airspace in the WRP Region Deep-Dive

- Airspace a focus of WRP from its inception
- Subject Matter Experts part of this deep-dive
- Regular calls held
- Developed draft Chapter to highlight efforts and findings

“Resilient airspace” for the WRP Region includes:

- A safe flying environment with the needed flexibility for users to meet their missions with the greatest harmony possible with other users.
- All users having reliable communication, navigation, and surveillance (GPS).
- All users having common set of public data that can be shared to enhance situational awareness.
- An opportunity for users to collaborate, share mission needs and concerns and be able to address them with regulating authorities in an efficient manner.
  - The ability to share real-time status and improve airspace access for all users.
  - Adapting to new technologies.

Resiliency of Airspace in the WRP Region Deep-Dive

- **Section 1: Brief Overview of Resiliency of Airspace**
- **Section 2: Emerging Trends/Projects in WRP Region's Airspace (what to be aware of)**
  - COVID-19 pandemic;
  - Air Traffic Control Modernization;
  - Electromagnetic Spectrum Needs;
  - Wildfire Response need for more streamlined access to airspace;
  - Commercial Space Operations from Non-Traditional Locations;
  - Commercial, General Aviation and DoD Projected Needs;
  - New Aviation Technology; and
  - Autonomy/Artificial Intelligence.
- **Section 3: Issues to address**
  - Gap 1: Ensuring the military has sufficient airspace to meet DoD readiness requirements
  - Gap 2: Integration of UAS into NAS
  - Gap 3: Development of Counter UAS State and Federal Policy
- **Appendix: Aviation Laws and Acknowledgments**

Gap 1: Ensuring the military has sufficient airspace to meet DoD readiness requirements

- Brief Overview of DoD Aviation Mission in the WRP Region
- Not enough airspace for everyone
- Airspace and other DoD Operations Require Electromagnetic Spectrum
- Next Steps:
  - Continued collaboration with the FAA,
  - Maximize efficiencies with the scheduling and use of Special Activity Airspace,
  - Developing long range/short duration overland corridors,
  - Reviewing airspace modifications and
  - Evaluating dynamic spectrum sharing.

Gap 2: Integration of UAS into NAS

- UAS/Drones background and emerging trends
- Safe Integration of UAS into NAS
  - Drone Manufacturers are moving at light speed
  - Change in culture
  - UAS Policies are changing/evolving
  - Technology is a great enabler
  - Importance of outreach and education
- Findings
  - Compliance with right of way rules in 14 CFR Part 91.113
  - Need for standardized procedures
  - Need for everyone to work together; outreach
  - Need for sufficient access to spectrum
  - BVLOS operations come with big challenges and responsibilities
  - There remains need to detect, sense and avoid UAS

Gap 3: Development of Counter UAS State and Federal Policy

- C-UAS background and policies (Drone detections; Threat and prevailing safety and security challenges; a few notable C-UAS resources)
- Findings identified the following needs:
  - Standards for C-UAS technology;
  - Early identification of a UAS threat to the NAS;
  - Ability to rapidly deploy; and
  - Collaboration, communication, and coordination.
- Additionally, C-UAS systems must be agile/nimble and response at an airport could be improved through better addressing reporting and communication; understanding of roles and responsibilities; addressing federal, state, and local laws.
- Response at an airport

Presentations* made to WRP Airspace Deep-Dive

**Illustrative list, not exhaustive*

FAA:

- Charting Aviation's' Future: Operations in an Info-Centric NAS: Steve Bradford, Chief Scientific and Technical Advisor, FAA
- The Information-Centric NAS: A vision for the future of the NAS: Dr. Stéphane Mondoloni, Dept Chief Engineer for the NAS Future Vision and Research Department, MITRE Corporation
- ASSURE Regulatory Research Update: Col (Ret) Stephen P. Luxion "LUX," Exec Dir, ASSURE FAA Center of Excellence for UAS
- SWIFT/SWIM Industry-FAA Team Collaboration presentations: Stefanie Calabrese, Member of the SWIM Program Office and SWIFT Chair; Xavier Pratt, Operational Issues Focus Group, and Ray Mitchell, Communications, Information and Network Programs
- NSRR presentation: Mark Kaplun, SWIM Governance Lead, FAA
- NASA Airspace Research: Leighton Quon, Deputy Director of Aeronautics, NASA Ames Research Center
- DoD presentations: Fallon Range Training Complex Modernization; Nellis Test and Training Range Mission Brief and Airspace; Air Force Industrial Installation Concept, Plant 42; Utah Test and Training Range; Spectrum Encroachment Awareness and Challenges for T&E Ranges; R-2508
- UAS into NAS: BNSF Railway RPA (Drone) Program; FedEx Air Operations Innovation; AOPA and the Future of Aviation; NavCanada efforts regarding the integration of Remotely Piloted Aircraft Systems (RPAS / UAS) into Canada's national airspace system; Academy of Model Aeronautics (AMA); DAC/Advance Aviation Advisory Committee
- C-UAS: FAA Law Enforcement Assistance Program UAS Outreach; American Airlines, Airports Council International – North America; Transportation Security Administration (TSA) UAS Efforts; Department of Defense Title 10 U.S. Code, §130i and cUAS Authorities

Overarching Themes

- There are many voices and efforts involved in airspace
  - This forum helps share information and perspectives
  - Developed Aviation Resources by Gap
- Importance of working together and identifying needs
  - Technology is a great enabler (communications, awareness, etc.)
  - Use of airspace has changed; more demands now by diverse stakeholders and platforms
  - Dynamic airspace
  - Integration is robust
  - Aviation spectrum needs
  - Policies are changing but technology is faster

Value of WRP

- A forum to engage with high-level representatives of states, federal and Tribal entities across WRP Region
- Opportunities to enhance situational awareness of policy and emerging issues
- Enable interagency dialogue for identifying, addressing, and avoiding these potential conflicts
- Recommendations and innovative solutions in the gap between real time problems and long-term policy development
- Access to tools and WRP Deliverables


WRP
WESTERN REGIONAL PARTNERSHIP
173 senior policy-level leaders
(and their staff) in attendance
•www.wrpinfo.org
Western Regional Partnership Principals' Meeting
Marine Corps Base Camp Pendleton
November 19, 2019

Space Integration

SWIFT 17 Update

Presented to: SWIFT 17

By: Crystal Toney, Space Integration

Duane Freer, ATO System Operations

Date: March 03, 2022

Federal Aviation Administration

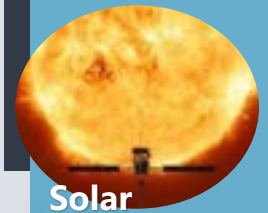
Meet our Presenters

Crystal Toney
Program Manager
Space Integration
(AJM-225)

Duane Freer
Manager
ATO Space Operations
(AJR-1800)

Industry Pulse
Macro View

SPACE EXPLORATION



Several Scientific Missions Scheduled

Astronauts and private citizens going to space

HUMANS IN SPACE

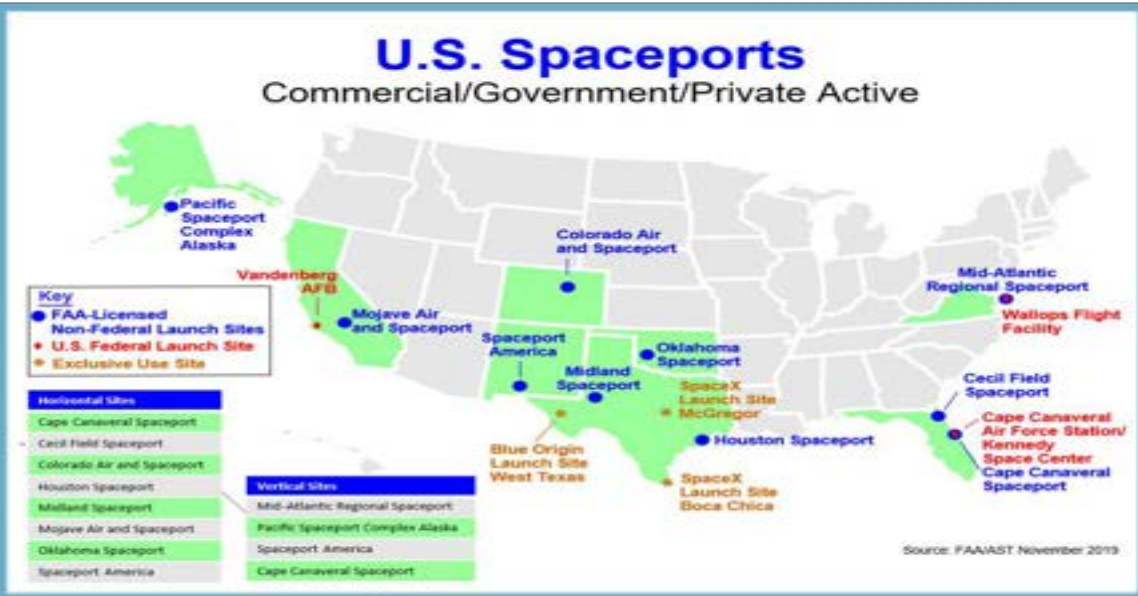
NEW LAUNCH VEHICLES

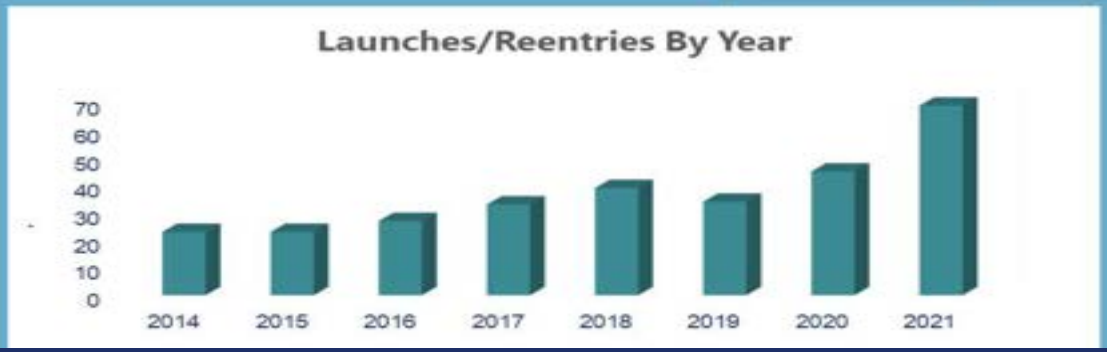
Developing Starships for Interplanetary Travel

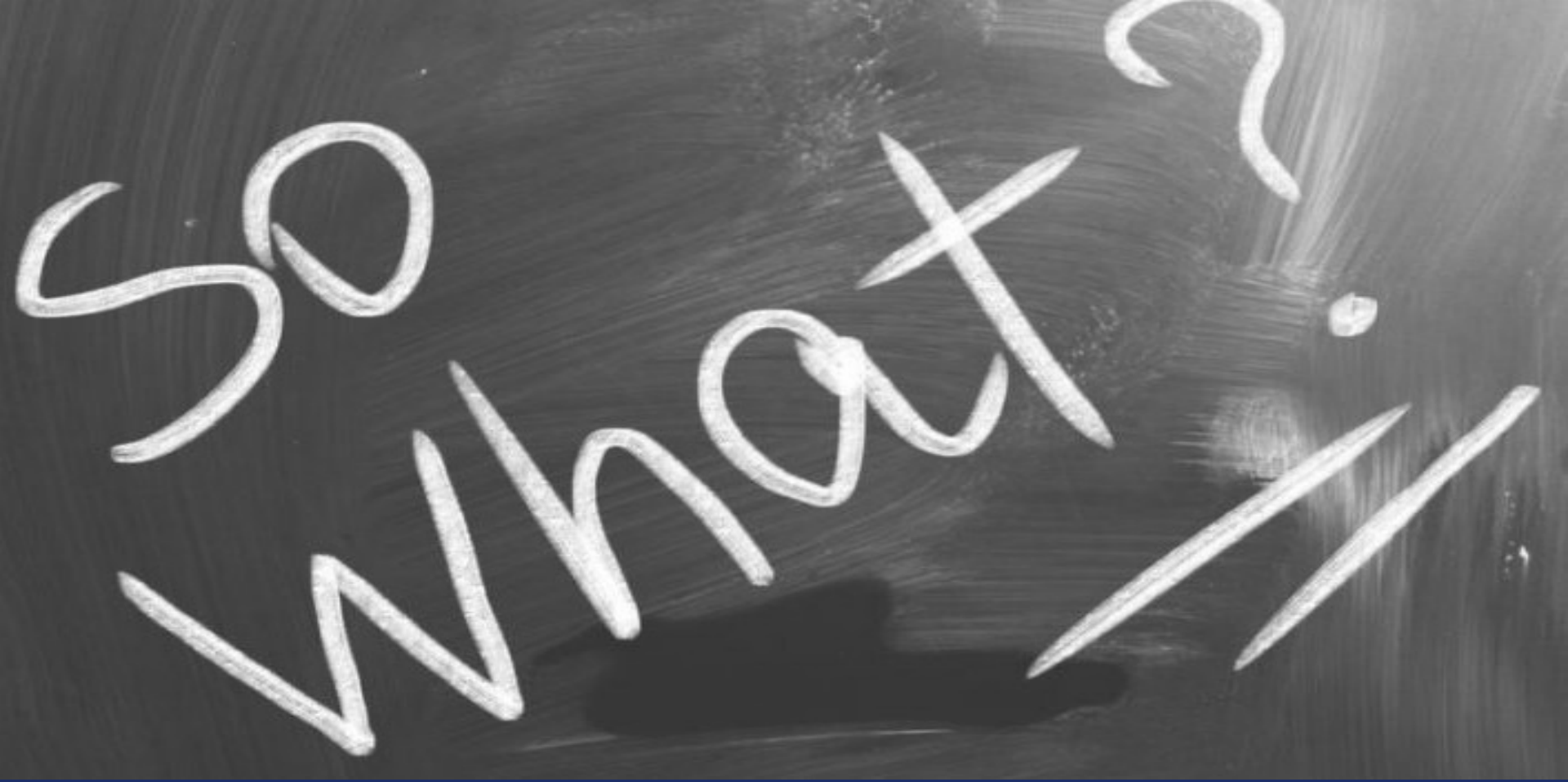
Worldwide Internet & Communication Coverage

TECHNOLOGY & COMMUNICATIONS

Industry Pulse Operational Tempo

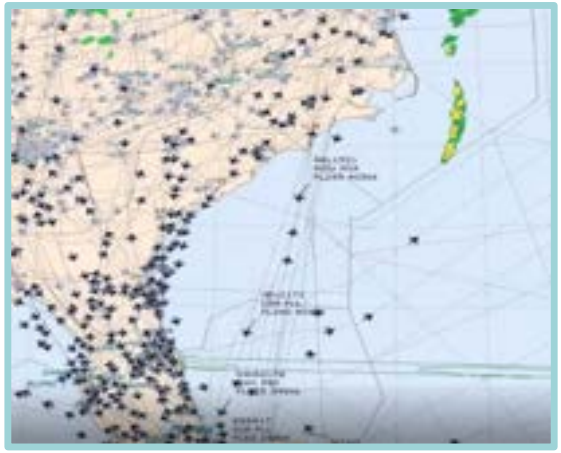





So what?

FAA Innovation
SpaceX DM-2 Launch

Previous State



Atlantic routes are **closed over an hour before** the Aircraft Hazard Area is activated

First southbound aircraft crosses a deactivated Hazard Area roughly **2.5 hours after** the launch operation

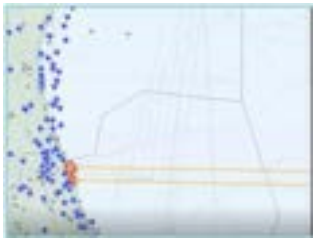
Lost capacity in the NAS in the National Airspace System (NAS)

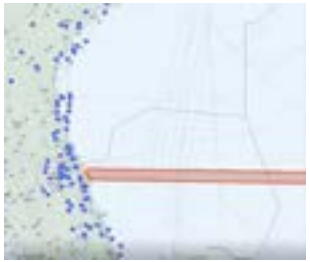
Inland sector alerts (in red) showing **high volume due to traffic rerouted** off the Atlantic Routes (ARs) due to a launch off of the Eastern Range

Looking Ahead

SDI operational prototype coupled with Time Based Procedures add real efficiencies to the NAS

	PREVIOUS STATE	CURRENT STATE
Pre-Launch	Increased inland sector traffic **congestion** due to sanitizing the airspace planned hazard areas	Time based procedures allow **more efficient use** of the Atlantic Routes for launches from the Eastern Range
During Launch	Atlantic routes **are closed** until well after the time frame of the hazard area has passed	Time based procedures allow **more** Atlantic routes can be **made available** based on timing and monitoring of the launch operation






What is
the FAA
doing
about it?

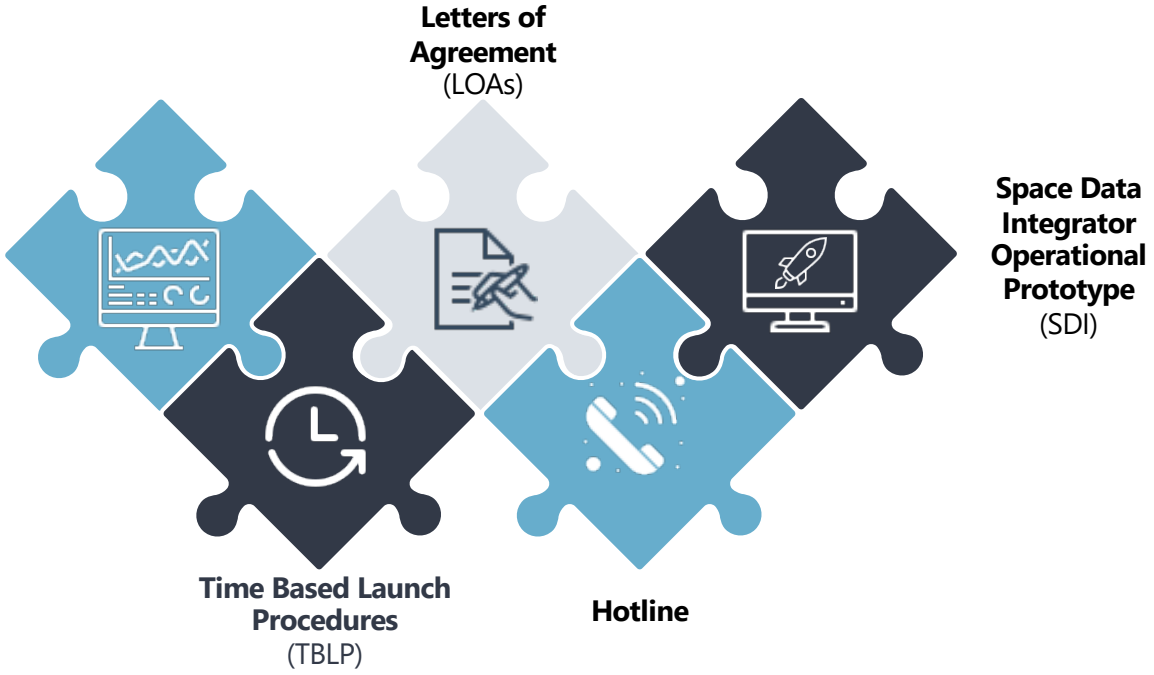
Space Integration into the NAS: Roles

Program Management Office Space Integration (AJM-225)
Support investment analysis, manage and oversee the integration of space operations into the National Airspace System

System Operations Services Space Operations (AJR-1800)
Plan and manage space launch and reentry operations, as well as introduce additional efficiencies to processes and procedures

Space Integration Overview: Current Improvements

Executing **improvements now** while simultaneously **building for the future**



What is the Space Data Integrator?

The **Space Data Integrator (SDI)** is an operational prototype that receives and distributes **launch and reentry data**. It was deployed to ATO Space Operations (AJR-1800) in June 2021.

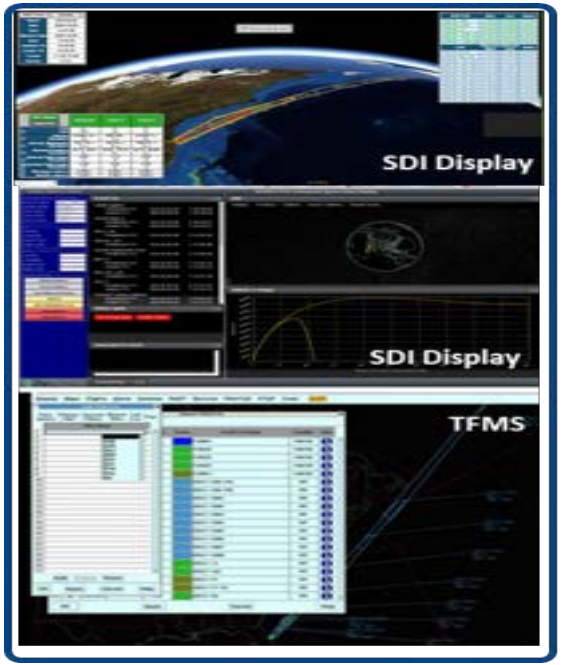
SDI enables **improved situational awareness** and **airspace management decision-making** and **eliminates manual data exchange** processes.

