REDAC / NAS Ops

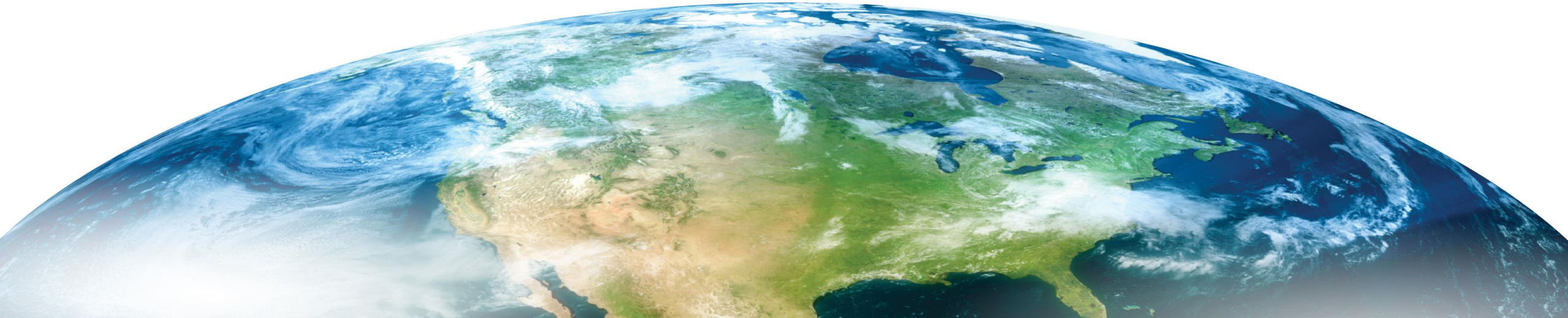
Operations Concept Validation & Infrastructure Evolution (ATDP)

BLI Number: 1A01C

Presenter Name: Guillermo Sotelo

Date: 03/16/2021

Review of FY 2021 - 2023 Proposed Portfolio



Operations Concept Validation & Infrastructure Evolution (ATDP) Overview

What are the benefits to the FAA?

As new concepts evolve, this program identifies operational gaps and potential technologies that could address these gaps. It conducts studies and analyses in operational focus areas to include Integration of Space Operations into the NAS, Evolution of Trajectory-Based Operations, and Time-Based Metering Operations with Advanced Rerouting. This program ensures that potential enhancements are operationally sound and captured in the Architecture plans for the NAS.

What determines program success?

Success is measured by the completion of the goals identified in multi-year plans developed for each activity. Initiatives that successfully complete all the project goals identified are then presented as candidates for acquisition.

Operations Concept Development & Infrastructure (ATDP)
Program Support

People:

- Program Manager: Guillermo Sotelo
- Subject Matter Experts: Traffic Managers, ATC, Discipline Experts, Airspace User Community

Research Facilities:

- WJHTC, MITRE/CAASD, NASA, Volpe, DAB Test Bed, NEXTOR

Operations Concept Validation & Infrastructure Evolution (ATDP) – Accomplishments in FY21

- **Future Flow Management:**
  - ATO Vision for FFM – Initial Coordination Version: Defines the ATO vision for the modernization of an all-encompassing, integrated Traffic Flow Management capabilities

- **NAS Integration of Transiting Operations (integration of upper E and Space L/R operations into the NAS):**
  - Business Outlook: analysis of ongoing efforts both internal & external to the FAA, and initial maturity assessment of industry proposed plans
  - Initial set of ATO operational goals, objectives, and outcomes in three focus areas: Upper E Operations, Vertical Transiting to/from Upper E, Space Launch/ Reentry Operations

Anticipated Research in FY22

Planned Research Activities:

- Technical/Operational analysis for the evolution of Traffic Flow Management (TFM)
- Technical/Operational analysis for the evolution of Oceanic Services
- New Entrants Operational Integration Analysis: Upper E Traffic Management (ETM), UAS Traffic Management (UTM), Urban Air Mobility (UAM)

Expected Research Products:

- Identification of operational opportunities and challenges as emerging concepts evolve,
- Identification of opportunities to accelerate the operational introduction of innovation into the NAS

Emerging FY23 Focal Areas

- Integration of new entrants into the NAS: Advanced Air Mobility
- Air Traffic Management Evolution

Operations Concept Validation & Infrastructure Evolution (ATDP)

Research Requirements

- As new concepts evolve, this program identifies operational gaps and potential technologies that could address these gaps by conducting studies and analyses in operational priority areas

Outputs/Outcomes

- Assessment and evaluation of operational requirements and the impact of the concept on system capacity, efficiency, safety, and human performance potentially leading to investment decision.

FY 2023 Planned Research

- Operational integration analyses as emerging concepts evolve
- Technical/operational analyses to accelerate the integration of new entrants into the NAS
- Technical/operational analyses to accelerate the operational introduction of innovation into the NAS

Out Year Funding Requirements

	FY21	FY22	FY23	FY24	FY25	FY26
F&E	$5 M	$5 M	$6 M	$6 M	$6 M	$6M

Preconditioning for Metered Arrival Flows

Sally Stalnaker

March 16, 2021

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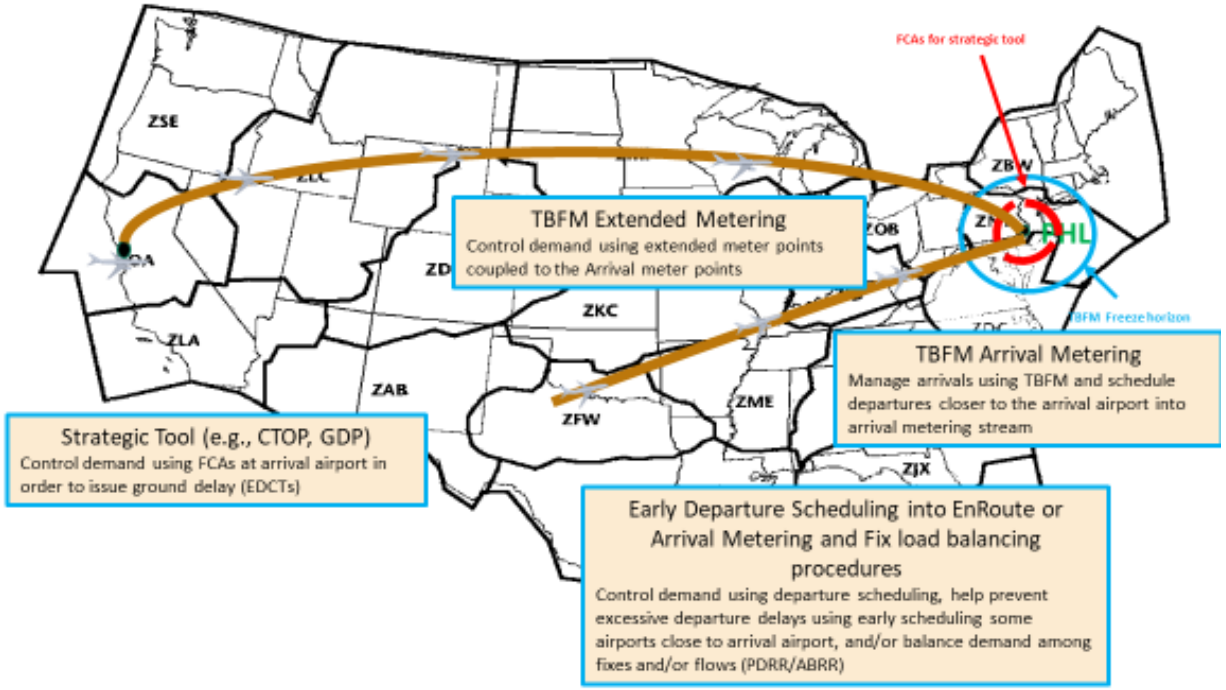
What is Preconditioning? And Motivation

Definition: The use of **strategic** traffic flow management tools to control demand to an **arrival metered** airport to **mitigate delays** and achieve **maximum throughput** possible given operational conditions.



Objectives

- Reduce large TBFM departure delay for flights departing closer to the arrival airport
- Provide flight operators with predictable delay
- Allow for flight operators to perform substitutions
- Reduce large metering delay for airborne flights
- Eliminate or reduce Miles-in-Trail (MIT) restrictions

Operational Conditions: Problems that TBFM cannot resolve (e.g., fix load balancing, effects of throughput or capacity reductions, and predictable departure delay management), sustained demand at or near capacity, and mix of short-haul and long-haul flights.

Components

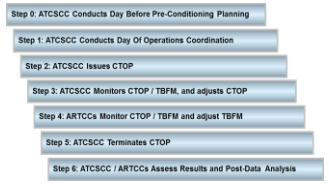
- Use of Strategic Traffic Management Initiatives (TMIs)
- Robust TBFM metering design and use which includes: Adaptation that reflects current routes in Terminal Radar Approach Control Facilities (TRACON) and uses all active runways; Arrival metering to the TRACON with “times on glass”; Freeze horizons close to airport; Segmented freeze horizons to manage uncertainty (if needed); and Tactical use of “Delay Scheduled Flights”.

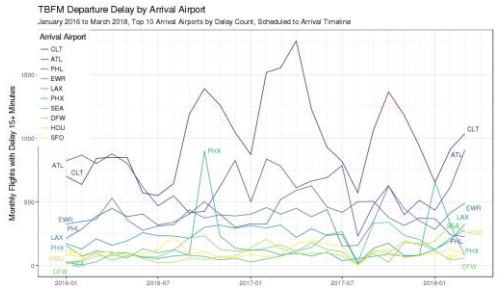
NASA Technical Transfer and Initial Analysis

- Evaluate NASA IDM Concept for application to sites beyond Newark International Airport (EWR).
- Develop a plan, for reduction of excessive departure delays of 15 minutes or more, that describes activities needed to enable use of existing strategic tools to precondition arrival metered flows in clear weather operations. Per FAA's direction, this effort focuses on the use of CTOP as the strategic tool.
- The plan includes near-term and longer-term activities (i.e., requiring automation development). Some of these activities could begin in parallel with the near-term activities.

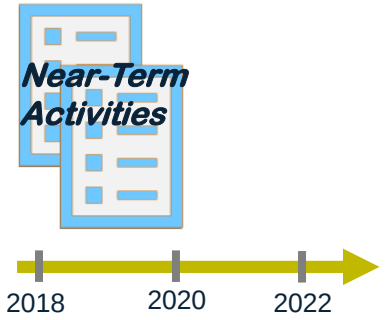
IDM concept

Generic Clear Weather Use Case





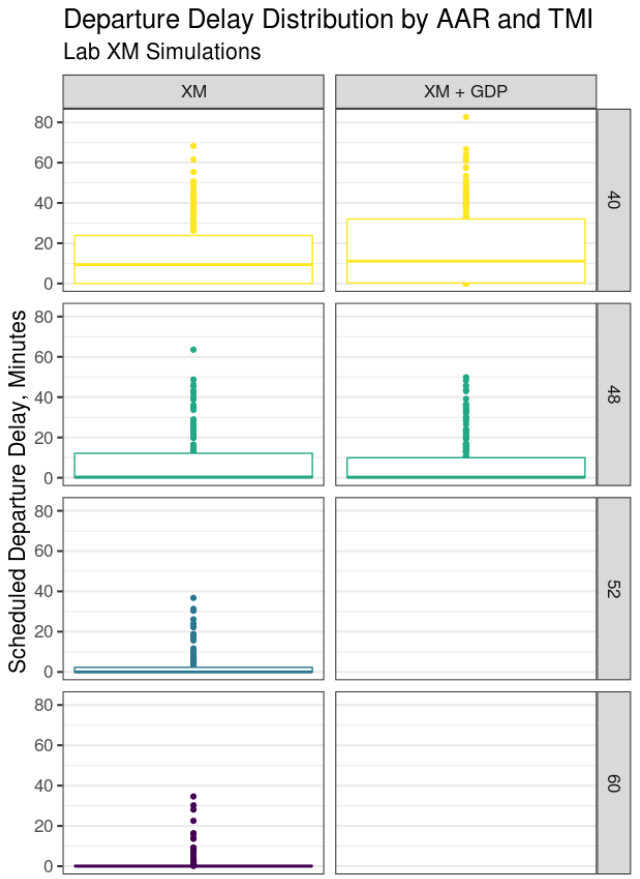
The Plan:



MITRE recommended the FAA perform a field trial

PHL Analysis in Preparation for Field Trial

- Level of airborne delay can be adjusted tactically through judicious use of “delay scheduled flights for this aircraft only” option
- The GDP with “delay scheduled flights” option reduces the delay both airborne and departure.
- *Strategic programs have the potential to create additional delay instead of mitigate delay*
- Evaluate TBFM XM design and adjust TBFM parameters, as needed, to address delays
- Pursue use of TBFM’s “delay scheduled flights” option tactically on a flight-by-flight basis to mitigate large TBFM departure delays, as needed.
- Explore other arrival airports, in the context of current operational conditions, to determine if the preconditioning concept for metered arrivals is applicable and beneficial

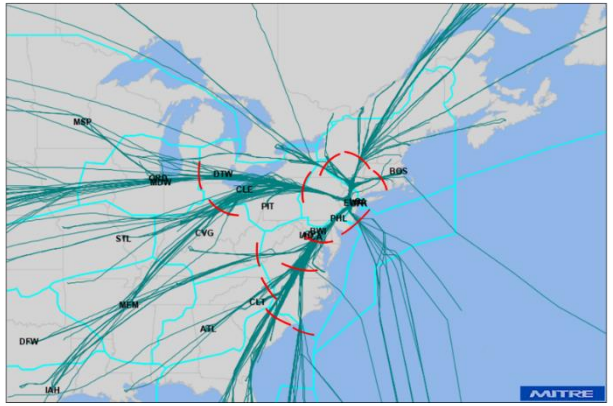


Explore NAS Wide Arrival Airports For Field Trial

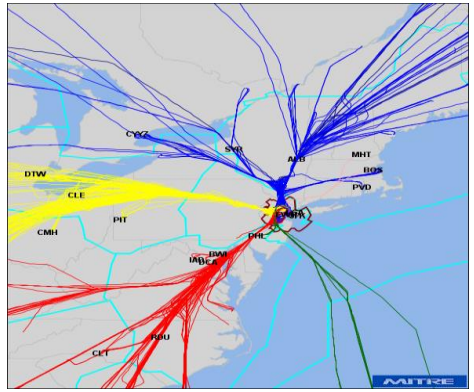
- Investigated fifteen airports based on large departure delays (15+ minutes)
  - Six arrival airports had potential: BOS, CLT, EWR, LAX, LGA, and SEA
  - BOS eliminated because of average two flights per day with large departure delays
  - FAA requested removal of EWR and LGA from consideration
  - CLT, LAX, and SEA remained. SEA has the correct profile for two, two-hour periods but does not have a robust metering design.
- *An arrival airport for field trial could not be found*
- FAA response and actions:
  - FAA expressed the concept as potentially still valid but no application in the near-term
  - AJR and AJT took the action to operationalize Collaborative Trajectory Options Program (CTOP)
  - The FAA tasked MITRE to explore the application of the preconditioning for metered arrivals concept in the context of future operations specifically at Newark Liberty International Airport (EWR)

Future EWR Analysis and Results

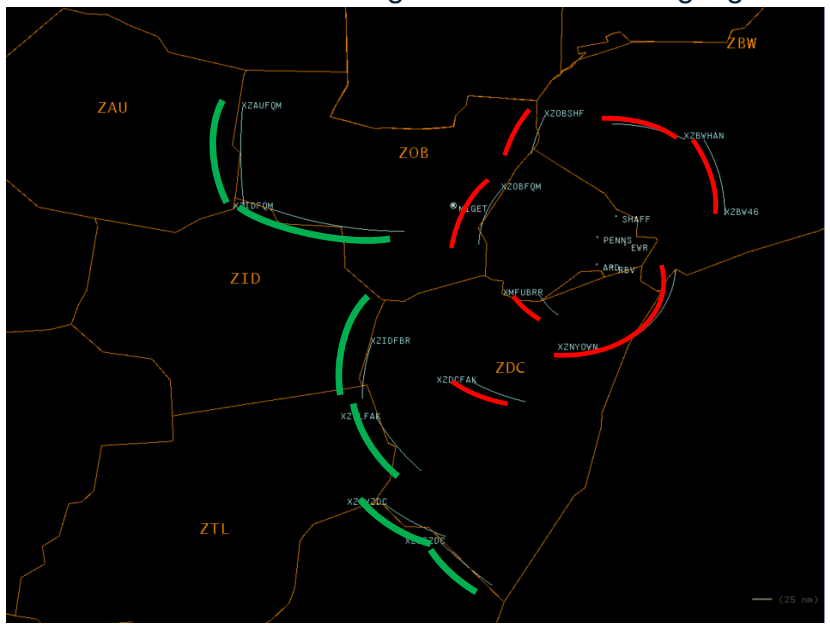
Notional EWR XM Design with Traffic Overlay



EWR Arrival Flows



Notional EWR TBFM Design with New XMP Highlighted



The **Red** Arcs depict existing outer arcs that were converted to Extended Meter Points (XMPs).

The **Green** Arcs depict newly created XMPs.

- MITRE developed an XM design for the analysis of EWR based on the PHL TBFM XM design developed by the FAA. Figures to left illustrate this notional design.
- To ensure proper operation of the notional EWR XM design, MITRE modified the existing EWR TBFM adaptation including routes changes and Persistent Forward Bias (PFB) mode.
- Potential opportunities (enough larger departure delays) exist for precondition in certain configuration and use of lower AARs.

Recommendations

- The FAA should pursue the use of targeted TBFM mitigation techniques (e.g., early scheduling and “delay scheduled flights for this aircraft only” option) for managing large departure flight delays as part of planned iTBO efforts to improve arrival metering at ATL, CLT, DEN, EWR, LAX, LGA, and PHL.

- The FAA should, when developing the TBFM XM designs, specifically address inclusion of international and TEC flights in the TBFM schedule (e.g., modify routes and meter arcs), turn on Persistent Forward Bias (PFB) in TBFM adaptation, and explore freezing flights on track for airports that are further away (e.g., 200 NM).

- The FAA should perform additional analysis to study potential benefits of applying preconditioning in other iTBO operating areas, i.e., NEC, Mid-Atlantic, and Southwest, at associated focal airports to mitigate large departure delays when airport arrival rates are constrained.