This strategy allows Space Operations to receive capabilities now (deployed June 2021), while validating requirements for Air Traffic.

- Provides initial near real-time capability to monitor launch and reentry vehicle location and status.
- Enables initial data exchange with Traffic Flow Management Systems (TFMS) and automation of some manual processes.

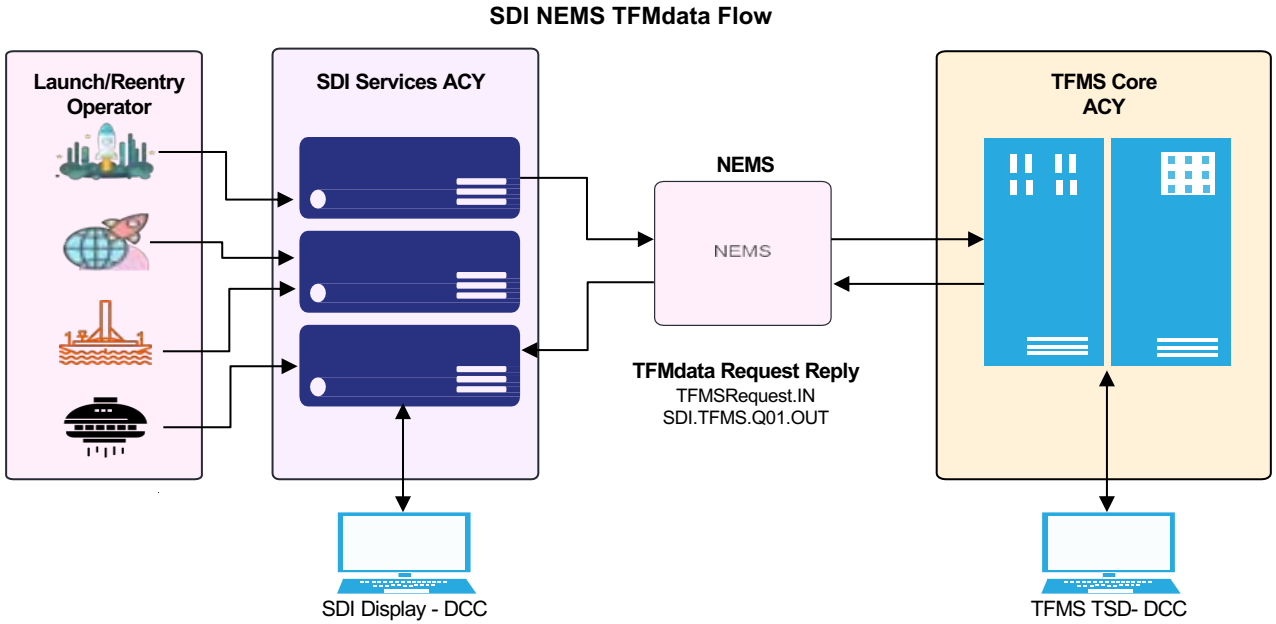
The long-term strategy is **to integrate** this capability **into existing systems** (not be a stand-alone system).

SDI allows the FAA to **begin integration** and keep pace with the increasing frequency and complexity of launch and reentry operations.



Data Exchange

- Voluntary participation to provide near real-time data to SDI.
- There is a common ICD for the SDI operational prototype.



What is the Future of Space Integration?

Geopolitical Impacts

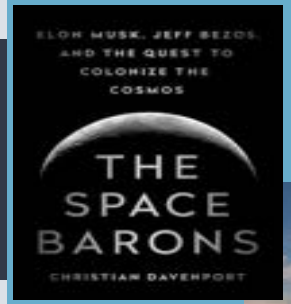
Geopolitics

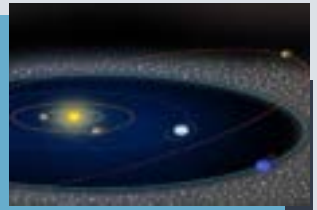
Economics

Defense

Exploration

Economics





Exploration

Defense

Warp Speed Growth!

The **FAA's space operations** efforts will continue to **generate innovative solutions** to support industry advancements and ensure the **safety of our national aerospace.**

SWIFT Focus Group Status Updates

Operational Context Document Focus Group

SWIFT 17 Update

Presenter: Ray Mitchell – LS Technologies

Date: March 03, 2022

Operational Context Document FG Update

- **Important Notices**
  - **This Focus Group has moved to an ad hoc cadence**
  - Documents will be previewed in close concert with SWIFT events moving forward
- **Documentation can be found via NAS Service Registry & Repository (NSRR) or by contacting**
  - ***Ray Mitchell @ ray.mitchell@lstechllc.com***
  - ***Xavier Pratt @ xavier.pratt@lstechllc.com***
  - ***Sandie Steele @ sandie.steele@lstechllc.com***
  - ***John Kelley @ john.kelley@lstechllc.com***
- ***Links to our most recent NCR documents in NSRR:***
  - **NCR WFS**: https://nsrr.faa.gov/nsrr-library-document/9955
  - **NCR WMS*:*** https://nsrr.faa.gov/nsrr-library-document/9946

Note: NSRR access requires user account, new accounts can be requested at https://nsrr.faa.gov/user/register

Development & Analytics Focus Group

SWIFT 17 Update

Presenters: Ray Mitchell – LS Technologies
Erin Cobbett – DAL
Mike Jagmin – UAL

Date: March 03, 2022

Development & Analytics Focus Group (DAFG)

Leads: Erin Cobbett (DAL), Mike Jagmin (UAL) and Ray Mitchell (LST) (Contract Support)

Background & Purpose Recap:

Data Analytics

- Identify smaller scale data, operational, and analytical problems that already exist in the community
- Identify services, messages, data elements, logical transformations to solve problems

Development

- Create logical software design to solve problems
- Develop physical representations of data as designed by group

Current Status:

- SPRINT 2 TBFM Delay Issue Bi-Weekly Sessions currently TBD. Resolution is underway
- Jan 27th NASA Digital Information Platform and First DAFG meeting of 2022

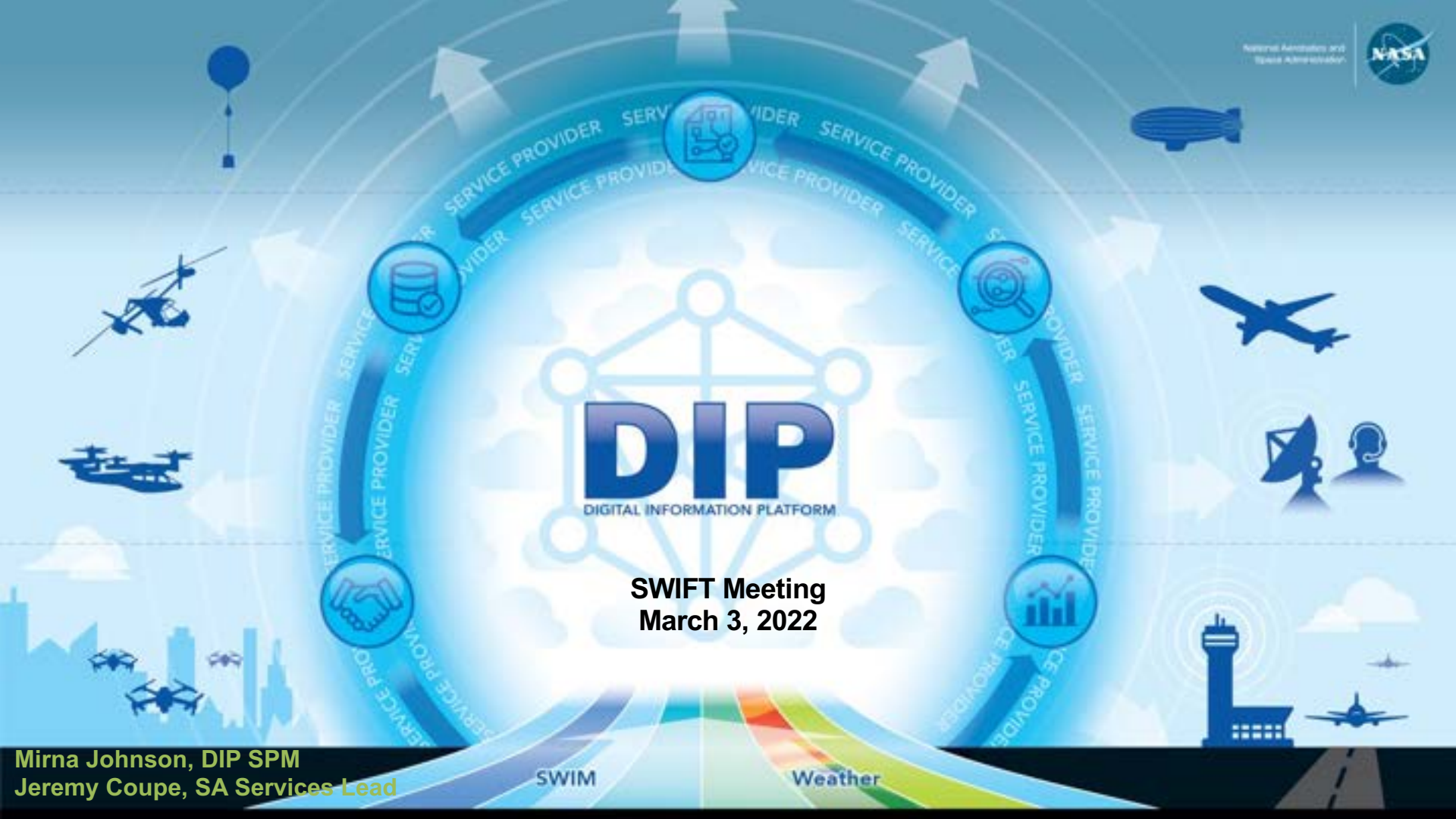
Next Steps:

- DAFG will continue the quarterly and or ad hoc cadence. The group is on standby to support the NY Case Study

Want to join us? Contact Us:

Erin Cobbett - erin.cobbett@delta.com

Mike Jagmin - michael.jagmin@united.com or Ray Mitchell – ray.mitchell@lstechllc.com



SWIFT Meeting
March 3, 2022

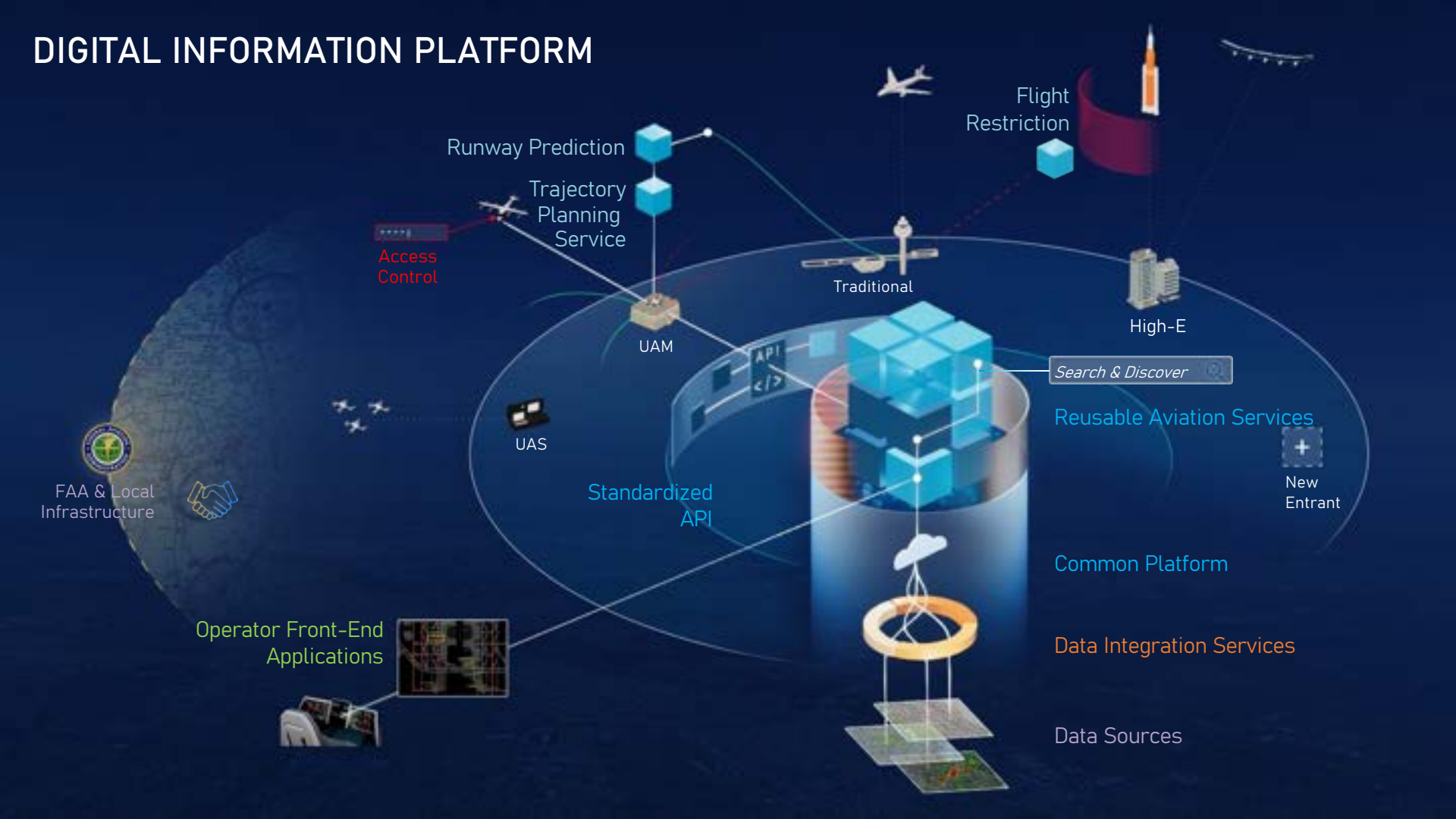
Mirna Johnson, DIP SPM
Jeremy Coupe, SA Services Lead

Digital Information Platform

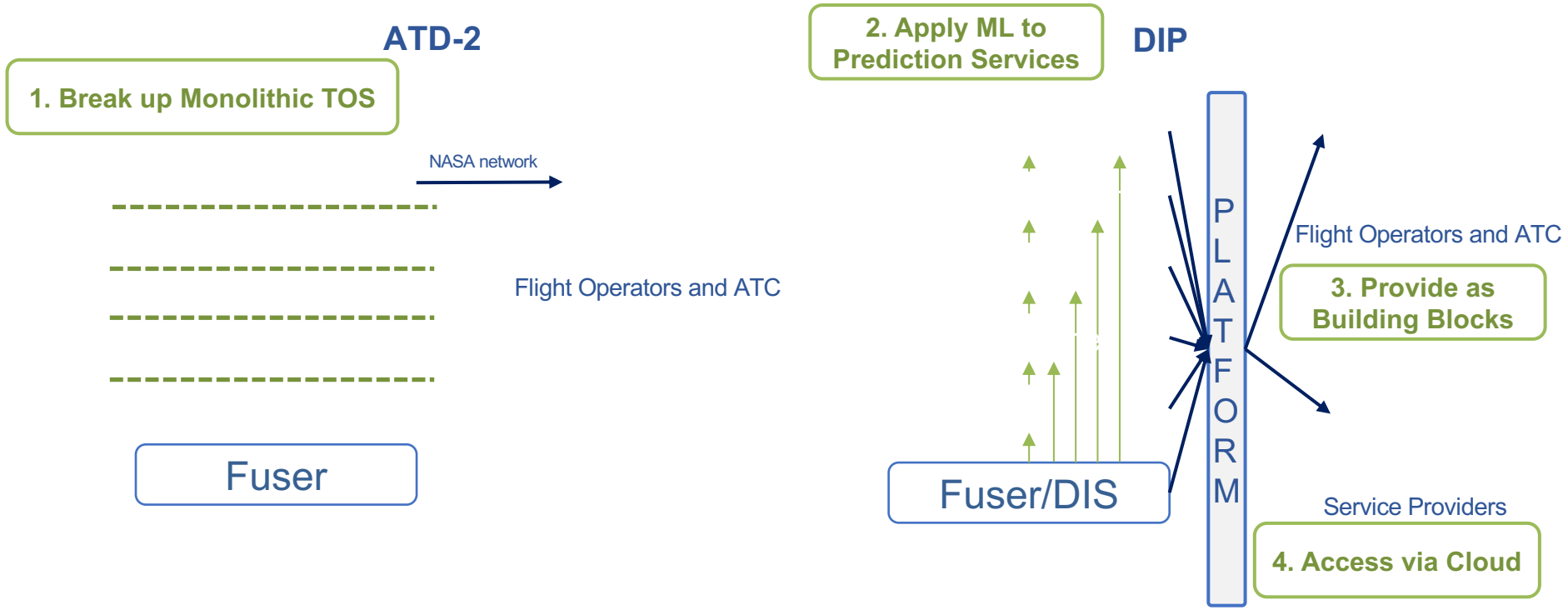
Accelerate NAS transformation for advanced, ***data-driven, digital services*** *to promote* ***efficient aviation operations***

Cloud-based ecosystem that takes data from many sources and turns it into easily accessible, easy-to-use digital information to expand the development of airspace management services

DIGITAL INFORMATION PLATFORM



Leveraging ATD-2 MicroServices



"DIP-itize" – Scalability towards NAS-wide implementation

DIP Research Areas

NASA Led DIP-Enabled Services for Sustainability

Ground and flight deck services focused on improving the sustainability of aviation operations

Industry Led Partner Service Demonstrations

Integration and demonstration of Partner services with DIP for validation of the platform

University Challenges

NTL NASA Tournament Lab

Development of innovative solutions and advanced algorithms for aviation services

Reference Digital Information Platform (DIP)

Development of a platform for advanced, data-driven, digital services for flight operators and service consumers

Sustainable Aviation Engineering Plan

- SA demos follow a crawl, walk, run approach to build up and validate capabilities in North Texas before deploying to new more complex airspace:

- **SA1a Operational Evaluation 1 FY22 in North Texas with ML technology**
  - System deployed on existing NASA NTX network with no cloud deployment
  - Validate service-oriented architecture leveraging micro-services
  - Validate ML micro-services as replacement for legacy adaptation-based surface model
- **SA1a Operational Evaluation 2 FY23 in North Texas with cloud deployment**
  - Validate system with AWS cloud deployment in North Texas
  - Validate 'last mile' services with Flight Operator consuming from AWS cloud environment
  - NASA network continued to be used to deliver User Interface to FAA
- **SA1b Operational Evaluation in FY24 in more complex airspace**
  - Validate cloud-based approach used in North Texas is scalable to other facilities
  - Validate new interfaces for Flight Operator to submit reroute requests to FAA (CSS-FD?)