- Address long term gaps including strategic fix load balancing capabilities, flight delay tracking capabilities (pre-departure through arrival), management of multiple strategic tools to condition multiple arrival flows, tailoring of strategic tool, ATC procedures, and airspace to mitigate delays for arrival flows.

iTBO Integrated Gate-to-Gate Strategy Analysis

Elizabeth Lacher

March 16, 2021

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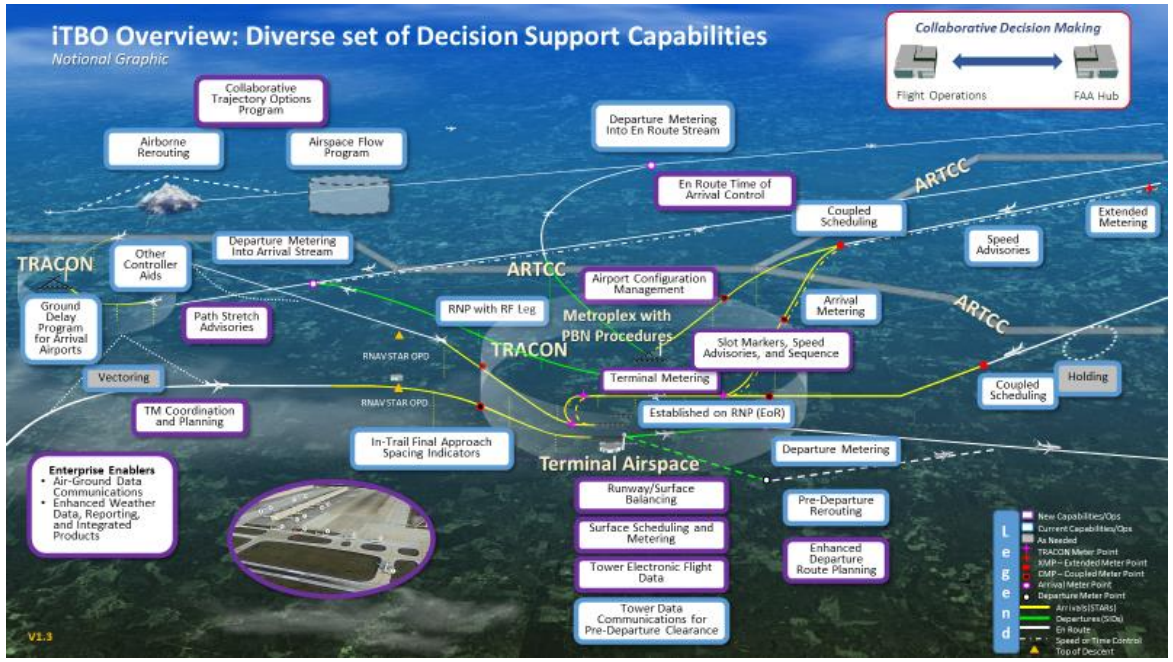
Motivation

- Provide narrative descriptions that clearly describe and detail key Air Traffic Management (ATM) roles, on a position-by-position basis, relative to how they perform their job given the envisioned integrated iTBO environment.
- Provide a common authoritative source document for people developing ATC procedures, training and education, testing scenarios, communication with the field, and other related activities
- Provide a baseline for the future flow management work
- Identify additional integration gaps and risks for iTBO, if any
- Target Audience: HQ Staff supporting various aspects of iTBO Implementation

Analysis Approach

Material Development Process

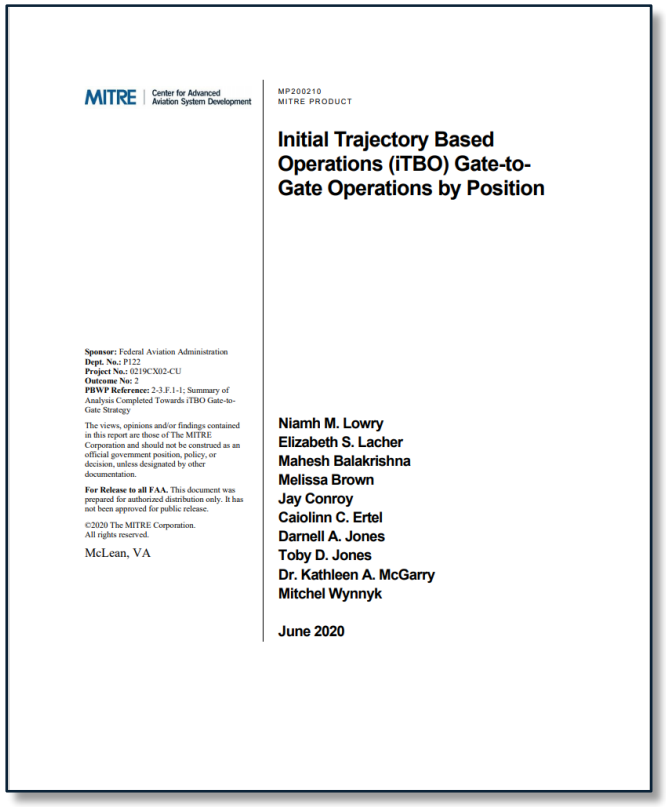
- Based on TBO documentation and expected operational scope
- Generated with input/review from over 35 MITRE CAASD Subject Matter Experts (SMEs) including 10 former air traffic controllers



Review and Validation Process

- Final draft sent for review and (2) coordination/review meetings held with FAA HQ LOB stakeholders and NATCA SMEs
    - Representatives from Air Traffic Services, System Operations, Mission Support Services, and the Program Management Office

Products Developed



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MP200210
MITRE PRODUCT

Initial Trajectory Based Operations (iTBO) Gate-to-Gate Operations by Position

Sponsor: Federal Aviation Administration
Dept. No.: P122
Project No.: 0219CX02-CU
Outcome No: 2
PBWP Reference: 2-3.F.1-1; Summary of Analysis Completed Towards iTBO Gate-to-Gate Strategy

The views, opinions and/or findings contained in this report are those of The MITRE Corporation and should not be construed as an official government position, policy, or decision, unless designated by other documentation.

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June 2020

- White paper
- Includes narrative descriptions of various positions' actions and decisions with respect to TBO, and how those are achieved

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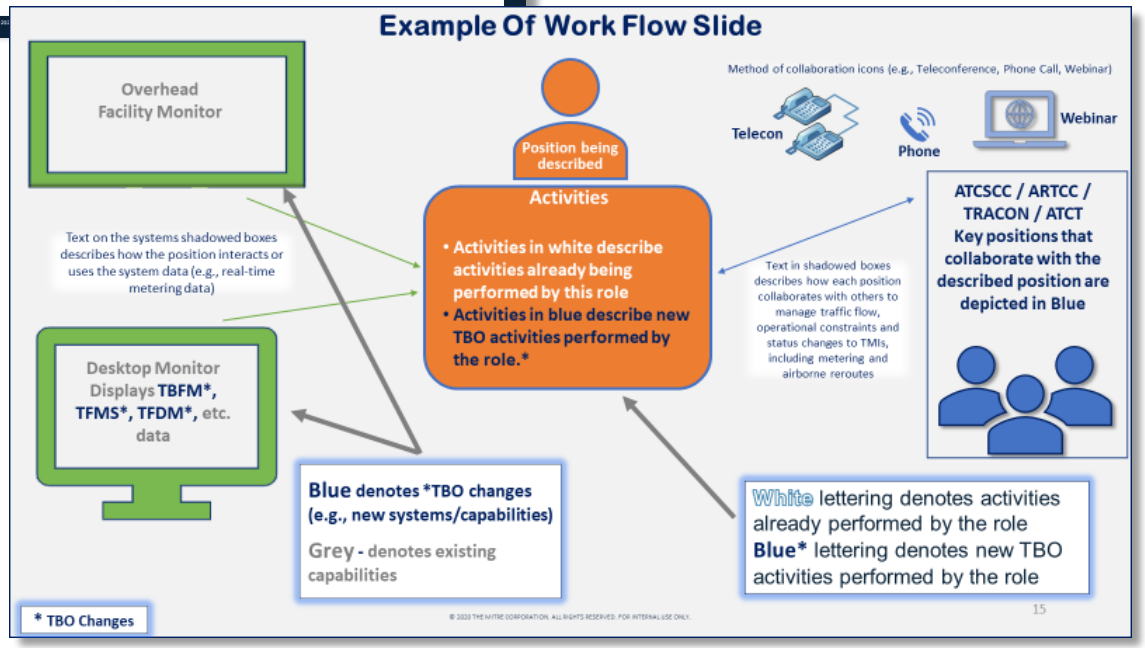
Initial Trajectory Based Operations (iTBO) Gate-to-Gate Strategy: *Position-Specific Workflows*



- Briefing with audio narration
- Broken into 5 modules, 15-20 minutes each

Product Scope: TBO Roles Documented

ATCSCC

- National Operations Manager (NOM)
- **Planner***
- Terminal National Traffic Management Officer (Terminal NTMO)
- **Terminal National Traffic Management Specialist (Terminal NTMS)***
- Metering National Traffic Management Specialist (Metering NTMS)
- Severe Weather National Traffic Management Officer (SWx NTMO)
- **Severe Weather National Traffic Management Specialist (SWx NTMS)***
- Tactical Customer Advocate (TCA)

TRACON

- Terminal Operations Manager (OM)
- Terminal Operations Supervisor (OS)
- **Terminal Feeder Controller***
- **Terminal Final Approach Controller***
- Supervisory Traffic Management Controller (STMC)
- **Arrival Management Traffic Management Coordinator (TMC)***
- **Departure Management Traffic Management Coordinator (TMC)***

ARTCC

- En Route Operations Manager (OM)
- En Route Operations Supervisor (OS)
- **En Route Radar (R-side) Controller***
- En Route Radar Associate (D-side) Controller
- ARTCC Traffic Management Unit (TMU)
- Supervisory Traffic Management Coordinator (STMC)
- **Arrival Management Traffic Management Coordinator (TMC)***
- **Departure Management Traffic Management Coordinator (TMC)***
- Reroute Coordinator
- Traffic Management Weather Coordinator (TMWC)

ATCT

- Tower Operations Manager (OM)
- **Traffic Management Coordinator (TMC)***
- **Local Controller***
- Ground Controller
- Controller - Flight Data / Clearance Delivery