Introduce Capabilities in Phased Approach towards new airspace

Operational Issues Focus Group

SWIFT 17 Update

Presenter: Xavier Pratt – LS Technologies

Date: March 03, 2022

Ops Issues Focus Group

Leads: Chris Gottlieb (JBU) and Xavier Pratt (LST) (Contract Support)

Background & Purpose Recap:

Ops Analysis

- Address NAS-wide operational issues that might benefit from information sharing between organizations
- Identify SWIM services, messages and data elements to resolve NAS user challenges

SWIM Data Use Cases

- Explore Ops issues through use case studies
- Leverage SWIM Operational Context documents and SWIM Info-services Roadmap to inform user investment decisions

Want to join us? Contact Us:

Chris Gottlieb - Christopher.Gottlieb@jetblue.com

Xavier Pratt - Xavier.Pratt@lstechllc.com

Current Status:

- NY Area Case Study: Applies SWIM data context to N90-bound flight trajectory deviation around convective Wx at ZOB/ZNY boundary
- CSS-FD Risk Reduction Activity: FAA and industry kickoff meeting to evaluate and refine proposed SWIM Flight Planning functionality in support of stakeholder buy-in

Next Steps:

- OIFG use FAA EIM analytical to leverage support tools for NY prediction model development. Engage DAFG for support
- CSS-FD team will schedule workgroups and TIMs to validate SWIM Flight Planning use case and develop client demos

Current Prioritized Ops Issues:

- **TBFM delays (UAL) who, what, why it matters**
- **Flight Planning over IP (SWA)**
- **Early Planning for Disruptions**
  - ***Early Detection of Deviations over a Fix (JBU)***
  - ***Early Detection of Airport Surface Delays (JBU)***
  - *Taxi Out Return to Gate tracking / visibility (DAL)*
  - *Long taxi issues at JFK (JBU)*
- TBFM/TFMS double delays

Bolded Issues – actively engaged

CAVAN SOLUTIONS | tep

SWIFT Widget Briefing: Fix Conformance Analysis

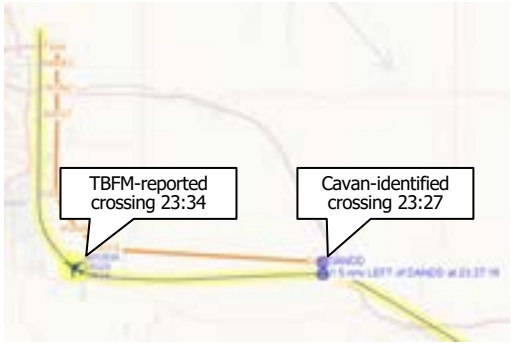
SWIFT 17

March 03, 2022

Executive Summary

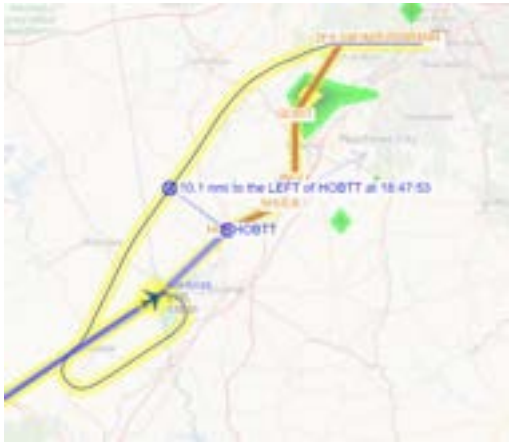
- Environment
  - Meter reference point crossing conformance is an important operational characteristic used in TBFM adaptation development and testing and a useful TBFM performance metric when TBFM times are provided to en route controllers
- Problem Statement
  - In a small number of situations, TBFM-reported fix crossing times can be inaccurate for use in adaptation development analysis and operational performance metrics
  - The distinction between meter fixes and meter fix arcs is not clearly conveyed in the SWIM TBFM STA messages
  - Conformance to meter fix arc crossing times is not available in the SWIM TBFM data
  - SWIM TBFM data does not indicate when a TBFM meter time is being used operationally
- Impact
  - Cavan has developed a cloud-based SWIM data integration and analysis platform called CavanReports that provides improved crossing conformance metrics
  - These metrics are computed in real time for thousands of flights per day and are available via web services, web-based visualizations, and email reports
- Goal
  - Provide accurate metering reference point crossing performance metrics

Operational example where the TBFM reported meter fix crossing is 7 minutes after the actual crossing



Case Studies

- Meter Fix crossing attributes (e.g., time, location, altitude, speed) support TBFM adaptation development and are a useful performance metric when TBFM times are provided to en route controllers
- Specific Examples:
  - Distance-Based Conformance to the Meter Fix
  - Time-Based Conformance to the Meter Fix Arc
  - Actions to Meet TBFM Meter Fix STA



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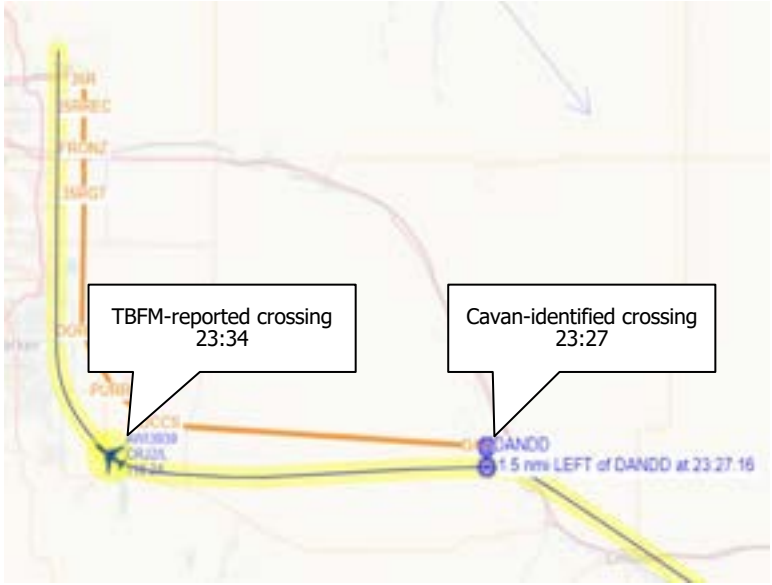
Distance-Based Fix Conformance - Issue

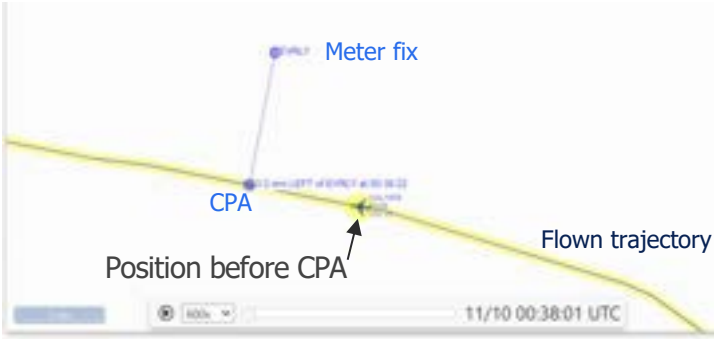
While the TFBM SWIM data feed includes a Meter Fix Crossing message, this data is sometimes inaccurate

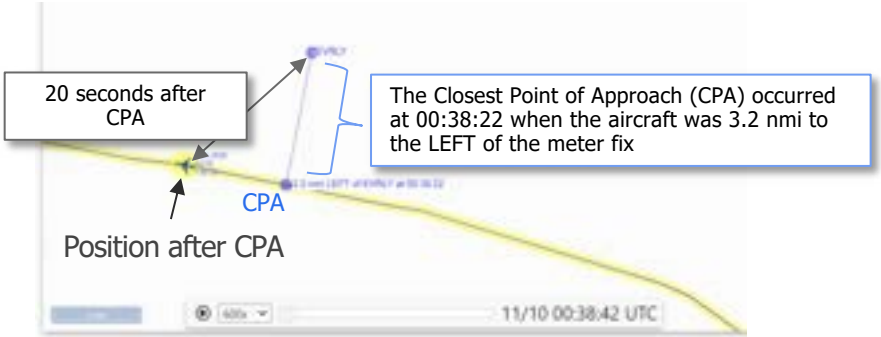
Operational example where the TBFM reported meter fix crossing is 7 minutes after the actual crossing



Distance-Based Fix Conformance - Solution

- Solution:
  - Calculate this metric based on merged TFMS and TBFM SWIM data
- Algorithm:
  - TFMS track position reports occur about every 30-60 seconds for each aircraft
  - Identify the closest point of approach (CPA) to the meter fix based on consecutive positions reports
  - The trajectory time, position, altitude, and speed are then interpolated to the CPA
- CavanReports computes this metric in real-time for about 12,000 flights* per day.





* Flights assigned to a TBFM meter fix regardless of whether a Scheduled Time of Arrival (STA) was assigned

Time-Based Conformance to Meter Fix Arcs - Issue

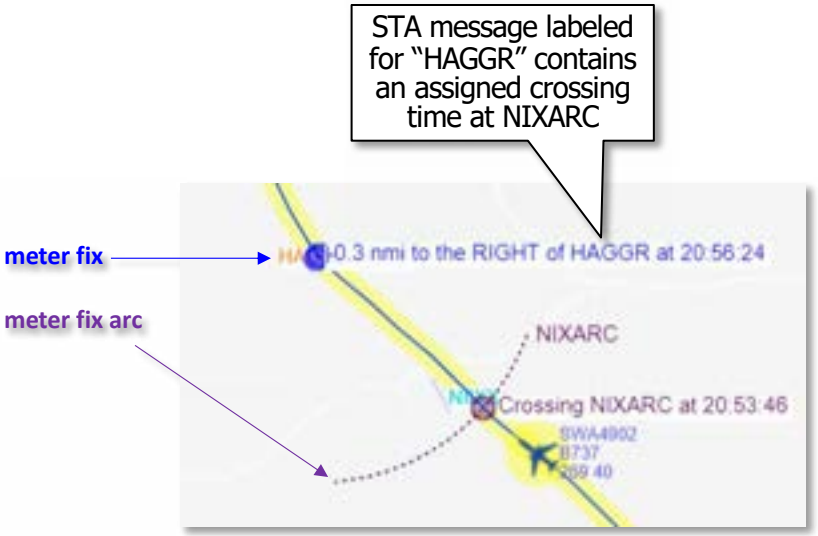
- TBFM Scheduled Time of Arrivals (STAs) can represent the time that aircraft should cross the meter fix arc
- In the TBFM SWIM feed, STA messages are labeled with the name of the *meter fix*, yet the time values are associated with the *meter fix arc*

Sample TBFM SWIM STA message

Meter fix = HAGGR

```
<sta>
    <mfx>HAGGR</mfx>
    <sta_sfx>2021-09-09T15:53:32Z</sta_sfx>
</sta>
```

STA provided for the schedule fix = NIXARC



- The meter fix and meter fix arc are typically in different locations which results in incorrect meter reference point crossing conformance if the TBFM SWIM message is used directly.

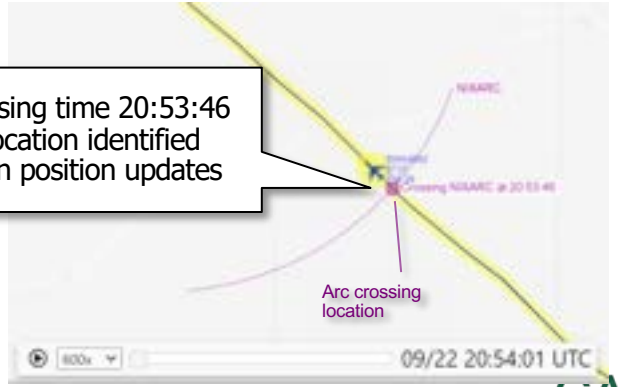
CAVAN SOLUTIONS

Time-Based Conformance to Meter Fix Arcs - Solution

- Solution:
  - Calculate this metric based on merged TFMS and TBFM SWIM data
- Algorithm:
  1. Extract the assigned crossing time and name of the meter fix from each TBFM STA message
  2. Use a lookup table to map the meter fix to the correct meter fix arc
  3. Process the TFMS trajectory to identify when the aircraft crossed the meter fix arc
  4. Compare the actual meter fix arc crossing time to the STA that was in place when the aircraft crossed the meter fix arc

20:53:33 position report **before** crossing arc

20:54:01 position report **after** crossing arc



Actions to Meet TBFM Meter Fix STA (1 of 3)

- This DEN flight is vectored immediately after its STA becomes frozen with 7 minutes of TBFM Airborne Delay*

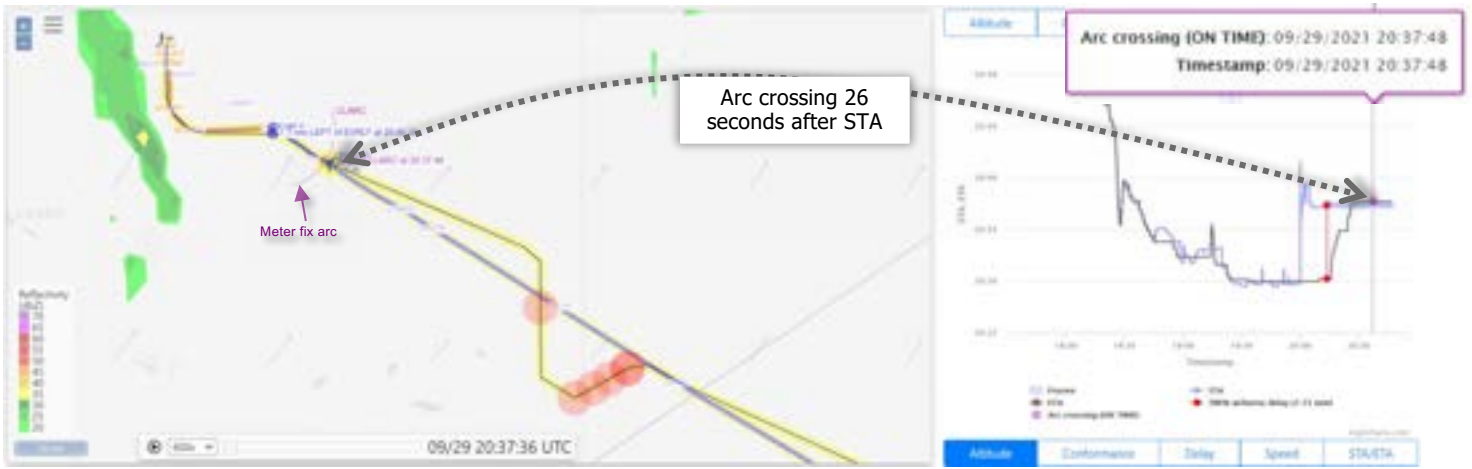
* TBFM Airborne Delay is a value-added metric defined as the difference between the STA and ETA at the time when the STA becomes frozen. This is the amount of delay (or delay reduction) needed for the aircraft to cross the meter reference point on time.

Actions to Meet TBFM Meter Fix STA (2 of 3)

- Red dots indicate changes in the TBFM ETA to the meter fix arc

Actions to Meet TBFM Meter Fix STA (3 of 3)

- The vectoring results in the aircraft crossing the meter fix arc within 26 seconds of the STA



* TBFM Airborne Delay is a value-added metric defined as the difference between the STA and ETA at the time when the STA becomes frozen. This is the amount of delay (or delay reduction) needed for the aircraft to cross the meter reference point on time.

SWIM "Art of the Possible"

- Combining TBFM SWIM data with TBFM operational and engineering expertise allowed improved analysis of meter fix crossing attributes by TBFM adaptation developers and operational SMEs
- The analysis platform leveraged is an excellent example of using SWIM data in a web-services environment to support operational performance analyses
  - Integrated TBFM, STARS, and TFM operational data from SWIM and TBFM adaptation data supported the necessary metrics development for analysis
  - Data visualizations were effective in confirming the issue and improvement of the calculated metrics
- CavanReports was built as a cloud deployed, web services, data integration platform that processes SWIM data and other related data sources into a correlated database to support web services, web applications, value added metrics, and data visualizations
- CavanReports is extensible to meet the needs of specific analyses

CAVAN SOLUTIONS

CavanReports – Data Integration

Winds Aloft: North American Mesoscale Forecast System (NAM)

Winds Aloft: 100-knot contours

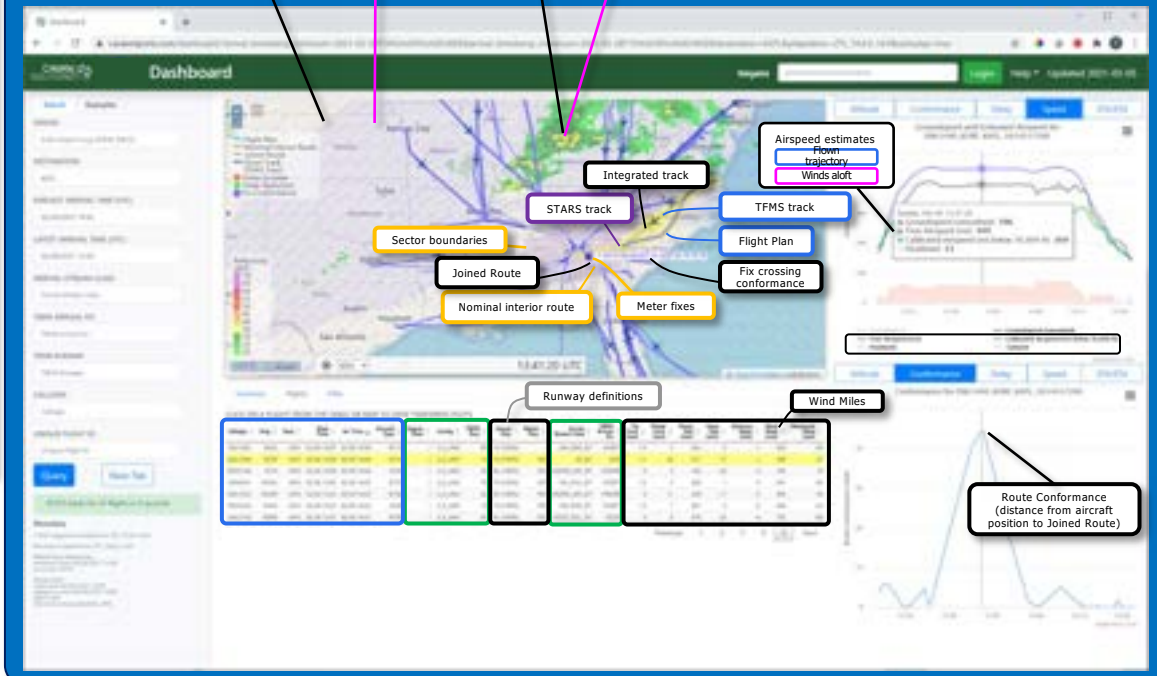
Reflectivity contours

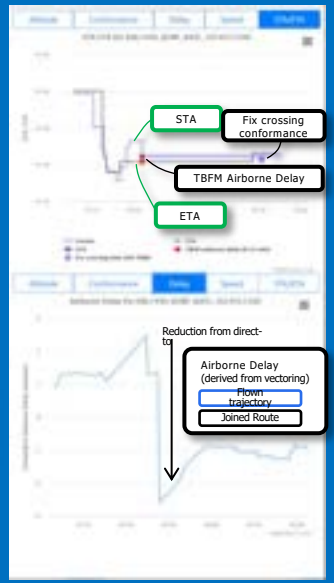
Reflectivity: MULTI-RADAR/MULTI-SENSOR SYSTEM (MRMS)

Operational Data Sources

- TFMS SWIM
- STDDS STARS SWIM
- TBFM SWIM
- Adaptation - RSYNC
- NOAA Weather
- NFDC
- Value added metric

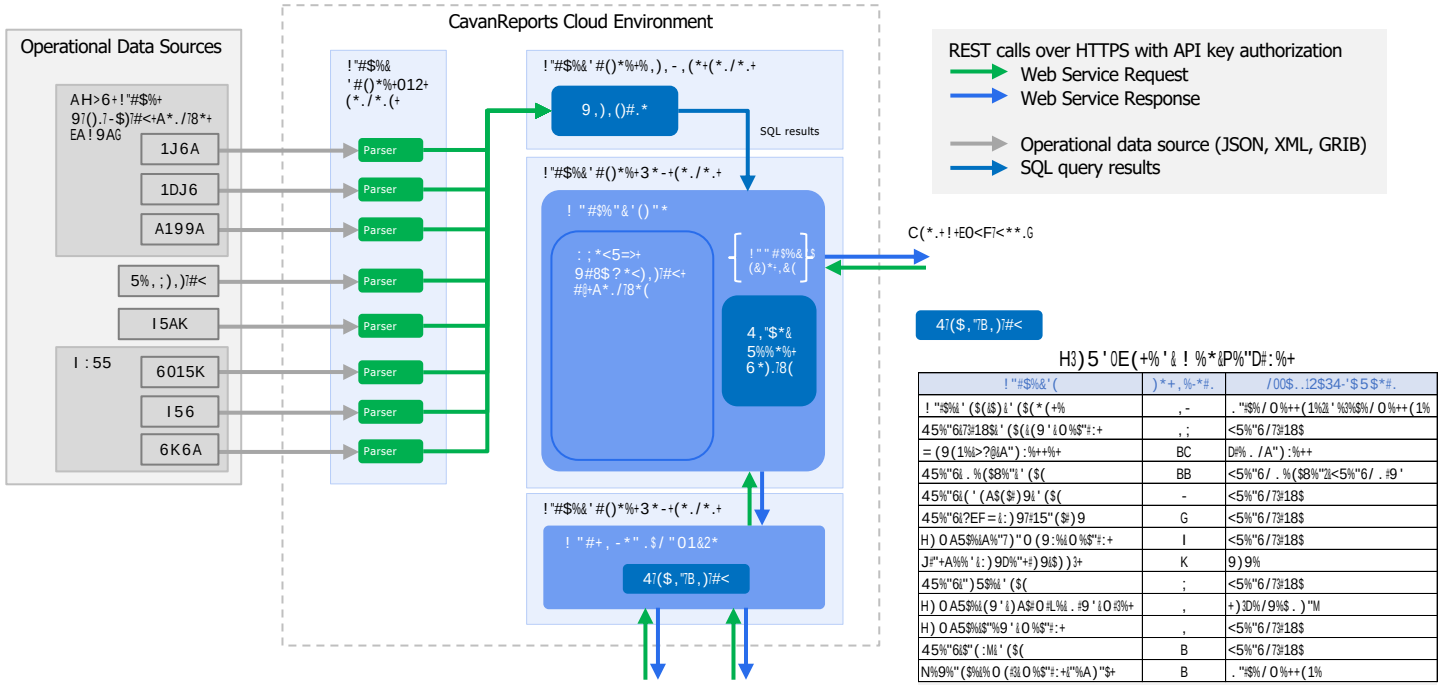
Visualization





CavanReports – Web Services Architecture

- Data parsing is automated and centralized (promotes consistency)
- Data is transformed into a standardized format that can be queried efficiently and is decoupled from the input data sources and end users (reduces complexity)
- Data and metrics are accessed through a standardized, cloud-based REST API where all services are documented ("common, simplified interface to integrated, processed information")
- All communication with the web server is encrypted for security using HTTPS
- Visualizations are interactive, consistent for all users, and accessible over the web via API key. The only software requirement is a web browser (promotes interoperability)
- Authorization is specific to each user and web service (enables controlled access to logic and data)