*** Accompanying position workflow developed**

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Future Flow Management

Amanda Staley

March 16, 2021

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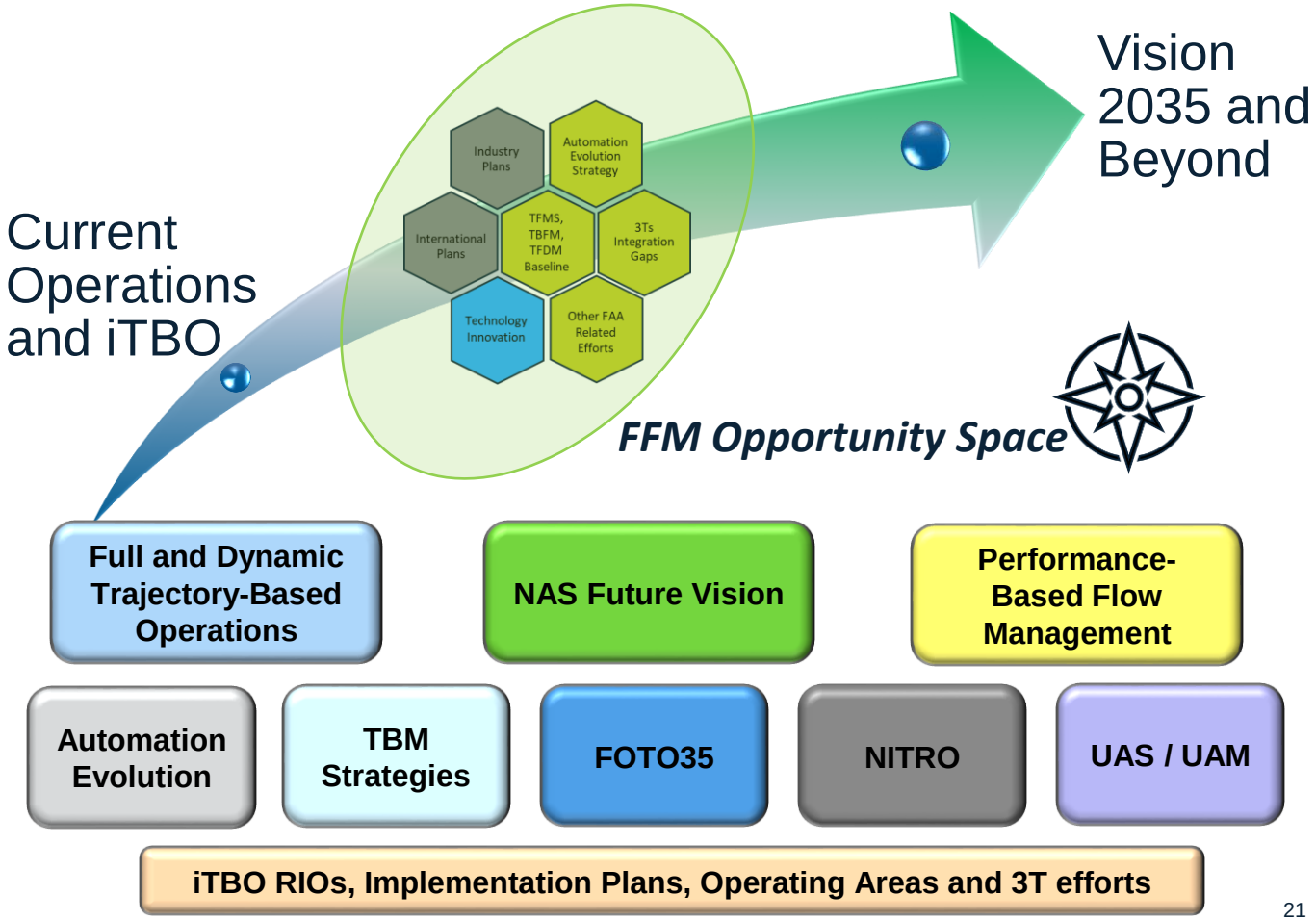
Defining Future Flow Management (FFM)

- New procedures, new capabilities, and new processes as the FAA shifts to TBO

- Comprehensive plan including:
  - Multi-faceted Vision of Future Traffic Flow Management Services to meet emerging needs
  - Strategy and Action Plan that inform FAA decisions and investments

Address operational shortfalls that persist
Integrate new, diverse NAS users and operations
Implement and capitalize on new opportunities



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FFM Vision Reflected by 4 Key Goals

ATO Future Flow Management Vision Statement: **Dynamic, flexible, and integrated sets of capabilities that provides for efficient, equitable management of NAS demand/capacity imbalances as they may arise in the TBO environment, and as they affect increasingly diverse NAS users/stakeholders.**

Data Science ✈ Integrated Automation ✈ Workforce Strength and Processes

Dynamic, on-demand data and analytics enable continuous TFM planning with uninterrupted sharing *to synchronize strategic and tactical actions*

Higher fidelity 4D flight trajectories drive development and execution of TFM integrated strategies *to improve predictability of NAS operations*

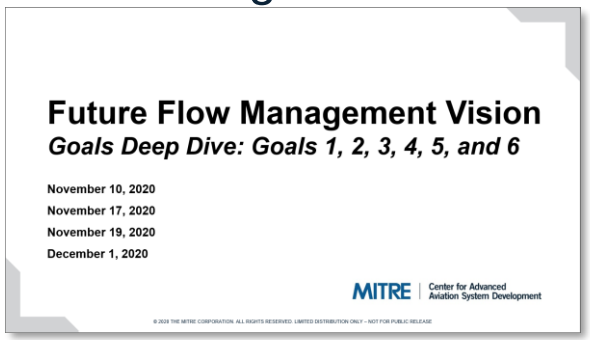
NAS User partnering evolves collaborative TFM decision-making and integrates diverse operations *to improve equity, access, and use for all NAS Users*

Enhanced processes combined with human capital investments accelerate implementation and application of modernized TFM services *to meet evolving needs*

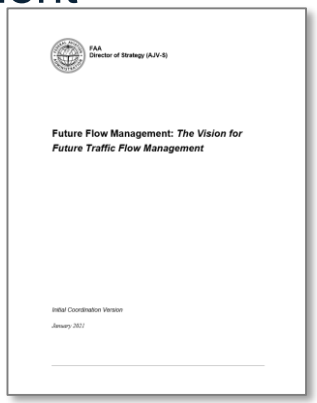
Impacts and Looking to the future: FFM

Key Results and Activities

- Completed 4 operational engagement sessions with AJV, AJT, AJR, and NATCA to review Vision Goals and detailed objectives and outcomes to meet those goals
- Completed CDM Future Concepts Team (FCT) engagement to garner feedback on Vision Goals and identify other needs and opportunities
- Delivered presented materials and all feedback collected to participants of the operational engagement sessions
- Finalized goal reviews with AJV-S management



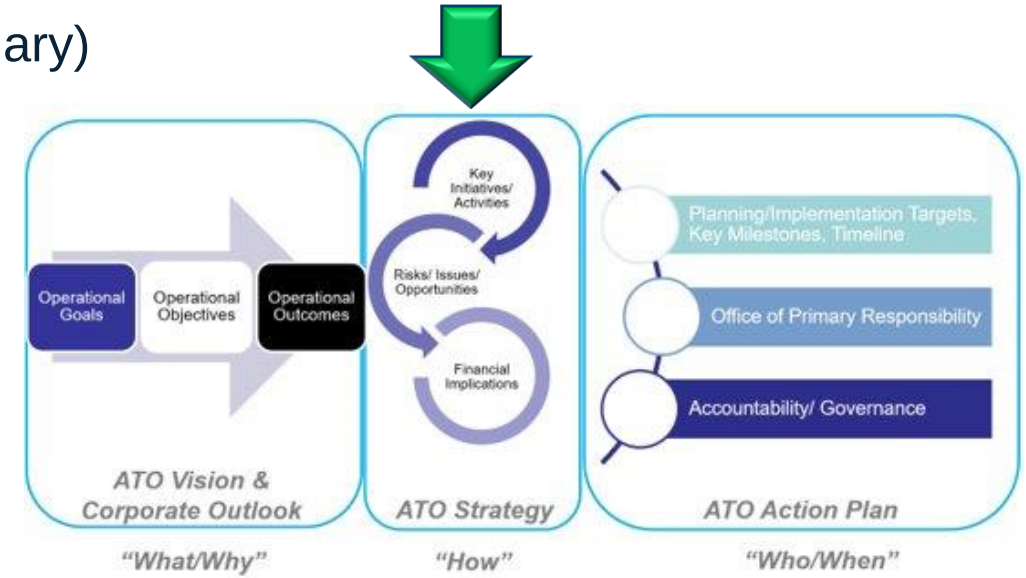
Operational Deep Dives



Vision Coordination Document

Next Steps

- Coordinate the FFM Corporate Vision/Outlook with the ATO
  - ATO-ANG executives briefing (Thursday, 2/4)
  - February PMO PMR
  - Distribute coordination vision document
- Engage appropriate stakeholders for collaborative strategy development (targeted 3rd week of February)



FFM ATO Corporate Plan

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FOTO35
Future of the Ocean 2035

Program Overview

For: Research, Engineering and Development Advisory Committee (REDAC)
From: Randolph “Randy” Mauer, FOTO35 Program Manager, ATO International

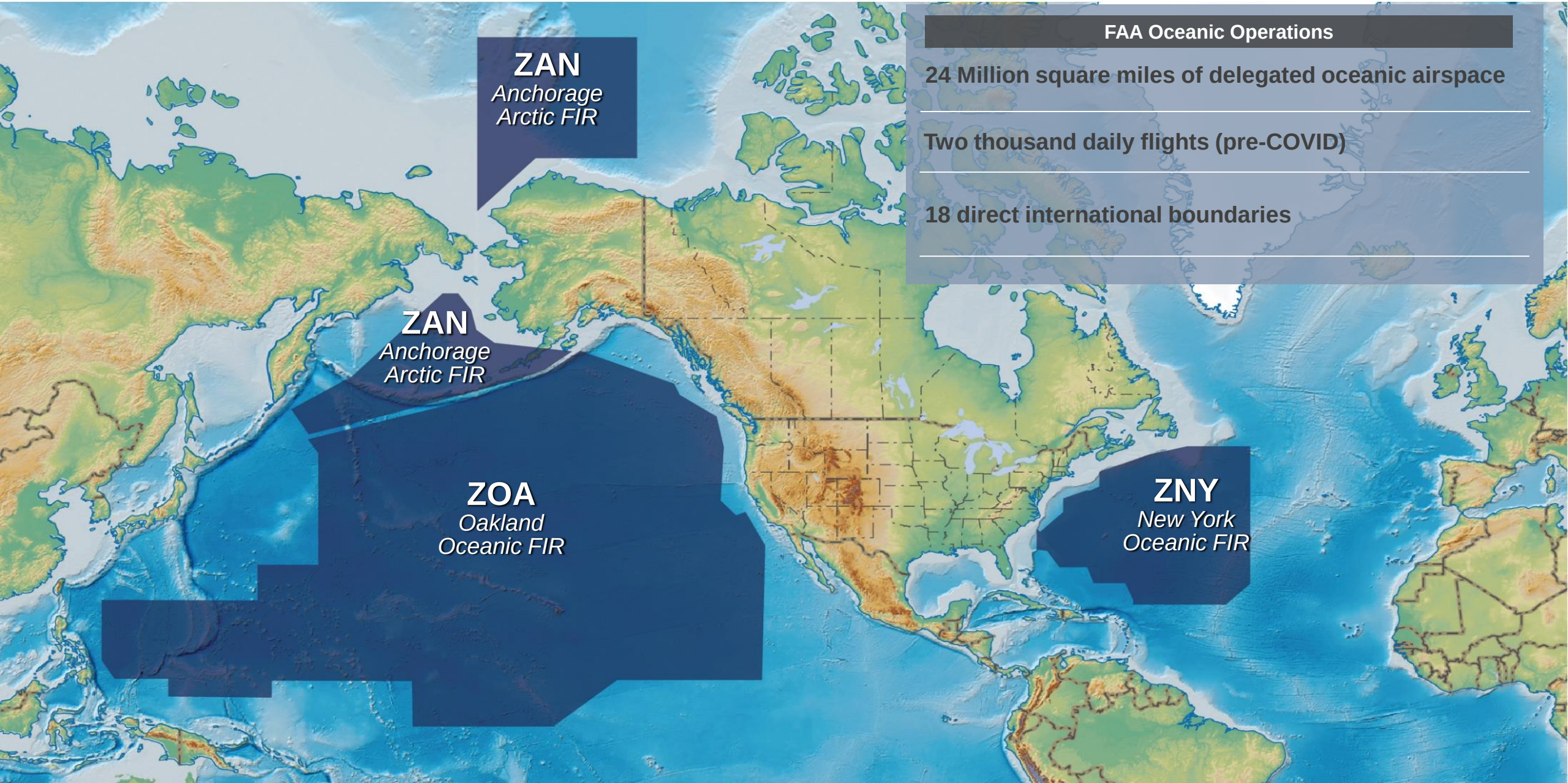
March 16th, 2021

Federal Aviation Administration

Agenda

- Overview
  - Current FAA Oceanic Operations
  - Program Development
- FOTO35 Goals
- FOTO35 Benefits
- FY21 & FY22 ATDP Activities
- Questions