CavanReports Value-Added Metrics

Metrics computed based on SWIM data by cloud-based RESTful web services running on AWS

- ***Closest Point of Approach (CPA) to meter fix*** *– Identified between consecutive position reports*
- ***Fix crossing time, altitude*** *– Flown trajectory data interpolated to when CPA occurred*
- ***Fix crossing distance*** *– Distance from fix at CPA*
- ***Fix crossing direction*** *– Left vs. right of the fix*
- ***Fix crossing speed*** *– Calibrated Airspeed (CAS) at CPA for comparison against target*
- ***Fix conformance*** *– Distance, altitude, and speed deviation from target*
- True Airspeed (TAS) - Computed based on flown trajectory mapped to NOAA winds aloft
- Calibrated Airspeed (CAS) - Calculated based on TAS and altitude
- ***Meter Fix Arc crossing location, time*** *– identified between consecutive position reports*
- ***Meter Fix Arc conformance*** *– Comparison between STA and Meter Fix Arc crossing time*
- Route conformance – Distance between flown trajectory and planned route of flight
- Vectoring delay – Geospatial comparison of flown trajectory vs. planned route of flight
- TBFM airborne delay – Difference between STA and ETA when STA first becomes frozen
- Runway matching – Match flown trajectory to actual landing runway
- Miles-In-Trail / Minutes-In-Trail – Spacing between consecutive aircraft based on flown trajectory
- Joined trajectory – Geospatial matching of position reports from TFMS and STDDS
- Joined route – Geospatial merging of filed flight plan with nominal interior route
- Planned distance – Length of filed flight plan
- Flown distance – Length of flown trajectory
- Wind miles – Distance flown through the air calculated from TAS

Italics metrics directly used in this fix crossing performance case study

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Summary

- In a small number of situations, TBFM-reported fix crossing times are not accurate for use in adaptation development analysis and operational performance metrics
  - Distance-based conformance to the meter fix
  - Time-based conformation to the meter fix arc
- A combination of NAS operational data and NAS operations expertise is required to accurately assess performance using SWIM data
  - Caution required when creating aggregated metrics since outliers or misunderstandings about data can lead to incorrect conclusions
  - Individual flight analysis details and summary metrics can be effective when the underlying data sources are well understood and vetted
- A cloud-based, web services architecture for computing value-added metrics using SWIM data in real time was used to identify and solve this operational performance issue
  - Metrics accessed via web services and displayed in web-based reports and maps
- CavanReports, an integrated data platform based on engineering and ATC expertise, has created a foundation for ongoing SWIM value-added services that can support a wide range of analyses for the SWIFT community

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New York Area Study on
Early Planning For Disruptions

SWIFT 17 Update

Presenter: Chris Gottlieb - JetBlue
Xavier Pratt – LS Technologies
Mark Hopkins – LS Technologies

Date: March 03, 2022

SWIFT 16 Recap & Context

Case Study Origins:

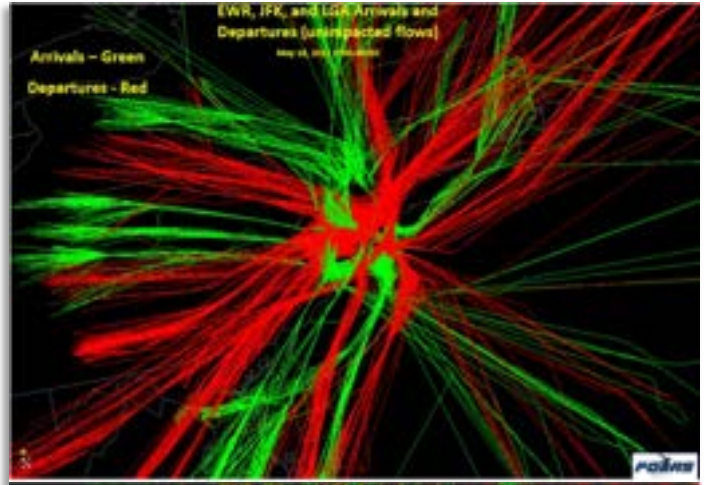
- Selected NY Metro Area for case study due to their daily vulnerability for SWAP events
- Sought alerting capabilities to support real-time tactical decisions by FAA and carriers

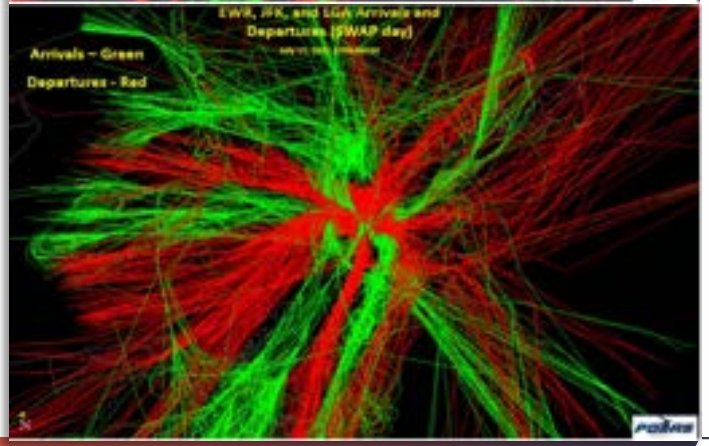
Case Study Modeling Approach:

- Leverage SWIM data to mitigate stakeholder *information gaps* during IROP events
  - *Identify ATC / industry challenges, desired outcomes, and Ops Impacts during IROP events*
  - *Select dates to serve as case study baseline for future predictive analytics / machine learning modeling*

Case Study Status:

- Analyze delay and impacts resulting from aircraft deviation along flight trajectory
  - *Selected June 21, 2021, as candidate disruptive date for model baseline*
    - Severe convective WX activity with traffic demand impacted ZNY operations
    - Convective WX and lightning events occurring from 1300Z through 2100Z
    - WX development over multiple N90 arrival, departure routes





Case Study Vignettes

Deviation off Trajectories

Convective weather (e.g., thunderstorms) near N90 moving eastward impacts airspace capacity, departure routes and fix resources.

Drivers to Observe:

- *Weather Location & Intensity, TMI Restrictions, Departure Fix Utilization, Arrival Deviations off Original Trajectories*

Flow Restrictions Workaround (NBAA)

Adjusting FCA ceilings to assist GA flights with ZNY flyovers.

Drivers to Observe:

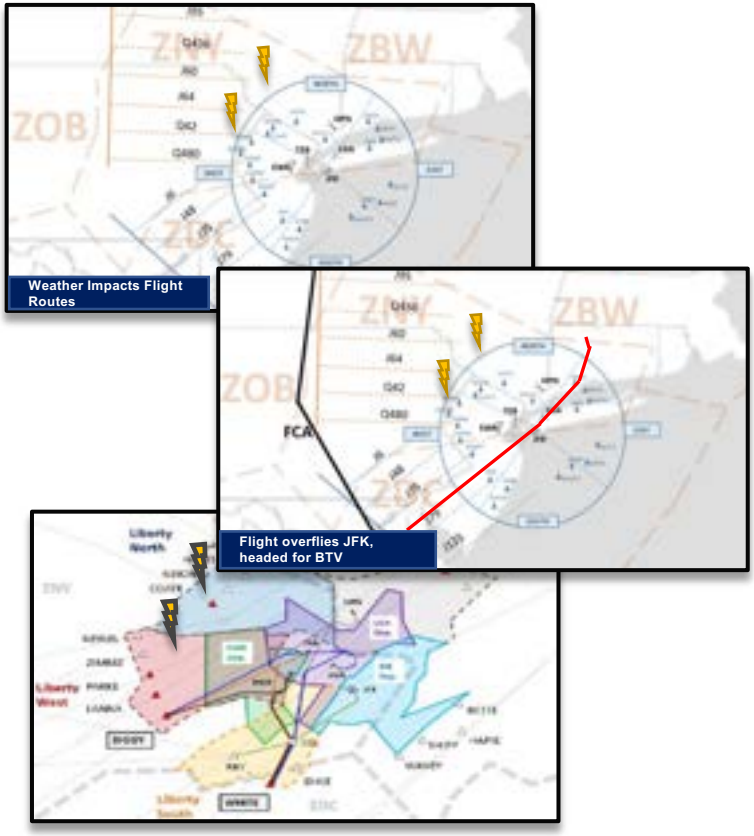
- *TMI Restrictions, Jet Route & fix availability, N90 Airspace Traffic Demand, Weather location, intensity & echo tops*

Airport Surface Operations

Convective weather (e.g., surface winds) creating unfavorable conditions; EWR sees spike in average taxi times, doubling LGA and JFK taxi times.

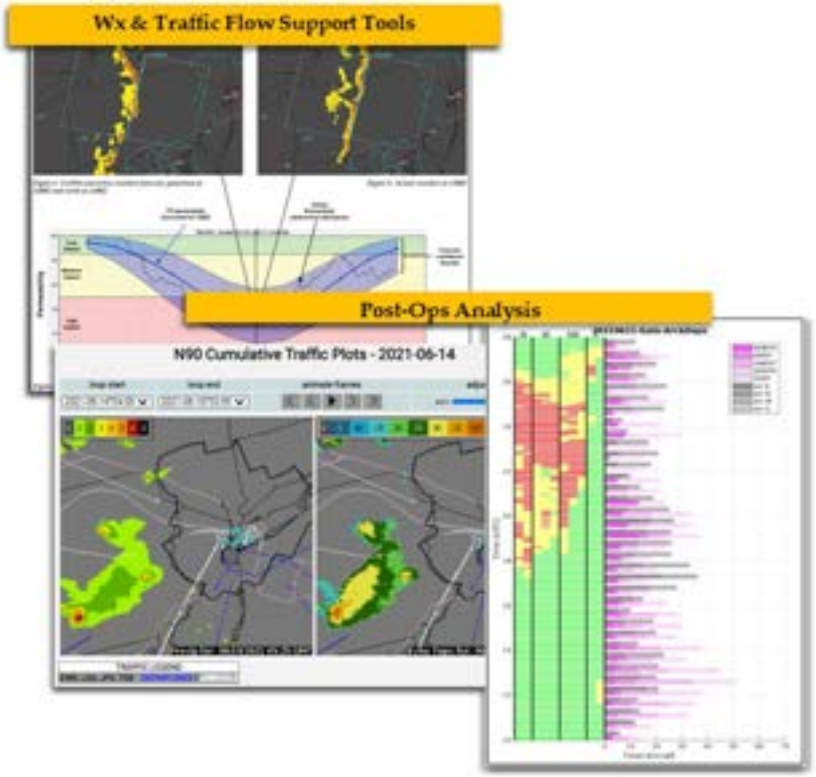
Drivers to Observe:

- *Weather Location & Intensity, Gate & RWY Assignments, Planned Taxi Times, Predicted Flight Demand*



Leveraging Available Tools

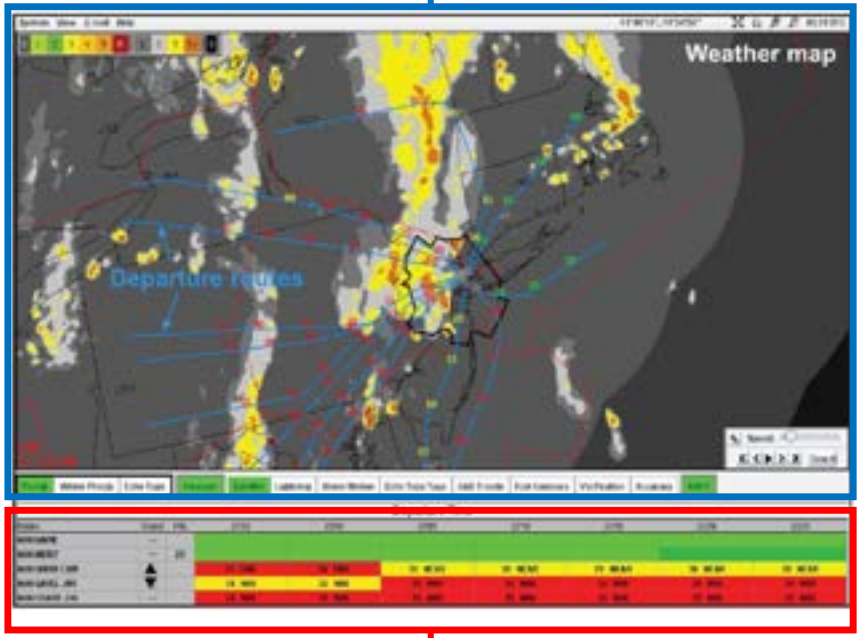
- **SWIM SFDPS, STDDS, and TFMData services**
  - **Identify deviations for N90-bound flight trajectories.**
  - **Correlating trajectory deviations to Surface Ops through SWIM messages.**
    - *Determine correlation between arrival deviations and departure Ops through TMI definition changes that affect departure/ground conditions. [Vignette 3: Airport Surface Ops]*
- **RAPT and TFI tools**
  - **The TFI tool can be used to evaluate the accuracy of selected AFP rates for the FCAs.**
    - *Leverage TFI to translate permeability into a target flow rate (aircraft/hour) representing the historical traffic level that can be sustained across that FCA under convective weather conditions. [Vignette 1: Deviation off Trajectory]*
  - **RAPT precipitation intensity, resource usage and echo tops forecasts can be leveraged to forecast storm impacts for specific flight routes**
    - *Assess RAPT level of impact to specific routes based on precipitation intensity, storm height, and expected pilot or GA flight behavior. [Vignette 2: NBAA Study]*



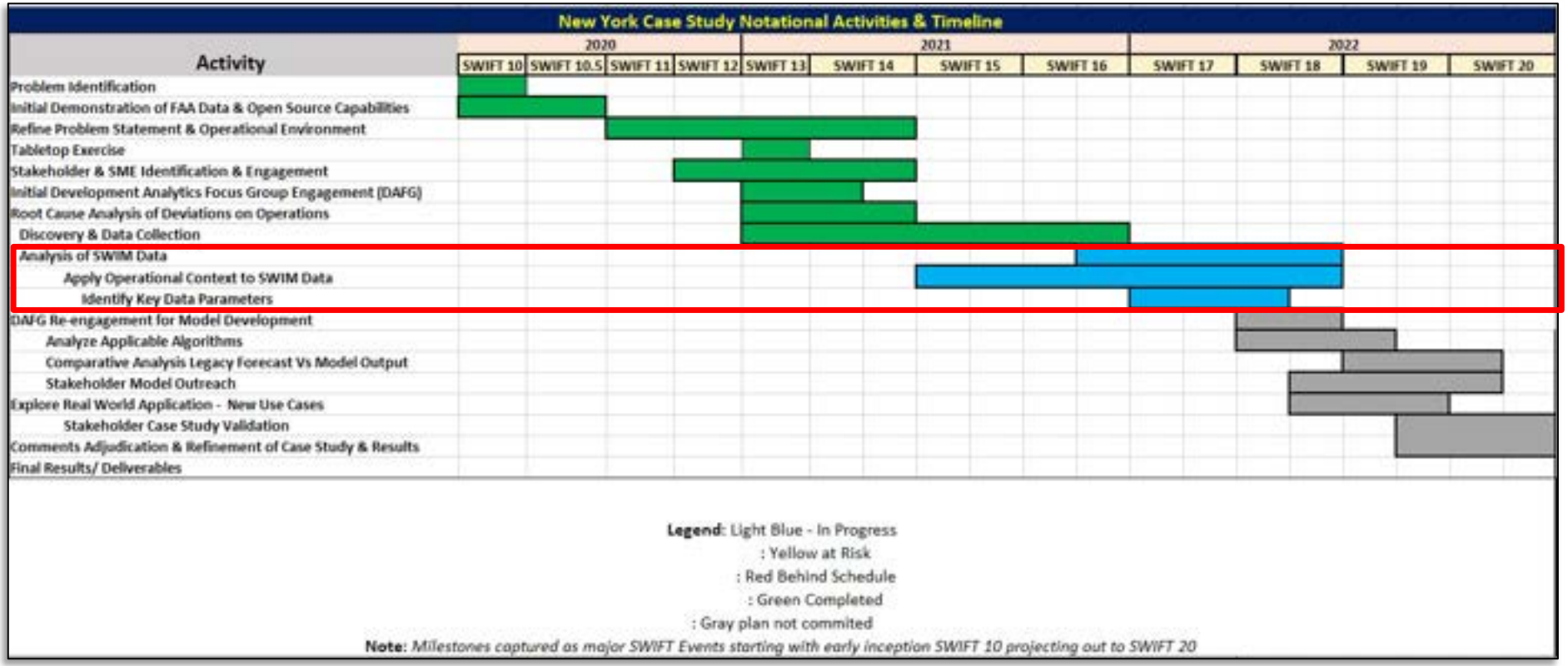
Leveraging SWIM Data

- **RAPT information available in SWIM data feeds…**
  - **TFMData: Flow** service provides the definition and parameters of TMIs, This service contains the **raptTimeline** and **RAPTData** messages available for DEP routes due to convective weather, at RAPT metroplexes.

Data Element	Data Element Definition
CIWSProctTime	Corridor Integrated Weather System (CIWS) weather product Date/Time stamp. The format is YYYY-MM-DDThh:mm:ss, where YYYY indicates the year, MM indicates the month, DD indicates the day, T indicates the start of the required time section, hh indicates the hour, mm indicates the minute, ss indicates the second.
RAPTTimelineData	RAPT timeline data for TSD display.
RouteTrend	Route blockage trend. The format is either INCOMPLETE, STABLE, IMPROVE, DECLINE, or NONE.
PIGTimer	Post-Impact Green (PIG) timer value in minutes. The format is an integer between -1 and 600
RouteBlockageData	RAPT route blockage indicator data
DepartureTime	Departure time for which this blockage data is valid. The format is a 5 character numeric string in the format hh:mm
EchoTop	Echo top value in thousands of feet. The format is an integer between 0 and 255
BlockageStatus	TSD route blockage display color. The format is either INVALID, LIGHT_GREEN, DARK_GREEN, YELLOW, or RED
BlockagePhase	Blockage phase value. The format is either CLIMB, TRANSITION, NEAR, or ENROUTE
HistoricalTrend	Historical route blockage trend
StatusTrend	Historical color trend value for TSD display. The format is either INVALID, LIGHT_GREEN, DARK_GREEN, YELLOW, or RED.
EchoTopTrend	Historical echo top trend value in thousands of feet. The format is an integer between 0 and 255.



Notional “Near Term” Timeline



Want to get involved? Please join us!

Please contact us:

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Information Services Roadmap

SWIFT 17 Update

Presenter: Xavier Pratt – LS Technologies

Date: March 03, 2022

SWIM Services Deployment (Near-Term)

What's New?

TBFM MIS: ***R1.1.0 targeting Spring 2022.*** New JMS properties for message routing based on additional A/C data attributes.

TFDM Build 1: ***IOC on TFDM Build 1.4 (CLE Keysite) October 2022.*** ISD on TFDM Build 1.5 in ***March 2023*** (allows deployment of Build 1 to additional sites)

TFMS: ***R15 targeting Fall 2022.*** Include Reroute Impact Assessment (RRIA). Retirement of FDFE Direct Service; FDFE data exchange replicated in Request/Reply.

SFDPS: Release of COTS update to OS, FUSE software and Hadoop database planned for remainder of 2022

CSS-Wx: ***IOC Targeting 2024.*** Integration with ERAM and system testing at WJHTC. End user systems, SWIM to support CSS-Wx & NWP testing

CSS-FD: ***RRA Industry demo/ testing targeting Q4 2022.*** Gather feedback and findings on FP use case, R&D connection testing and user test client development.

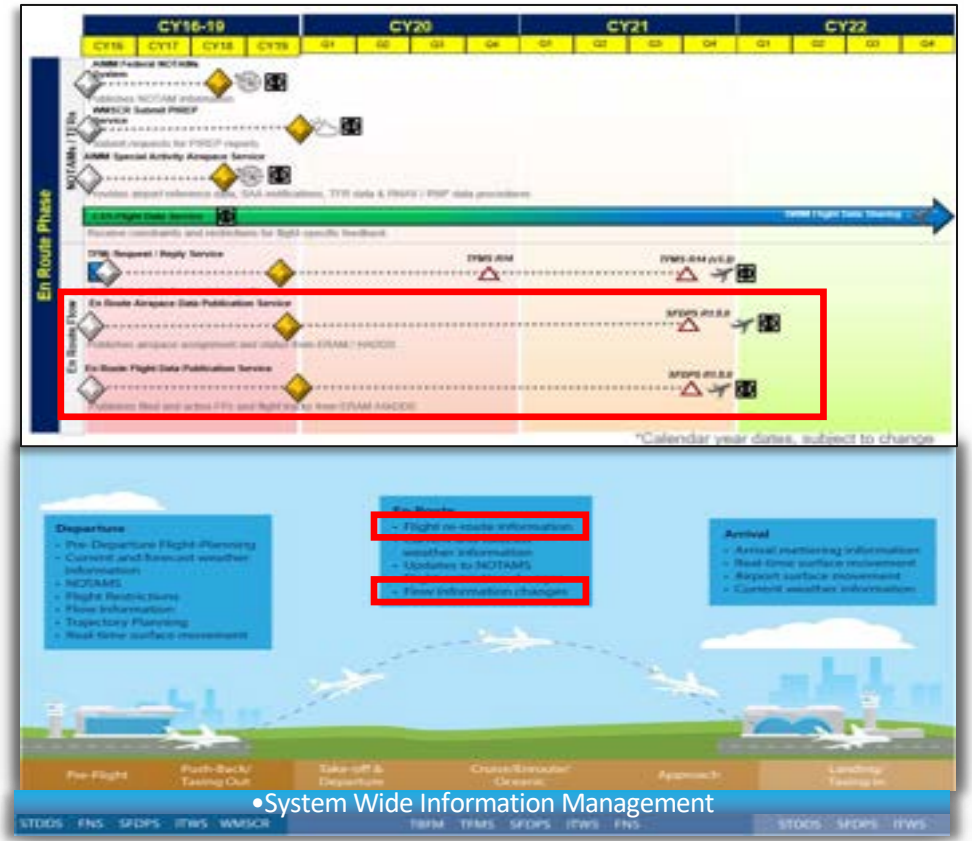
AIMM ACS Ph 2: ***completed Dec 2021.*** Providing integrated aeronautical information via WS subscriptions and queries.

STDDS: ***R6P2 completed Sep 2021.*** Includes TAIS message enhancements, publish additional TDLS messages, and SMES runway event and CAT10 enhancements

SWIM Services (NY Case Study Perspective)

Leverage SWIM services to assess LGA, JFK, EWR, TEB reaction to convective weather…

- **SFDPS R1.5.0 available as of Oct 2021**
  - *Airspace Data: En Route Airspace Data Publication (ERADP) provides Airspace Assignment from ERAM /HADDS. Examine ZNY-bound flights impacts in N90 environment:*
    - *Route Status messages*
    - *Sector Assignment status messages*
  - *Flight Data: En Route Flight Data Publication (ERFDP) publishes filed and active FPs and flight tracks from ERAM/HADDS. Identify ZNY-bound flight deviations at ZOB-ZNY boundary:*
    - *Flight Plan, Flight Plan Update, Flight Amendment, Cancellation*
    - *Hold Information*
    - *Flight Departure, Arrival Information*
    - *Point Out Information, Handoff*
    - *Track Information*
    - *Position Updates*



SWIM Services (NY Case Study Perspective)

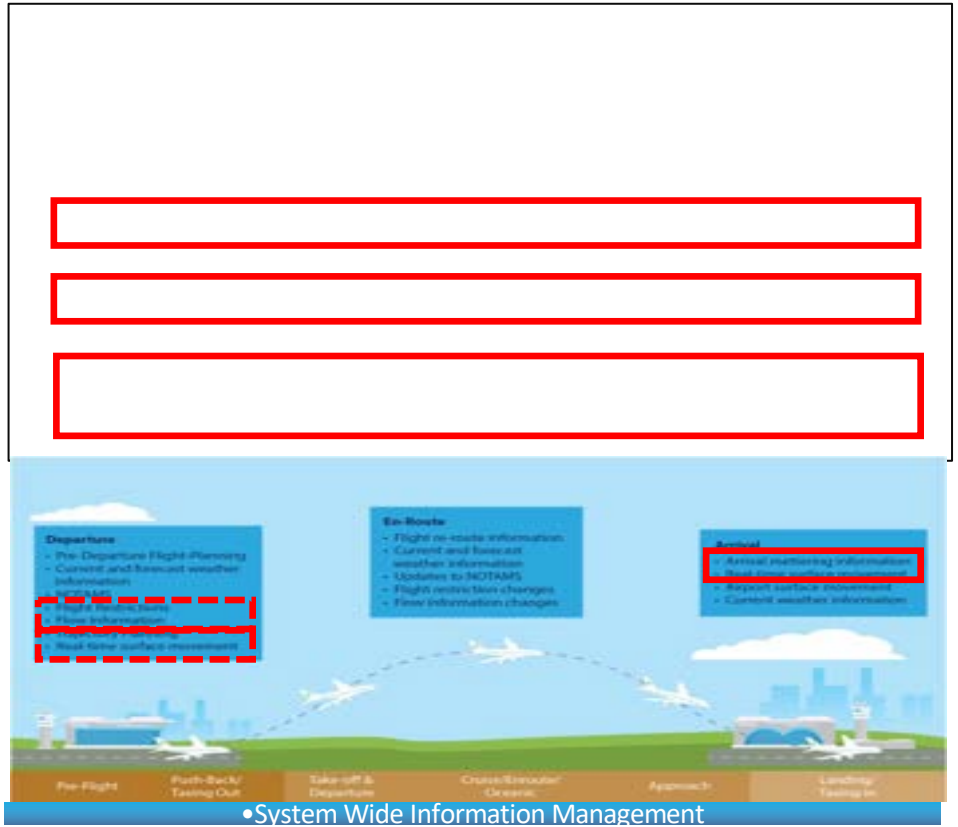
Leverage SWIM services to assess LGA, JFK, EWR and TEB reaction to convective weather…

- **TFMData R14 v3.2 available as of Q4 2021**
  - *Flow Service: Publishes TFMS TFM initiatives and definitions. Correlate ZNY-bound traffic deviations with changes in restriction times in N90 environment:*
    - *AFP Advisory, Cancel, Compression, Update*
    - *FEA/FCA Broadcast*
    - *GDP Advisory, Blanket, Cancel, Compression, Update*
    - *GS Advisory, Cancel, Update*
    - *RAPT Timeline message*
    - *Restriction message*
    - *TMI Flight Data List*
  - *Flight Service: Publishes TFMS Flight Information and CDM data for LGA,TEB, JFK bound flights to observe ZNY traffic flow:*
    - *Flight Plan, Flight Plan Update, Flight Amendment, Cancellation*
    - *Boundary Crossing Update*
    - *Departure Information*
    - *NCSM Flight Sectors, Flight Schedule Activate, Flight Control, Flight Times*

SWIM Services (NY Case Study Perspective)

Leverage SWIM services to assess LGA, JFK, EWR, and TEB reaction to convective weather…

- **STDDS R6P2 available as of Sept 2021**
  - *Airport Flight Tracks: Terminal Automation Information Service (TAIS) publishes live FP, track data and traffic count data from STARS:*
    - *! "#!$%& '#%()#*+,-./#0+%(*
    - **1"2*3"#4$5%)&%6/*
  - *Airport Movement: Surface movement Event Service (SMES) publishes aircraft movement from JFK, LGA, and TEB aircraft track positions (ASDE-X/ASSC):*
    - *"7819:#;<66%-<*
    - *7=$>%&<#?5@<;<(/#1@<(/#;<66%-<*
  - *Airport Departures: Tower Departure Event Service (TDES) publishes EFSTS and D-ATIS N90 departure events:*
    - *3+<%$%(&<#8<+,@<$<)#,(>5$;%/,5(*
    - *89"!A7#,(>5$;%/,5(*
- **TFDM – TTP for NY airports (Future Case Study Enhancement)**
  - *Surface Management: TTP Build 1 will enhance the prediction model by providing N90 Airport and Flight Information along with specific demand/delay information and airport-initiated departure stop restrictions:*
    - *",$B5$/#A(>5$;%/,5(#;<66%-<6*
    - **+,-./#8<+%C#?<66%-<6*
    - *7=$>%&<#?</<$,(-#0$5-$%;60#!$%>>,&#?%(%-<;<(/#E<6/$,&/,5(6#A(>5$;%/,5(*



SWIFT Portal Community Forum

Presented to: SWIFT #17

By: SWIM Communications & Outreach Team

Date: March 3, 2022

Federal Aviation Administration

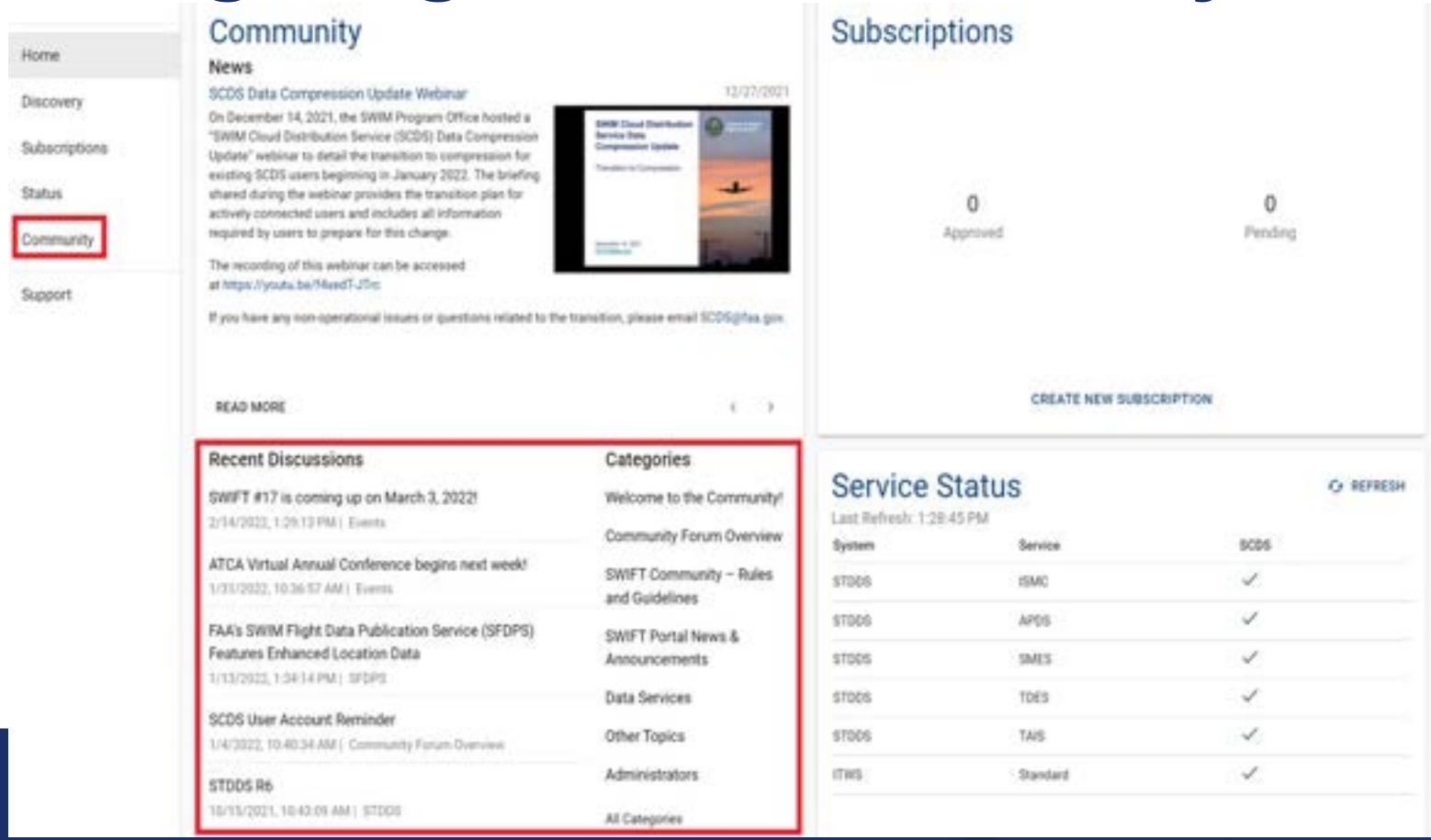
Community Forum Overview

The SWIFT Portal Community Forum is a place to interact with members of the SWIM Community, discuss ideas, and stay up-to-date on the latest news and events.

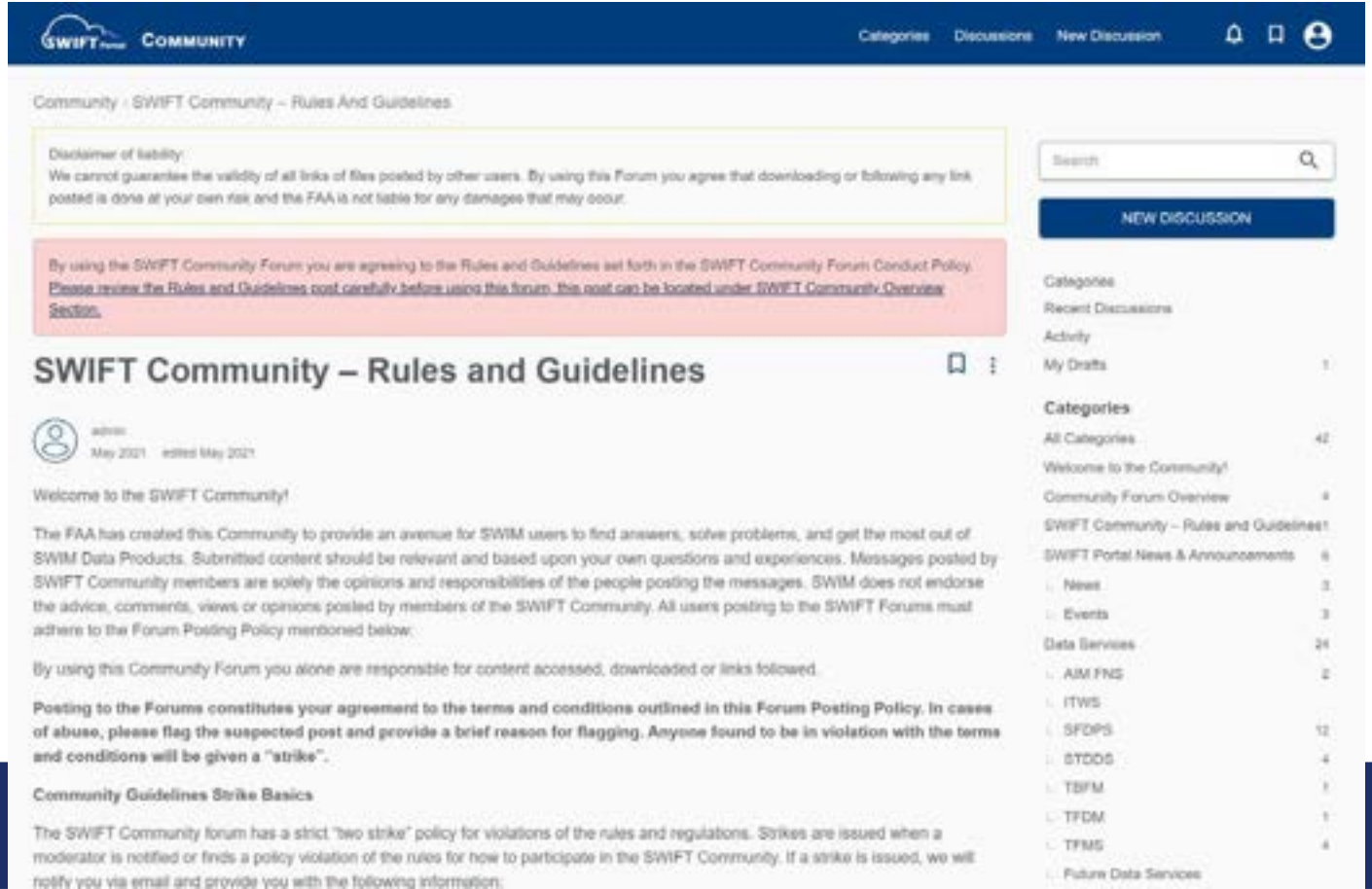
To get started, visit:
https://community.swim.faa.gov/

or scan the QR code above

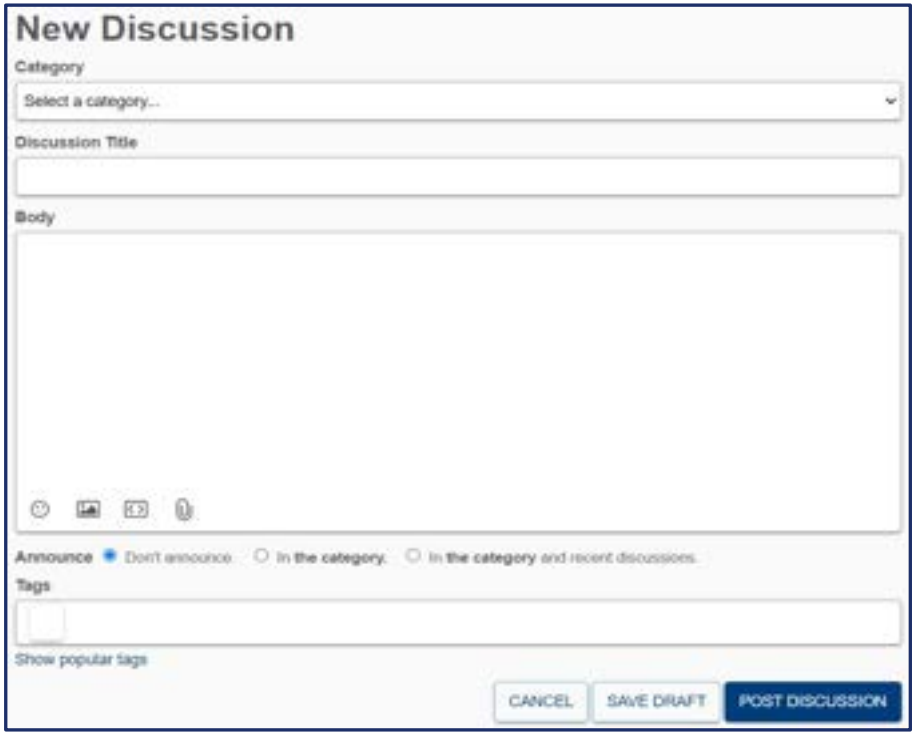
Navigating to the Community Forum

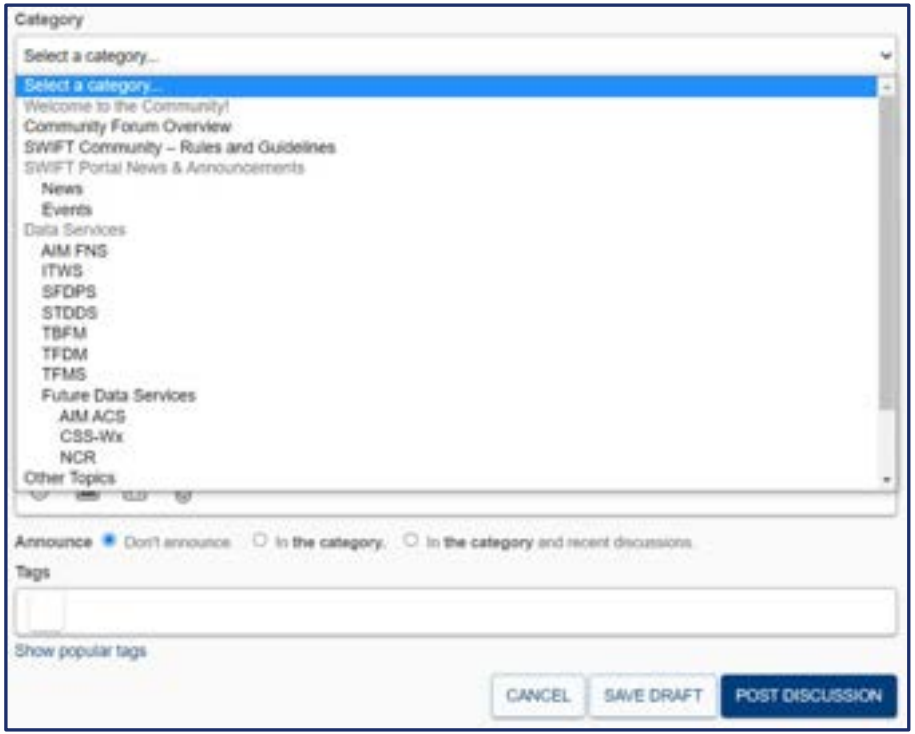


Rules and Guidelines



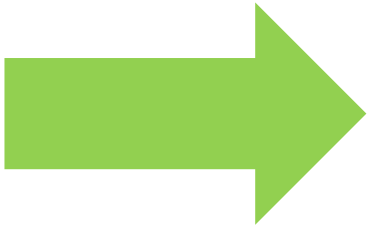
Creating a Discussion Post

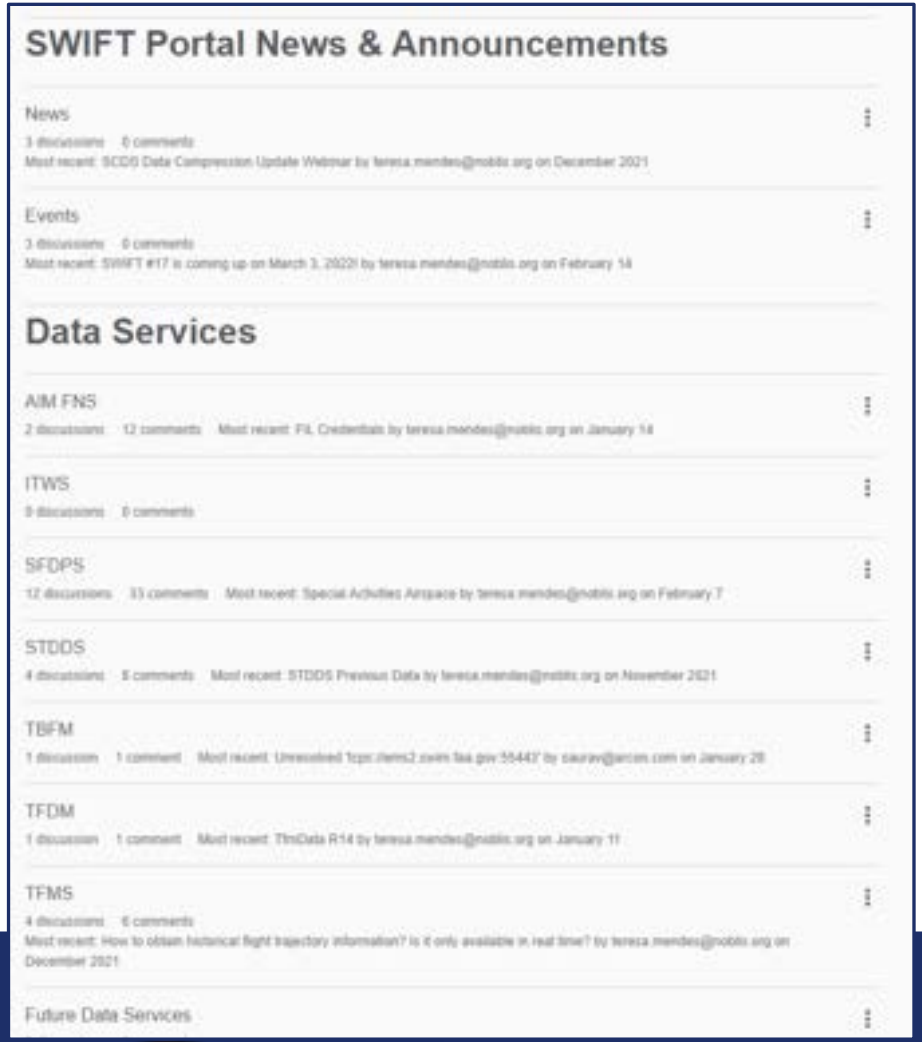




Categories and Tags

Select a Category that best fits your new Discussion Post





Notification Preferences

Adjust your Notification Preferences so you don’t miss any engaging discussions!

Get Involved!

- All users are welcome to post questions and/or respond to other users
  - **We strongly encourage you to engage with other Community members through the Community Forum!**
- The SWIM Team actively reviews discussion posts to ensure questions/comments are responded to in a timely manner
- For FAQs, Guides (including Familiarization Videos), or to Ask a Question please visit the SWIFT Portal Support Page
  - https://support.swim.faa.gov

Final Announcements

#18 Virtual Workshop

Date

- **Wednesday, May 25th**

Location

- ***Online***

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

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Back Up Slides

NY Area Case Study

Information Gaps SWIM Data (Summary)

Identified Information Gap during IROP Event	Relevant SWIM Service	Impacted NAS Stakeholder	Disrupted Operation
Need to aggregate data on DEP fix constraints to support alerting around crew issues.	SFDPS – En Route Airspace Data Publication	Flight Operator	Departure Deviations
Speed restrictions may be imposed at ARTCC when traffic begins to flow off-nominally. In certain cases, this may not be communicated to TRACON. In this case, speed restrictions could be deduced from the radar view (e.g. observing ground speeds).	SFDPS – En Route General Data	ATC, ARTCC & TRACON	Departure Deviations
Knowledge of where a pop-up storm could develop that could lead to deviations on a route. We could then coordinate ways around the weather, or ways outbound. Knowledge of when to reroute flights on the ground waiting; estimates on how long fixes would be impacted to make use of all available routes. This supports decision points for dispersing traffic over multiple available fixes.	TFMData: Flow, TFM:Data Flight, Integrated Terminal Weather System (ITWS)	ATC TRACON	Departure Deviations
Need to understand when and why ATC issues flight reroutes or events that involve changing a flight trajectory (e.g. DEP fix, ARR fix, waypoints)	SFDPS – En Route Flight Data Query, TFMData: Flow	Flight Operator	Arrival Deviations
During severe weather, we would want to move traffic out of ZNY, away from departures. Given ZNY tight route structure and coordination, we must know when and where to cut off the line and reroute flights..	SFDPS – En Route Flight Data, TBFM Metering Information Service, ITWS	ATC ARTCC & TRACON	Arrival Deviations
During weather events, we would typically restrict the entire flow into ZNY airports (e.g. AFPs, GDPS, etc.), but sometimes only the southern routes require restrictions. Combining routes (which is difficult to do in TRACON space) is something that wasn't done enough. ZDC does this routinely, which also helped manage flows into EWR and LGA without needing a GDP (ZNY-bound flights).	TFMData: Flow, SFDPS – En Route Data Airspace Query	ATC TRACON	Arrival Deviations

SFPDS Flight & Airspace Data Messages

SWIM Flight Data Publication Service (SFDPS)*: Provides flight data and updates to clients for filed and active flight plans			
✓	Flight Plan information	✓	Tentative Aircraft identification Amendment Information
✓	Flight Amendment Information	✓	Tentative Flight Plan Removal
✓	Converted Route Information	✓	Tentative Flight Plan Amendment Information
✓	Cancellation Information	✓	Track Information
✓	Departure Information	✓	Drop Track Information
✓	Aircraft Identification Amendment Information	✓	Interim Altitude Information
✓	Hold Information	✓	Automated Radar Terminal System (ARTS) Flow Control Track/Full Data Block Information
✓	Progress Report Information	✓	Beacon Code Reassignment
✓	Flight Arrival Information	✓	Beacon Code Restricted
✓	Flight Plan Update Information	✓	Flight Plan Data Bank (FDB) Fourth Line Information
✓	Expected Departure Time Information	✓	Point Out Information
✓	Position Update Information	✓	Inbound Point Out Information
✓	Tentative Flight Plan Information	✓	Handoff Status

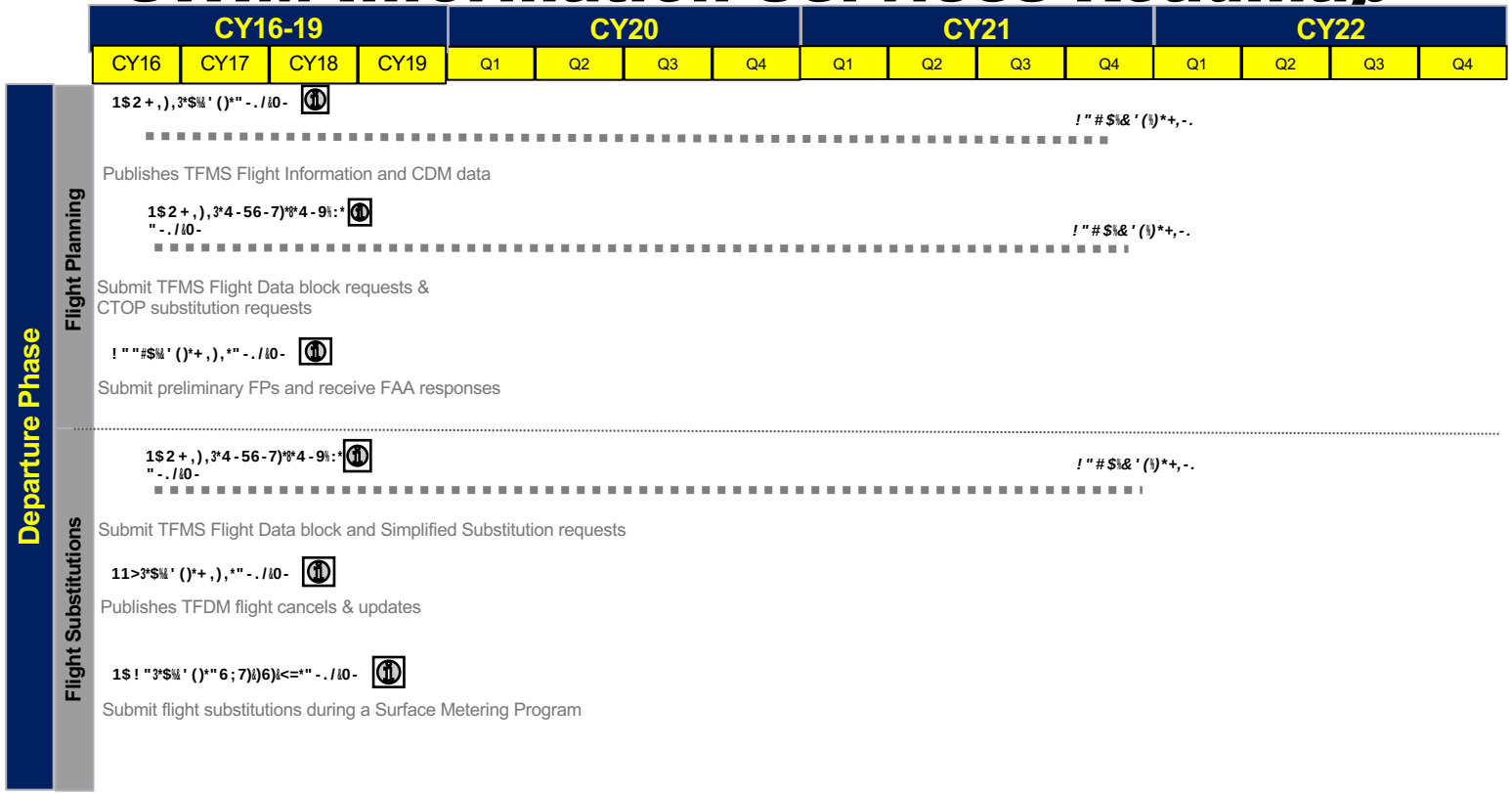
Airspace Data Publication Service*: Published by SFDPS			
✓	Sector Assignment Status	✓	Special Activities Airspace (SAA)
✓	Route Status	✓	Altimeter Setting
Operational Data Publication Service*: Published by SFDPS			
✓	Traffic Count Adjustment	✓	Beacon Code Utilization
✓	Instrument Approach Count Adjustment	✓	Geographic Beacon Code Utilization
✓	Sign In Sign Out		
General Information Message Publication Service*: Published by SFDPS			
✓	General Information		

ITWS Data Messages

Weather Data	
Integrated Terminal Weather System (ITWS) Data Publication: Provides specialized weather products in the terminal area	
✓ Configured Alerts	✓ Tornado Detections Wind Profile
✓ Forecast Accuracy	✓ Anomalous Propagation (AP) Indicated Precipitation
✓ Forecast Contour	✓ AP Status
✓ Forecast Image	✓ Gust Front Estimated Time to Impact
✓ Gust Front TRACON Map	✓ Hazard Text 5nm
✓ Microburst TRACON Map	✓ Hazard Text Long Range
✓ Precipitation 5nm	✓ Hazard Text TRACON
✓ Precipitation Long Range	✓ ITWS Status Information
✓ Precipitation TRACON	✓ Microburst Automatic Terminal Information Service (ATIS)
✓ Storm Motion (SM) Storm Extrapolated Positions (SEP) 5nm	✓ Runway Configuration
✓ SM SEP Long Range	✓ Storm Motion 5NM
✓ SM SEP TRACON	✓ Storm Motion TRACON
✓ Terminal Weather Text Normal	✓ Terminal Weather Text Special
✓ Tornado Alert	✓ Wind Shear ATIS

Information Services Roadmap

SWIM Information Services Roadmap



Aeronautical Data

Flight/Flow Data

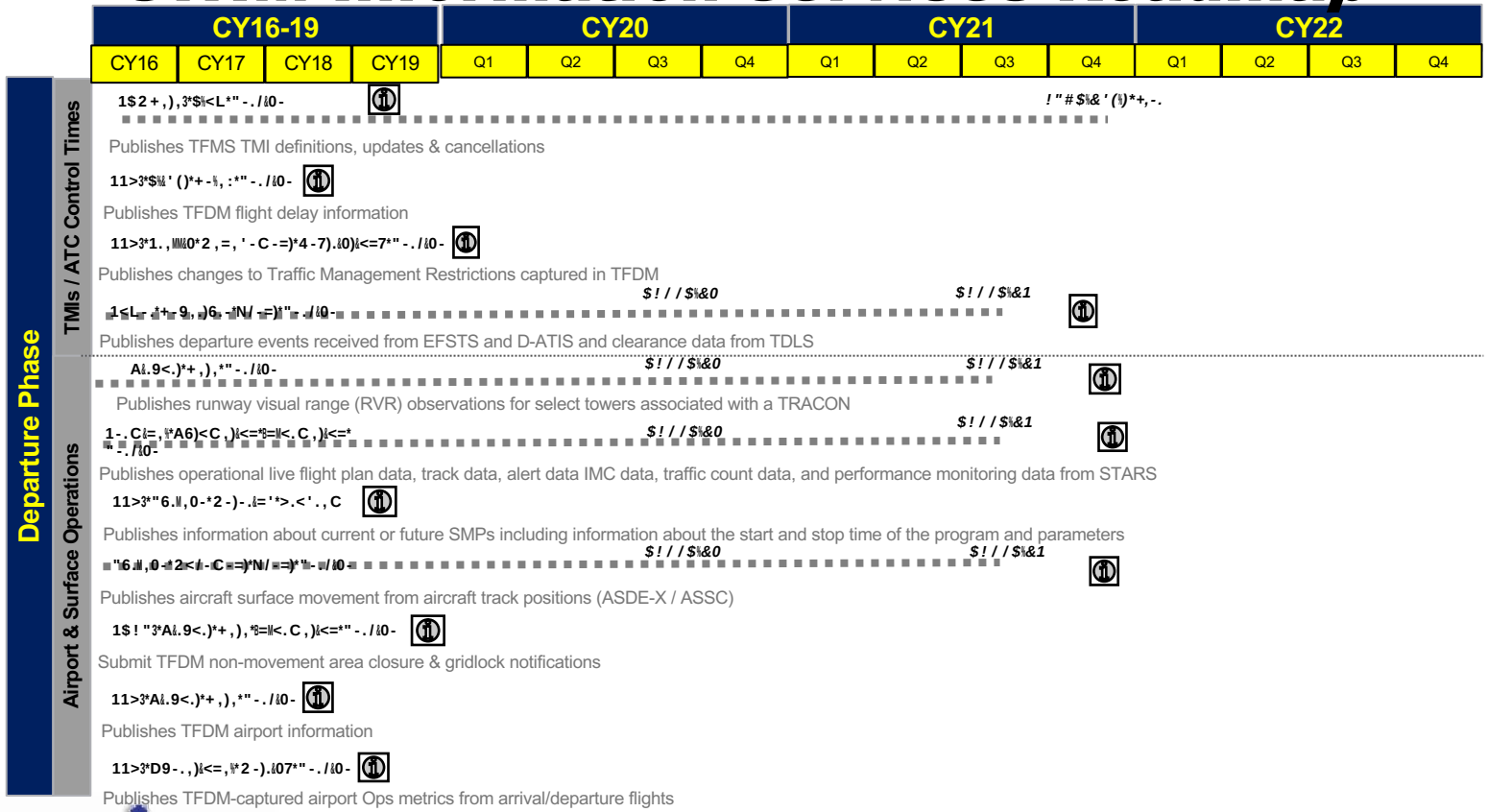
Surveillance Data

Weather Data

Service Information

*Calendar year dates, subject to change

SWIM Information Services Roadmap



*Calendar year dates, subject to change

Aeronautical Data

Flight/Flow Data

Surveillance Data

Weather Data

Service Information

SWIM Information Services Roadmap

CY16-19				CY20				CY21				CY22			
CY16	CY17	CY18	CY19	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

En Route Phase

Aeronautical Information & NAS Status

A ! "*+ ,) , *"6 ; 70.i9)i<=*" - . / i0 -

Publishes changes to Aeronautical Information Data. Sourced from SAA, NAV Lean, SAMS/MADE, other AIMM sources

A ! "*Ai.79 , 0 - *! <=i%0)*+ -) - 0)i<=*" - . / i0 -

Provides conflict detection information between the scheduled airspace and protected airspace under restrictions or reservations from SAA, NAV Lean, SAMS/MADE and other AIMM sources

A ! "*+ ,) , *O6 - . : *" - . / i0 -

Allows users to request and retrieve, or subscribe to, multiple user-defined subsets of Aeronautical Information

A ! "*P - <@ -)i0*! < C 96) ,)i<=*" - . / i0 -

Provides the magnetic declination of a specific point on earth, for a given date, based on data from the National Geodetic Data Center from SAA, NAV Lean, SAMS/MADE, other AIMM sources

A ! "*><7)*D97*" - . / i0 -

Allows users to define and request metrics for existing Aeronautical Information from SAA, NAV Lean, SAMS/MADE and other AIMM sources

A ! "* I - ; *$ - ,)6. - *" - . / i0 -

Allows users to submit queries to return aeronautical features using AIXM features (e.g., airports, navaids, obstacles, procedures, and NOTAMs) that match the query. Sourced from SAA, NAV Lean, SAMS/MADE, and other AIMM sources

A ! "* I - ; *2 , 9*" - . / i0 -

Allows users to produce maps of spatially referenced data dynamically from geographic information as JPEGs, PNGs or GIFs. Sourced from SAA, NAV Lean, SAMS/MADE and other AIMM sources

A ! "* I - ; *2 , 9*1i% - *" - . / i0 -

Allows users to produce a map tile of spatially referenced data dynamically from geographic information, using tile images. Sourced from SAA, OAS, FNS, SAMS/MADE, and eNASR / eNFDD

2 3 &i% & ' , '

QA"*! < C C <=*4 - i% - . - =0 - *i% - i / i0 -

Allows users to consolidate and corelate NAS data and filter NAS constraints based on entered flight route

*Calendar year dates, subject to change

- Aeronautical Data
- Flight/Flow Data
- Surveillance Data
- Weather Data

Service Information

SWIM Information Services Roadmap

	CY16-19				CY20				CY21				CY22			
	CY16	CY17	CY18	CY19	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
En Route Phase																
Weather Data																

8=)-'.,)-@*1-.C&=,%*I-,)(-.*":7)-C

Publishes weather information in graphic and textual formats

!""#IE*I-;*!</-.,'-*"-./&0-

Publishes gridded WXXM weather data products to users that request the information

!""#IE*I-;*2,9*"-./&0-

Allows users to request multiple images from a WMS server and overlay them into a single view

!""#IE*I-;*2,99&='*1&&-*"-./&0-

Allows users to use predetermined maps to cache map tiles as a scalable solution and pre-render images with a default set of map characteristics

!""#IE*I-;*2,99&='*1&&-*"-./&0-

Publishes non-gridded WXXM weather data products that have XML based encodings

Aeronautical Data

Flight/Flow Data

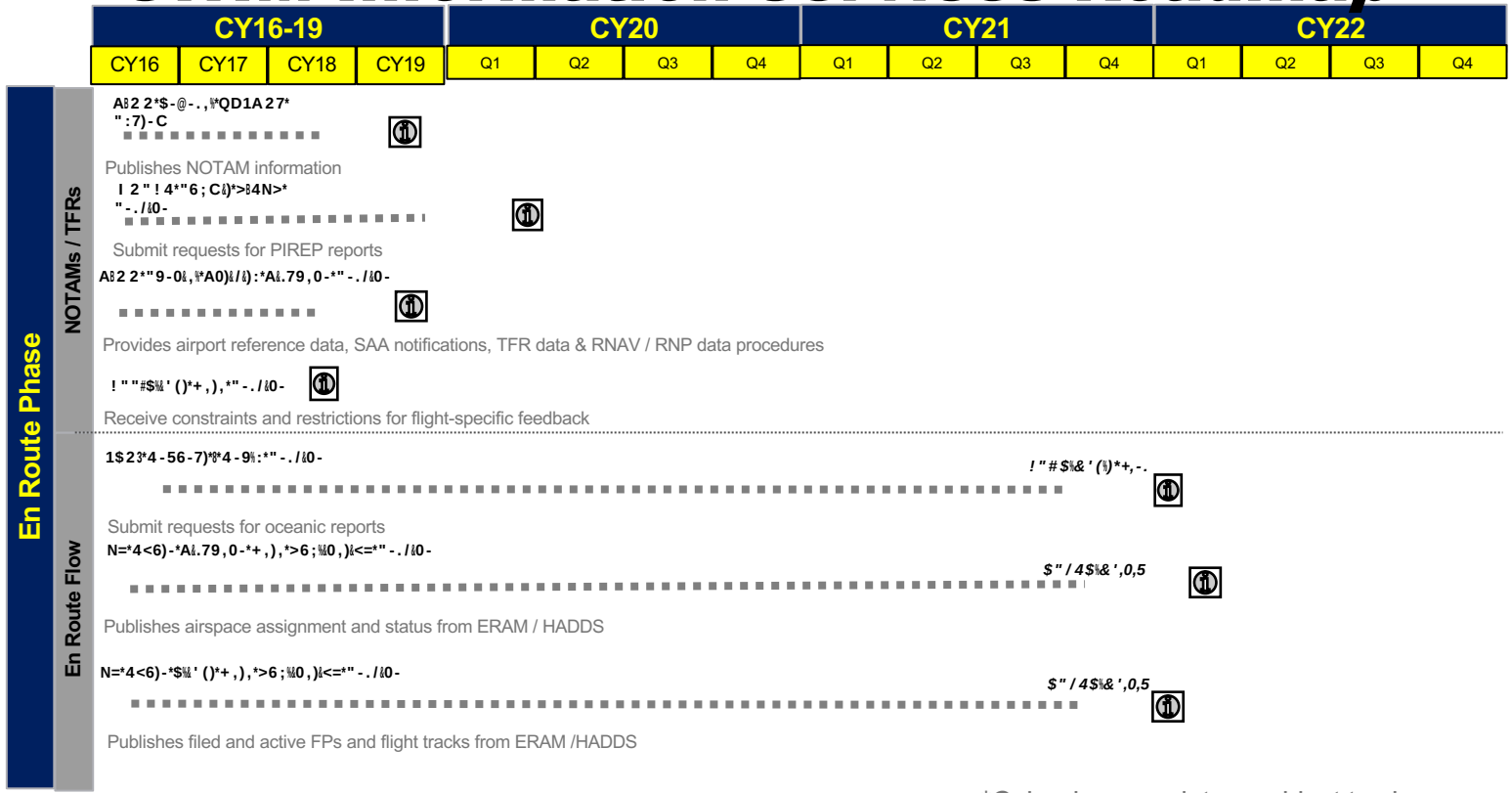
Surveillance Data

Weather Data

•*Calendar year dates, subject to change

•Service Information

SWIM Information Services Roadmap



Aeronautical Data

Flight/Flow Data

Surveillance Data

Weather Data

Service Information

*Calendar year dates, subject to change

SWIM Information Services Roadmap

CY16-19				CY20				CY21				CY22			
CY16	CY17	CY18	CY19	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Arrival Phase

Airport & Surface Operations

1F$23*2-)-.i='*%=ll<.C,)i<=*"-./i0-

!6"#%#7$%&',',5

Publishes of aircraft metering information, airport configuration and adaptation data

Ai.9<.)*+,),*"-./i0-

$!//$%&0 ***$!//$%&1***

Publishes runway visual range (RVR) observations for select towers associated with a TRACON

1-.Ci=,i*A6)<C,)i<=*%=ll<.C,)i<=*
$!//$%&0 ***$!//$%&1***
"-./i0-

Publishes operational live flight plan data, track data, alert data IMC data, traffic count data, and performance monitoring data from STARS

11>3*"6.ll,0-*2-)-.i='*>.<'.,C

Publishes information about current or future SMPs including information about the start and stop time of the program and parameters

"6.ll,0-*2</-C-=)*N/-=)*"-./i0-

Publishes aircraft surface movement from aircraft track positions (ASDE-X / ASSC)

1$!"3*Ai.9<.)*+,),*%=ll<.C,)i<=*"-./i0-

Submit TFDM non-movement area closure & gridlock notifications

11>3*Ai.9<.)*+,),*"-./i0-

Publishes TFDM airport information

11>3*D9-.,)i<=,i*2-).i07*"-./i0-

Publishes TFDM-captured airport Ops metrics from arrival/departure flights

*Calendar year dates, subject to change

- Aeronautical Data
- Flight/Flow Data
- Surveillance Data
- Weather Data

Service Information

ITWS

•Back to Roadmap

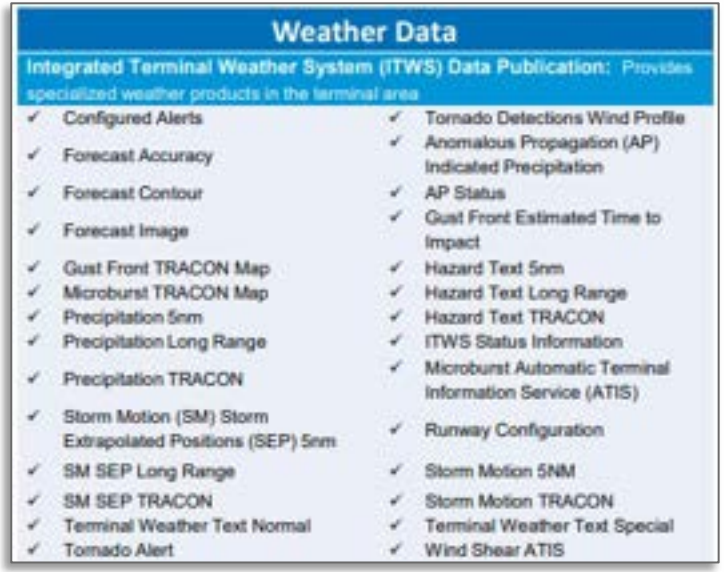
Service Description

- ITWS receives data from a variety of weather and surveillance radars and sensors and converts this data to a format understandable by various software components able to present current weather information in graphic and text formats.

Service Interface

- Publish/Subscribe via JMS

Message Sets



Weather Data

Integrated Terminal Weather System (ITWS) Data Publication: Provides specialized weather products in the terminal area

- ✓ Configured Alerts
- ✓ Forecast Accuracy
- ✓ Forecast Contour
- ✓ Forecast Image
- ✓ Gust Front TRACON Map
- ✓ Microburst TRACON Map
- ✓ Precipitation 5nm
- ✓ Precipitation Long Range
- ✓ Precipitation TRACON
- ✓ Storm Motion (SM) Storm Extrapolated Positions (SEP) 5nm
- ✓ SM SEP Long Range
- ✓ SM SEP TRACON
- ✓ Terminal Weather Text Normal
- ✓ Tornado Alert
- ✓ Tornado Detections Wind Profile
- ✓ Anomalous Propagation (AP) Indicated Precipitation
- ✓ AP Status
- ✓ Gust Front Estimated Time to Impact
- ✓ Hazard Text 5nm
- ✓ Hazard Text Long Range
- ✓ Hazard Text TRACON
- ✓ ITWS Status Information
- ✓ Microburst Automatic Terminal Information Service (ATIS)
- ✓ Runway Configuration
- ✓ Storm Motion 5NM
- ✓ Storm Motion TRACON
- ✓ Terminal Weather Text Special
- ✓ Wind Shear ATIS

SFDPS - *En Route Flight Data Publication (ERFDP)*

•Back to Roadmap

Service Description

– The En Route Flight Data Publication Service publishes flight plan, track, and other flight-related messages. Data published are derived completely from Common Message Set (CMS) messages received by SWIM Flight Data Publication Service (SFDPS) from the Host Air Traffic Management (ATM) Data Distribution System (HADDS) at each of the Contiguous United States (CONUS) Air Route Traffic Control Centers (ARTCCs). The source of the data received by HADDS is the En Route Automation Modernization (ERAM) at the ARTCC.

Service Interface

– Publish/Subscribe via JMS
– Request via SOAP WS with Replay via Subscribe JMS

Message Sets

SWIM Flight Data Publication Service (SFDPS)*: Provides flight data and updates to clients for filed and active flight plans

✓	Flight Plan information	✓	Tentative Aircraft identification Amendment Information
✓	Flight Amendment Information	✓	Tentative Flight Plan Removal
✓	Converted Route Information	✓	Tentative Flight Plan Amendment Information
✓	Cancellation Information	✓	Track Information
✓	Departure Information	✓	Drop Track Information
✓	Aircraft Identification Amendment Information	✓	Interim Altitude Information
✓	Hold Information	✓	Automated Radar Terminal System (ARTS) Flow Control Track/Full Data Block Information
✓	Progress Report Information	✓	Beacon Code Reassignment
✓	Flight Arrival Information	✓	Beacon Code Restricted
✓	Flight Plan Update Information	✓	Flight Plan Data Bank (FDB) Fourth Line Information
✓	Expected Departure Time Information	✓	Point Out Information
✓	Position Update Information	✓	Inbound Point Out Information
✓	Tentative Flight Plan Information	✓	Handoff Status

•**Latest News**

- **SFDPS R1.5.0 Preliminary deployment completed October 2021**
  - Update SFDPS software: SFDPS OARS table allowing current available data fields to be delivered to SFDPS from ERAM. Correct software defects tracked with Jira Tracking Tool. Flight Plan, Flight Plan Amendment and Flight Plan Update
  - Data Base Reconstitution: Flight Plan and Track

SFDPS - *En Route Airspace Data Publication (ERADP)*

•Back to Roadmap

Service Description

- The En Route Airspace Data Publication service publishes route, sector, altimeter setting, and special activities airspace information. Data published are derived completely from Common Message Set (CMS) messages received by SWIM Flight Data Publication Service (SFDPS) from the Host Air Traffic Management (ATM) Data Distribution System (HADDS) at each of the 20 Contiguous United States (CONUS) Air Route Traffic Control Centers (ARTCCs). The source of the data received by HADDS is the EnRoute Automation Modernization (ERAM) at the ARTCC.

Service Interface

- Publish/Subscribe via JMS
- Request via SOAP WS with Replay via Subscribe JMS

Message Sets

Airspace Data Publication Service*: Published by SFDPS			
✓	Sector Assignment Status	✓	Special Activities Airspace (SAA)
✓	Route Status	✓	Altimeter Setting
Operational Data Publication Service*: Published by SFDPS			
✓	Traffic Count Adjustment	✓	Beacon Code Utilization
✓	Instrument Approach Count Adjustment	✓	Geographic Beacon Code Utilization
✓	Sign In Sign Out		
General Information Message Publication Service*: Published by SFDPS			
✓	General Information		

•**Latest News**

- **SFDPS R1.5.0 Preliminary deployment completed October 2021**
- Update SFDPS software: SFDPS OARS table allowing current available data fields to be delivered to SFDPS from ERAM. Correct software defects tracked with Jira Tracking Tool.
  - Route Status messages: Provides an increase in a data field
  - Data Base Reconstitution: Route Status
  - Special Activity Airspace (SAA): Updated with additional data to reflect expanded controller changes to SAA schedules

SFDPS - *En Route General Message Publication (ERGMP)*

•Back to Roadmap

Service Description

- The En-Route General Message Publication Service publishes general information and status messages. Data published are derived completely from Common Message Set (CMS) messages received by SWIM Flight Data Publication Service (SFDPS) from the Host Air Traffic Management (ATM) Data Distribution System (HADDS) at each of the Contiguous United States (CONUS) Air Route Traffic Control Centers (ARTCCs). The source of the data received by HADDS is the En Route Automation Modernization (ERAM) at the ARTCC.

Service Interface

- Publish/Subscribe via JMS
- Request via SOAP WS with Replay via Subscribe JMS

Message Sets

Message Name	Description	Supported Properties
ERAM Status Information	The ERAM Status Information message is sent when an ERAM status change occurs.	SourceFacility
General Information	A general information message is used to communicate a free-form text message from one facility to one or more other facilities. The content of the message is free-form text, contained in an inter-facility remarks field.	
Hold Status Information	The Hold Status Information message provides hold information (holding fix, and estimated fix departure time for definite-duration holds) on all active aircraft to a client during the initialization process.	
Interim Altitude Status Information	The Interim Altitude Status Information message provides interim altitude status information on all active aircraft to a client during the initialization process.	
Unsuccessful Transmission Information	The Unsuccessful Information Transmission (UI) message is sent by ERAM when transmission of flight data to a remote facility is unsuccessful either due to a transmission error or because transmission of the flight data to the remote facility is inhibited.	

STDDS - *Airport Data Service (APDS)*

•Back to Roadmap

Service Description

- STDDS Airport Data (APD). The SWIM Terminal Data Distribution System (STDDS) Airport Data (APD) service publishes Runway Visual Range (RVR) data to SWIM consumers. Data includes runway visibility and trend for touchdown, midpoint and rollout, depending on the instrumentation for the runway. Data also includes edge and centerline light intensity settings.

Service Interface

- Publish/Subscribe via JMS

Message Sets

Message Name	Description	Supported Properties
RVR Data Update Message	Sent periodically (nominally every 60 seconds) and upon change of any published fields received from RVR.	airport

WMSCR – *Submit PIREP Service*

•Back to Roadmap

Service Description

- The Weather Message Switching Center Replacement System (WMSCR) collects, processes, stores, and disseminates textual aviation weather products such as PIREPs and Altimeter data.

Service Interface

- Publish/Subscribe via JMS

Message Sets

WMSCR PIREP Data Publication	• PIREPs	• Altimeter settings

STDDS – *Tower Departure Event Service (TDES)*

•Back to Roadmap

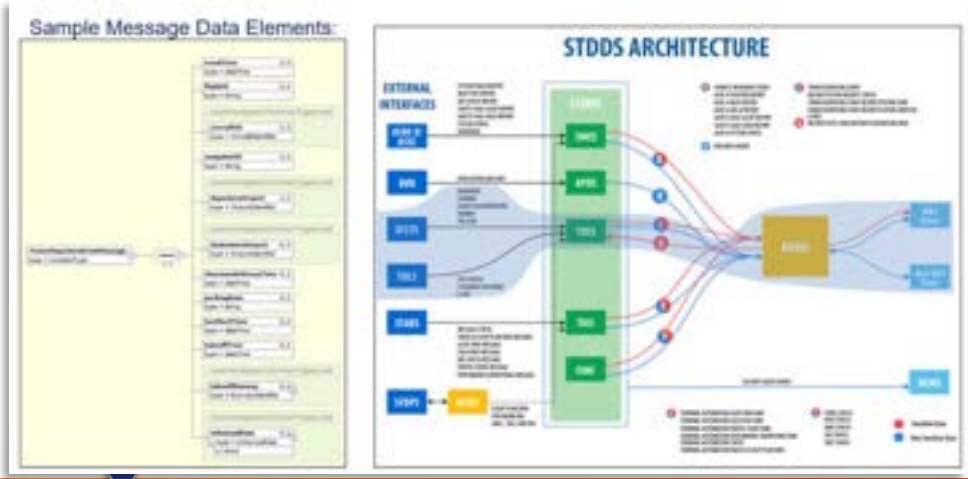
Service Description

- STDDS Airport Data (APD). The SWIM Terminal Data Distribution System (STDDS) Airport Data (APD) service publishes Runway Visual Range (RVR) data to SWIM consumers. Data includes runway visibility and trend for touchdown, midpoint and rollout, depending on the instrumentation for the runway. Data also includes edge and centerline light intensity settings.

Service Interface

- Publish/Subscribe via JMS

Message Sets



•Latest News

•STDDS Ph2R6 completed September 2021

- Publish additional TDLS data in TDES messages
  - Adds beacon code, ECID and aircraft type from TDLS to all TDES messages except the D-ATIS message.
- Parse and publish entire dataHeader in DATISMessage
  - Includes the Data Type, ATIS code, and Data Generation Timestamp found in the DATIS message header –
  - R6 will continue publishing the dataHeader field containing raw D-ATIS data, for backwards compatibility.

STDDS – *Surface Movement Event Service (SMES)*

•Back to Roadmap

Service Description

- The Surface Movement Event Service sends derived surface movement events for all aircraft monitored at select towers associated with a TRACON. In addition, the service sends ASDE-X/ASSC track positions for all aircraft and vehicles collected from towers associated with a TRACON.

Service Interface

- Publish/Subscribe via JMS

Message Sets

Message Name	Description	Supported Properties
ASDEX Message	Sent upon the receipt of a System Track message, a Status message, an ADS-B Plot Report, or a MLAT Plot Report from ASDE-X or ASSC. The MsgType indicates the type of message as follows: AT – PositionReportAY – SystemStatus AD - adsbReport ML - mlatReport	airport
Safety Logic Alert Report	Sent upon the receipt of a Safety Logic Alert Report from ASDEX or ASSC.	
Safety Logic Hold Bar Message	Sent periodically (nominally every 60 seconds) and upon change of any published fields received from ASDE-X or ASSC.	
Surface Movement Event Message	Provides surface movement events derived from ASDE-X or ASSC position data.	

•**Latest News**

- **STDDS Ph2R6 completed September 2021**
- Enhance SMES with 2 additional airport movement events:
  - Runway in—target has entered the geographical boundaries (lat/lon) of a runway
  - Runway out—target has exited the geographical boundaries (lat/lon) of a runway
- Add *_COVAR and DF type fields to the MLAT and ADSB CAT10 messages to improve track precision measure
- Extend SFDPS data enhancement to the ASDE-X/ASSC CAT10 data (MLAT and ADSB messages)

STDDS – *Terminal Automation Information Services (TAIS)*

•Back to Roadmap

Service Description

- The Terminal Automation Information Service (TAIS) publishes operational live flight plan data, track data, alert data, Instrument Meteorological Conditions (IMC) data, traffic count data, and performance monitoring data from the Standard Terminal Automation Replacement System (STARS) to authorized SWIM service consumers.

Service Interface

- Publish/Subscribe via JMS

Message Sets

Message Name	Description	Supported Properties
TA Status	STARS status sent periodically (nominally every 60 seconds) and upon change of any published fields received from STARS.	Source Tracon
TA Track and Flight Plan	A package of track and flight plan data. Only track data with altitude below an adaptable threshold (nominally 18000ft) is published.	
TA Raw	Full base64 encoded contents of a STARS AIG message. The MsgType indicates the type of AIG message as follows: AR – Alert Data SI – SISO Event IR – IMC Status CR – Traffic Count Data PR – Performance Monitoring Data	

•**Latest News**

- **STDDS Ph2R6 completed September 2021**
  - Reduce flight plan repetition –
  - Add rawFlightRules field to TerminalAutomationFlightPlan message
    - rawFlightRules can contain more than ‘V’ for VFR, ‘P’ for VFR on Top, and ‘E’ for Enroute IFR (site adapted)

AIMM – *Aeronautical Common Services (ACS)*

•Back to Roadmap

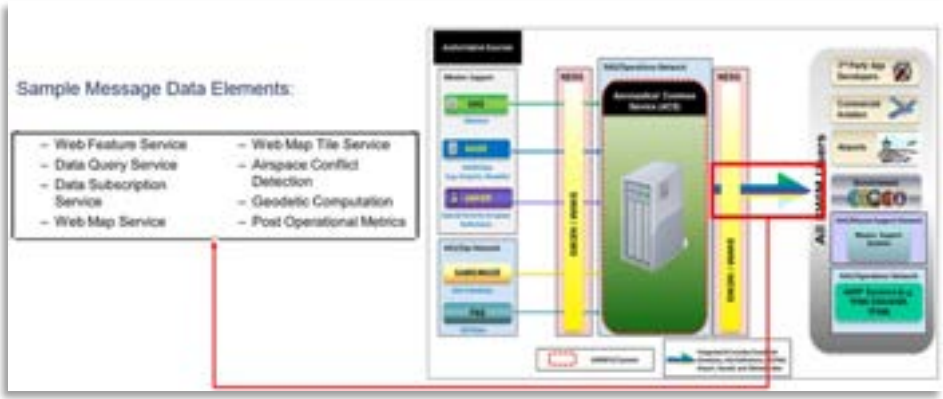
Service Description

- AIMM Phase 2 is leveraging the prior aeronautical information modernization efforts to provide a common platform via the ACS to provide services that integrate static and dynamic aeronautical information, making integrated Aeronautical Information available for information consumers over SWIM.
- The ACS provides a set of web services for information consumers that provide integrated static definitions for aeronautical information such as airports, NAVAID, airspace, and obstacles with dynamic status updates such as schedules and NOTAMs.

Service Interface

- Request/Reply via OGC

Message Sets



•Latest News

- **ACS capabilities are operational and available to internal FAA consumers and external consumers September 2021.**
  - Feature requests via a WFS and a Data Query Service.
  - Feature change notification service.
  - Aeronautical information image services
  - ACS mapping services to support viewing aeronautical information and NOTAM data
  - Airspace confliction detection service
  - Geodetic calculation service
  - Post –Ops metrics service

AIMM – *Federal NOTAMs System (FNS)*

•Back to Roadmap

Service Description

- The Federal Notice to Airmen (NOTAM) System (FNS) Publication is a subscription-based service for publishing NOTAMS. It supports all NOTAMS, legacy and digital, published in the United States NOTAM System (USNS).
- The Federal Notice to Airmen (NOTAM) System (FNS) NOTAM Distribution Service (FNS-NDS) is a web service that provides digital NOTAM messages in Aeronautical Information Exchange Model (AIXM) format in response to requests by end users. The FNS-NDS is a system-to-system interface that enables end systems to receive digital NOTAMs from FNS. The FNS-NDS uses the event schema developed by the international Digital NOTAM Focus Group jointly led by EUROCONTROL and the FAA. Digital NOTAM messages exchanged through the FNS-NDS include static baseline features as well as the temporary changes due the NOTAM event and enable the graphical display of NOTAMs. The FNS NDS supports the distribution of all NOTAMs, to include the digital NOTAMs originated through the FNS as well as legacy NOTAMs originated through the legacy system.

Service Interface

- Publish/Subscribe via JMS
- Request/Reply via SOAP Web Service

Message Sets

Message Name	Description					
Get Capabilities	GetCapabilities is a discovery request, which provides information related to the options provided by the FNS-NDS Web Feature Service.					
Get Feature	**Property Name**	**Description**	**Permissible Values**			
	Source Type	Specifies the NOTAM classification	• Domestic (D) • FDC (F)	• Military (M) • Local Military (L)	• International (I) • Others (O)	
	Location Designator	NOTAM location designator of the affected airport/heliport or facility	Any active NOTAM location identifier			
	NOTAM Function	New, Replacement, Cancelled	• NOTAMN	• NOTAMR	• NOTAMC	
	NOTAM Keyword	Keyword associated with the NOTAM	• AD • APRON • AIRSPACE • CHART • COM • IAP • NAV	• OBST • ODP • ROUTE • RWY • SECURITY • SID • SPECIAL	• STAR • SVC • TWY • VFP • CONSTRUCTION • LTA	
	Airspace Usage	Additional message property to filter airspace related NOTAMs	• TFR	• SUA	• CARF	
	NOTAM Status	Status of the NOTAM	• ACTIVE	• CANCELLED		

•Latest News

- **NOTAMs API target launch Fall 2021**
  - Quick on boarding and access
  - Multiple formats for user needs
  - Enables direct NOTAM query
  - All NOTAM and available geometry from single source
    - *Integrates TFR and SAA*
    - *Enables graphical visuals*

TFDM Build 1 – *TTP Airport, Flight Data, Flight Delay, Ops Metrics, TMR Services*

Service Description

- TFDM is the surface management solution for NextGen. TFDM is planned to provide Airport and Flight Information Service (AFIS), which is expected to be deployed in the timeframe. AFIS data includes airport configurations, airport specific demand and delay information, and airport-initiated departure stop restrictions. AFIS will provide more timely and specific information on individual flights from the operators, including gate and estimated off block times as well as schedule and surface metering information from TFDM to operators. TFDM services will interface with other information services to provide airport-specific arrival predictions and schedules, call for release data exchanges, flight data, and surface situational awareness

Service Interface

- Publish/Subscribe via JMS

Message Sets

Business Function	Steady State Flow Message Types
Airport Information	Airport Information Heartbeat
Flight Data	Flight Add Flight Update Flight Notification Flight Delete Heartbeat
Flight Delay	Flight Delay Heartbeat
Surface Metering Programs	SMP Data Message SMP Flight List Update Heartbeat
Traffic Management Restrictions	Traffic Management Restrictions Heartbeat

•**Latest News**

- **Developed remote TFDM lab access for developmental testing of the TFDM software**
  - Completed Build 1 software updates and completed most of testing
  - Waterfall deployment schedule target release March 2022
- **TFDM Build 1**
  - Testing at WJH Tech Center
  - Key Site: CLE
  - New Projected* IOC Date: Oct 2022

•Back to Roadmap

TFDM Build 2 – *TTP Surface Meter Program, TFCS Flight Sub Services*

Service Description

- TFDM is the surface management solution for NextGen. TFDM is planned to provide Airport and Flight Information Service (AFIS), which is expected to be deployed in the timeframe. AFIS data includes airport configurations, airport specific demand and delay information, and airport-initiated departure stop restrictions. AFIS will provide more timely and specific information on individual flights from the operators, including gate and estimated off block times as well as schedule and surface metering information from TFDM to operators. TFDM services will interface with other information services to provide airport-specific arrival predictions and schedules, call for release data exchanges, flight data, and surface situational awareness.

Service Interface

- Request/Reply via JMS

Message Sets

- TBD

•Latest News

- **Completed Build 2 preliminary software development**
  - Completed TFDM testbed for early industry connection to TFDM
  - Waterfall deployment schedule target release March 2022 - and projected date Oct 2023
- **TFDM Build 2**
  - Preliminary testing at WJH Tech Center
  - Key Site: Charlotte-Douglas International Airport (CLT)
  - New Projected* IOC Date: Summer 2023

•*Back to Roadmap*

TBFM – *Metering Information Service (MIS)*

•Back to Roadmap

Service Description

- The TBFM Metering Information Service publishes metering information to allow the TBFM system, FAA systems (e.g., TFMS), and industry to collaborate, share TBFM data and be informed of TBFM STAs that are in effect during metering events.

Service Interface

- Publish/Subscribe via JMS

Message Sets

Message Name	Description	Supported Properties
Aircraft Information	Provides metering information about an aircraft; specifically: flight plan (relevant subset), STAs, ETAs, Meter Reference Elements (MREs) Assignments, and scheduling group information	Data Group, ARTCC
Configuration Information	Provides metering information about the configuration of the system; specifically: airport configurations, airport acceptance rates, TRACON acceptance rates, gate acceptance rates, Meter Point acceptance rates, runway acceptances rates, super stream class configurations, and satellite airport configurations	
Other Information	Provides metering information about the status of metering and the status of system interfaces	
Adaptation Information	Provides information about applicable system adaptation to include TRACON names, gate names, configuration names, Meter Reference Point names, and stream class names	
Sync	Sent only to indicate an impending refresh of all TBFM data, either as a result of system startup or a periodic synchronization event.	

•**Latest News**

- **New JMS Properties for more efficient message routing based on:**
  - Departure Airport, Destination Airport
- **Additional Aircraft Data Attributes**:
  - Computer Identifier (CID) , Global Unified Flight Identifier (GUFI)
- **New Heartbeat Message**
  - Heartbeat Message indicating TBFM MIS service is operational. Requires 3rd (new) .xsd file
- **TBFM connecting to Solace vs WebLogic broker**
  - New service version v1.1.0 to provide SWIM based

NCR – *NAS Common Reference*

•Back to Roadmap

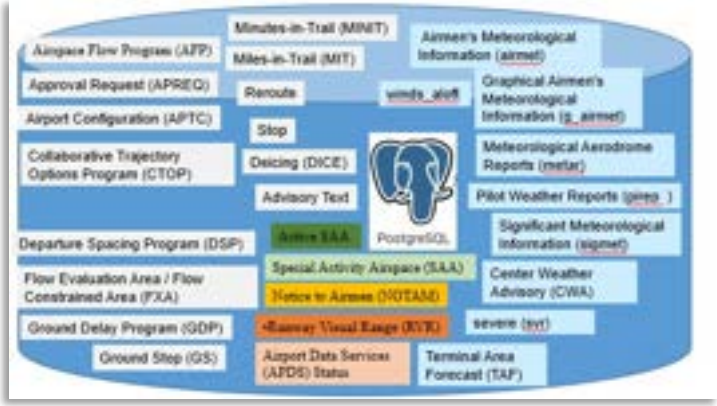
Service Description

- NCR is a NAS Program that provides SWIM Services for parsing, storing, and correlating NAS data. Consumes multiple SWIM producers across NAS domains such as Aeronautical, Traffic Flow Management and Weather. Provides data standardization such as geo-referencing, units of measure and Coordinate Reference Systems (CRS). NCR enables dynamic queries for any combination of geospatial, temporal and attribute filters, which are submitted as subscriptions. NCR can apply constraints to trajectories 2D, 3D or 4D. NCR GML or GeoJSON responses integrate with open-source code.

Service Interface

- Request/Reply via GeoServer and NEMS

Message Sets



•Latest News

- **NCR R1.1 currently in Ops as of August 31, 2021, for internal users**
  - Will monitor stability and performance
  - Will be doing some performance tuning in the next few months
- **External NESG users will be on-ramped in the first half of CY2022 in batches**
- **Before on-ramping, NCR will help users in building their client software and testing in FNTB environment**
  - Based on FNTB availability

TFMS – *TFMData: Flight Data Service*

•Back to Roadmap

Service Description

- Flight Data is comprised of data from a variety of systems, but the main contributor of input data is the Enroute Computer System and International Data Providers. TFMS has a consolidated view of the entire system and adds value to that information such that the resulting output is an accurate reflection of the state of the NAS in terms of traffic flow management. Flight Data is sent as it is updated, when there is a commanded change, or when there is a computed change.

Service Interface

- Publish/Subscribe via JMS

Message Sets

Message Name	Description
Track Information	Track information messages are used to provide a position update for the identified flight. In cases where the track position causes a route re-conformance (trajectory modeling) additional route data is provided. The messages are transmitted as received by TFMS on a cyclic basis.
Flight Plan Amendment Information	The flightPlanAmendment message provides revised flight plan data as the result of a flight plan being successfully amended.
Arrival Information	Arrival Information Message is used to provide arrival data and time information for all eligible arriving flights.
Beacon Code Information	The Beacon Code Information Message provides beacon code data on eligible flight plans.
Departure Information	The Departure information messages is transmitted for all eligible initially activated flight plans.
Flight Plan Information	The Flight Plan Information Message is used to provide flight plan data for all eligible flight plans.
Flight Plan Cancellation	Flight Plan Cancellation messages are used to provide cancellation data for all eligible flight plans when a cancel message is received from the Host/ERAM or IRCP interface or an operator action associated with the schedule database that causes previously Scheduled Activated flights inserted into the NCSM to be canceled.
Boundary Crossing Update	Boundary Crossing Update is used to provide TFMM with current flight plan information on active eligible flights that are inbound from one ARTCC to another ARTCC facility.
Oceanic Report	Oceanic Report Type provides flight information for transoceanic flights and is generated when an Oceanic Position Report is received via NADIN.
NCSM Flight Create	NCSM Flight Create message is used to provide create data when CDM a flight create message is received.
NCSM Flight Modify	NCSM Flight Modify message is used to provide modify data when CDM a flight modify message is received.
NCSM Flight Route	NCSM Flight Route message is used to provide route data for events that cause the flight route to be updated. The events are associated with CTOP or Reroute TMIs. They are also used to update the route information when the weekly adaptation data update is performed.
NCSM Flight Times	"NCSM Flight Times message is used to provide updates of flight time data when departure or arrival times change due lateness in departure, a TBFM issued Scheduled Time of Departure, or STDDS surface movement events."
NCSM Flight Schedule Activate	NCSM FlightScheduleActivate message is used to provide data flight data whenever an operator command or automatic timer causes a flight in the schedule database to be inserted into the NCSM. The timer is a five minute timer that causes flight's to be entered into the NCSM for demand prediction purpose 24 hours prior to their departure time.
NCSM Flight Control	NCSM Flight Control message is used to provide control data for messages/events that cause EDCT to be issued.
NCSM Flight Sectors	NCSM Flight Sectors message is used to provide updated sector crossing data an Airspace Assignment message is received.

•**Latest News**

- **TFMS R14 deployment completed October 2021**
  - The new TFMData Schema version for R14 will be v3.2
  - TFMDatav3.2 to v2.0.5 mediation will be deployed with R14
  - Request/Reply re-certification will also shift with R14 deployment
- **All TFMData Request/Reply clients will be need to re-certified for R14 v3.2**
  - Users will not be expected to re-test for SWIM connectivity
  - Users who license their clients from a third party will not need to individually re-certify if the third-party product client is re certified

TFMS – *TFMData: Flow Data Service*

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Service Description

- Flow Information is data that describes the TFM initiatives that are created, updated, or deleted from the system. Flow Information is created by TFM users; the information is used by TFMS to monitor capacity, to assist in controlling capacity of the system, or to describe characteristics of the system. Flow information provides a shared state of TFMS with authorized users in support of situational awareness and potentially to be used by CDM users in their own automation and research activities. Users consuming Flow Information can construct a dataset (or database) consistent with TFMS.

Service Interface

- Publish/Subscribe via JMS

Message Sets

Message Name	Description
AFP Advisory	Initial/Update Airspace Flow Program Message.
AFP Cancel	Cancel Airspace Flow Program Message.
AFP Compression	Initial/Update GDP/UDP Compression Message.
Airport Config Message	The airport configuration report.
CDM Update Data	TMI related data messages.
CTOP Cancel	Cancel Message.
CTOP Definition	Initial/Update CTOP Message.
Deicing Message	Deicing report.
ERAM Amendment Status Update	Details of the flights last ERAM amendment request.
FADT Broadcast	FADT Broadcast - R13 preferred way of communicating updates, cancellations of AFP,GDP, and GS programs.
FEA/FCA	Initial/Update/Cancel FEA/FCA Message.
FOS Data	FOS Flow Information output.
FEA/FCA Secondary Filters Delete	Initial/Update FEA/FCA secondary filters delete.
FEA/FCA Secondary Filters Update	Initial/Update FEA/FCA secondary filters update.
GDP Advisory	Initial/Update GDP/UDP Message.
GDP Blanket	Initial/Update GDP/UDP Blanket Message.

Message Name	Description
GDP Cancel	Cancel GDP/UDP Message.
GDP Compression	Initial/Update GDP/UDP Compression Message.
General Advisory	General Advisory Message.
GS Advisory	Initial/Update GS Message.
GS Cancel	Cancel GS Message.
AFP/GDP Update	Air Flow Program (AFP) or Ground Delay Program (GDP) TMI parameter create/update.
Blanket Update	AFP/GDP Blanket parameters create or update for TMI.
Compression Update	AFP/GDP Compression parameter update or create TMI.
Delete	Parameter delete for Fuel Advisory Delay TMI.
GS Update	Ground Stop (GS) TMI parameter create/update.
RAPT Timeline Message	The RAPT Timeline data.
Reroute	Initial/Update/Cancel Reroute Message.
Restriction Message	The restriction report.
TMI Flight Data List	General flight data for flights associated with any TMI or monitored airports.

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TFMS – *TFMData: Request/Reply Service*

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Service Description

- The TFM Request/Reply Business Function exposes all of the TFMS services and makes them available to the SWIM community. TFMS Request/Reply is managed by TFMS by authorizing user request to ensure only FAA approved users are requesting services of the TFMS. These include requests that can impact the TFM system and/or the behavior of Air Traffic Flow.

Service Interface

- Request/Reply via JMS

Message Sets

Message Sets	Description
Airport Fix Reply Data	Airport arrival and departure fixes.
Slot List	Slot assignment list.
CTOP Reply Data	
EDCT Check Report	
EDCT List Report	
EDCT Show Report	
EDCT Slot List Report	
EDCT Sub Show Report	
EDCT Unassigned Slots Report	
Flight Recon Data	
Forwarded Slot List	
FOS Reply Data	
Hist Popup Data	
Reroute Reply Data	
RRIA Reply Data	
Substitution Response Data	
TMI Reply Data	

Message Name	Description
Oceanic Position Report	
Flight Recon Request	
Flight Schedule Request	
FOS Request	
FEA/FCA Request	
Reroute Request	
Hist Popup Request	
Reroute Model Request	
Sub Block Request	
TMI Resync Request	

Message Name	Description
Advisory Request	Advisory Related Requests.
TMI ID Request	Request for a unique TMI ID to be used in a subsequent request for the creation of a TMI.
Airport Request	Request for candidate flights by airports.
AFP/GDP Update Request	Request to create or update an Air Flow Program (AFP) or Ground Delay Program (GDP) TMI.
GS Update Request	Request to create or update an Ground Stop (GS) TMI.
Blanket Update Request	Request to create or update an AFP/GDP Blanket parameters for TMI.
Compression Update Request	Request to create or update an AFP/GDP Compression TMI.
Delete Request	Request to delete parameters for any Fuel Advisory Delay TMI.
Fuel Advisory Delay Request	Request to create or update any Fuel Advisory Delay TMI.
Airport FIX Request	Identifies the airports for which arrival and departure fixes are to be supplied.
CTOP Request	Includes all of the CTOP requests.
EDCT Request	Includes all of the EDCT possible requests.

•Latest News

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SWIM Flight Planning – *Common Support Services: Flight Data (CSS-FD)*

Service Description

- **Flight Planning & Filing: 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
- **Flight Data Sharing: 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 Additional flight data for **Trajectory Based Operations (TBO), International data exchange standards** *(i.e. Flight Information Exchange Model (FIXM)),* **Enhanced Collaborative decision-making and** International Civil Aviation Organization (ICAO) provisions for **Flight and Flow – Information for a Collaborative Environment (FF-ICE) and mixed-mode**

Service Interface

- TBD

Message Sets

- TBD

•**Latest News**

- **CSS-FD Risk Reduction Activities seek to (1) obtain feedback on capabilities and constraint feedback, (2) Understand integration needs with eAU systems (3) Leverage capabilities of operator's modern analytics and SWIM interfaces**
  - Sprint 1: Foundational Infrastructure
    - Data Management and security framework activities.
    - Prototype Development and Notice to Industry commenced November 2021
  - Sprint 2: Initial FPL Exchange/Feedback
    - Evaluation of Constraints/Restrictions, Flight Specific Feedback and Re-evaluation Process.
    - Industry kickoff targeted December 2021 and User Trials targeting Summer/Fall 2022

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NextGen Weather – *Common Support Services: Weather (CSS-Wx)*

Service Description

- **CSS-Wx will function as a single provider of weather data products within the NAS, using standards-based weather dissemination. The service makes weather products available from NOAA, NWP and other data sources for integration to air traffic systems, and provides weather products via a set of common Web Services for weather, using international data access and data format standards.**

Service Interface

- TBD

Message Sets

Gridded Weather Data

- Precipitation (VIL)
- Precipitation (VIL) with Mask
- Precipitation (VIL) Forecast
- Precipitation (VIL) Forecast with Mask
- Echo Tops
- Echo Tops Forecast
- Precipitation (Base Reflectivity)
- Precipitation (Composite Reflectivity)
- Precipitation (Composite Reflectivity) with Mask
- Surface Precipitation Phase
- Surface Precipitation Phase Forecast
- Icing Layer
- Composite Icing
- Icing Layer Forecast
- Composite Icing Forecast
- Turbulence Layer
- Turbulence Layer Forecast
- Composite Turbulence
- Composite Turbulence Forecast
- Convective Weather Avoidance Fields
- Convective Weather Avoidance Field Forecast
- Satellite
- Terminal Winds
- *NOAA Model Data (RAP, HRRR, GFS, NAM)**

Non-Gridded Weather Data

- Precipitation (VIL) Forecast Accuracy
- Precipitation (VIL) Forecast Contours
- Echo Tops Forecast Accuracy
- Echo Tops Forecast Contours
- Lightning
- Storm Information Hazard Text
- Storm Information Leading Edges
- Storm Information Motion Vectors
- Fronts Forecast
- Growth Trends
- Decay Trends
- Forecast Confidence
- Convective Weather Avoidance Polygons / CWAP Forecast
- Wind Profiles
- Tornado Detections
- Icing Layer Contours
- Composite Icing Contours
- Turbulence Layer Contours
- Composite Turbulence Contours
- Pilot Report (PIREP)
- Urgent Pilot Report (PIREP)
- *ICAO Aircraft Report (AIREP)**
- *Significant Meteorological Information (SIGMET)**
- *Convective Significant Meteorological Information (Convective SIGMET)**
- *TFM Convective Forecast (TCF)**
- *Airmen's Meteorological Information Advisories (AIRMET)**
- *Graphical AIRMET (G-AIRMET)**
- *Winds Aloft Forecast**
- *Surface Weather Observations*
- *Aviation Watch Notification**
- *Tornado Warnings**
- *Severe Thunderstorm Warnings**
- *Public Severe Weather Watch Notification (SEL)**
- *Volcanic Ash Advisory Statement (VAAS)**
- *Terminal Area Forecast (TAF)**
- *Center Weather Advisories**
- *Meteorological Impact Statements**
- *Severe Weather Statements (SVS)**

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Latest News

Recently completed re-planning approved by JRC in May 2021

- Decommission Weather and Radar Processor (WARP) and Corridor Integrated Weather System (CIWS)
- Team currently performing Benefit analysis to monetize Flight Planning benefits through SWIM

Key Site Initial Operational Capability (IOC) in 2024

- NOAA NextGen IT Web Services (NGITWS) targeting August 2021 release
- Currently conducting CSS-Wx integration and system testing at WJHTC
- Ongoing CSS-Wx interface testing with ERAM at WJHTC
- End user systems and SWIM to support CSS-Wx and NWP testing by 2024