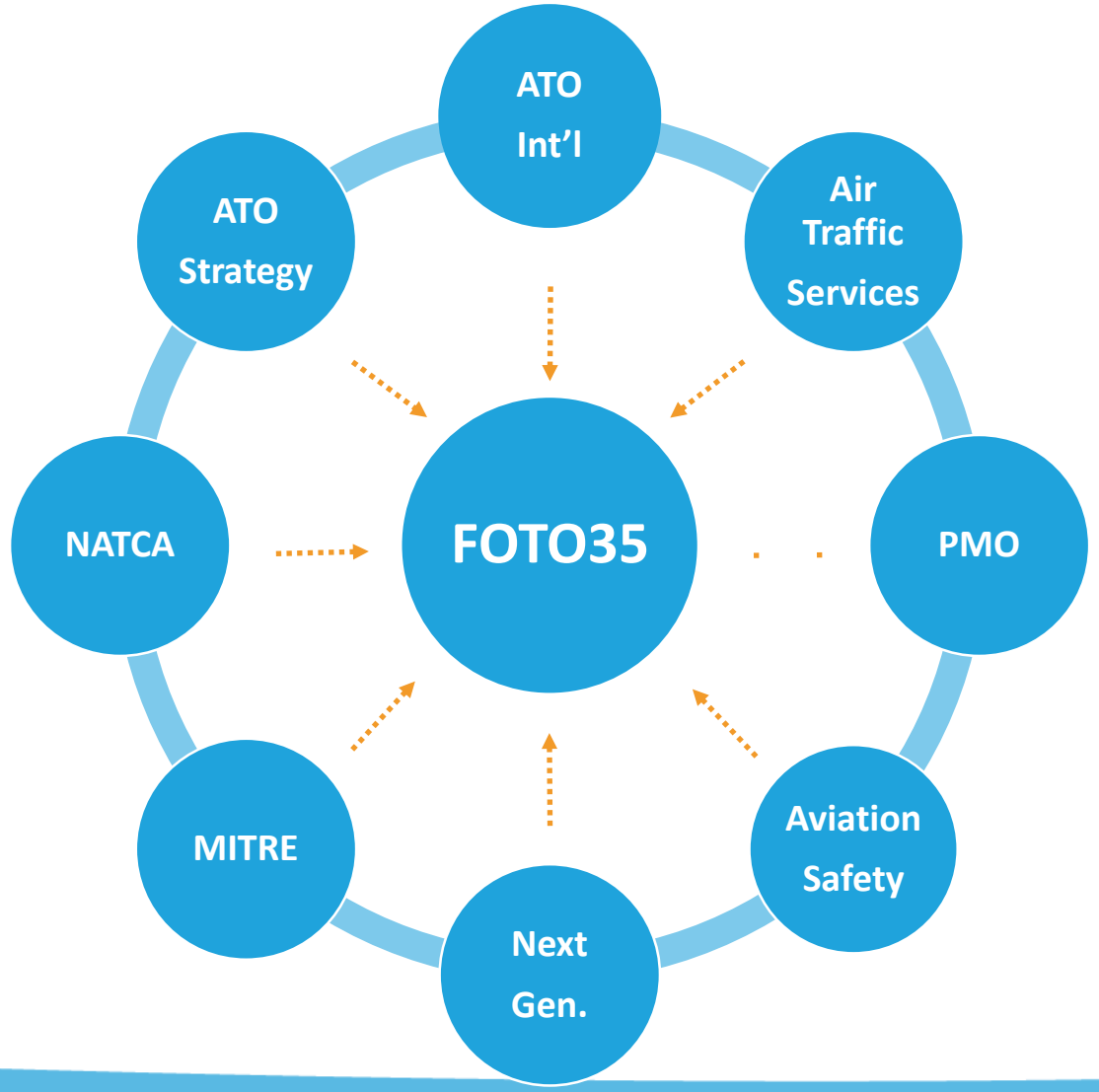
FAA Oceanic Operations: Scope & Scale



FAA Oceanic Operations

- 24 Million square miles of delegated oceanic airspace
- Two thousand daily flights (pre-COVID)
- 18 direct international boundaries

Program Development – Collaboration Is Key



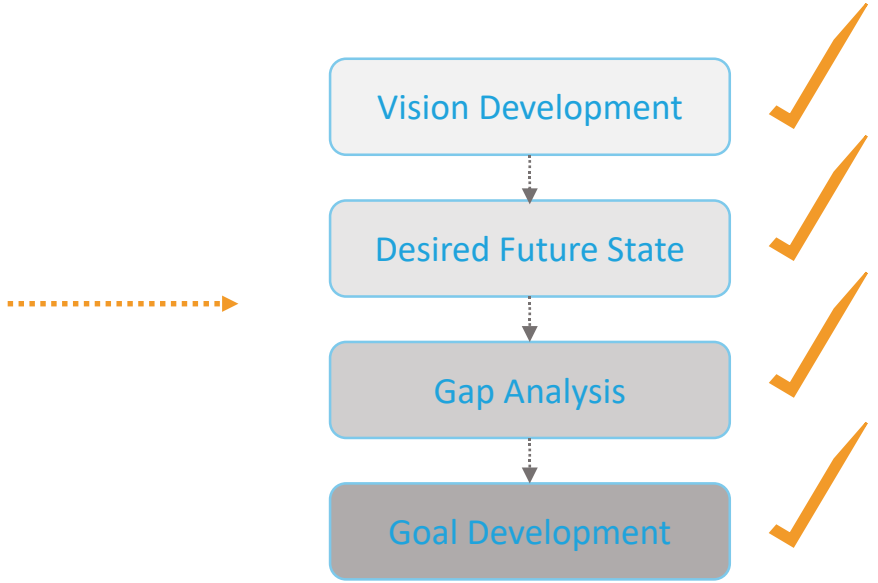


FOTO35 Goals and Desired Outcomes

1 Implement 4DT Operations (Traj. Based Oceanic Control)

DESIRED OUTCOMES

1) Seamless, "Gate to Gate" operations between FAA's oceanic, offshore, domestic ATS systems, and neighboring ANSPs
2) Seamless operations between FAA's oceanic and foreign ANSP ATS systems
3) Users' flights are more efficient by improved processes implemented to process flight plans and more frequently update trajectories while taking advantage of weather and cost-index data

2 Enhance FAA's Oceanic Separation Procedures

DESIRED OUTCOMES

1) Improve operational safety and efficiency for oceanic users
   - Application of horizontal-radial separation procedures
   - On-demand tactical maneuver capability
   - Increased accommodation and resolution of critical aircraft contingency scenarios
   - Improved departure/arrival ATC services into remote oceanic airports
   - Efficient management of pair-wise aircraft performance differences (*tactical maneuvers around blocking aircraft*)
2) Real-time/low latency voice communications & enhanced surveillance

3 Safely Integrate Emerging Users & Space Operations

DESIRED OUTCOMES

1) Establish policies procedures and technology for effectively handling space launches and re-entries, UAS, high altitude balloons, and supersonic aircraft in the oceanic environment
2) Increase situational awareness (communications and surveillance) with non-conventional users, including performance factors
3) Automate input of all nonconventional user and space operations data, including airspace use, planning and coordination

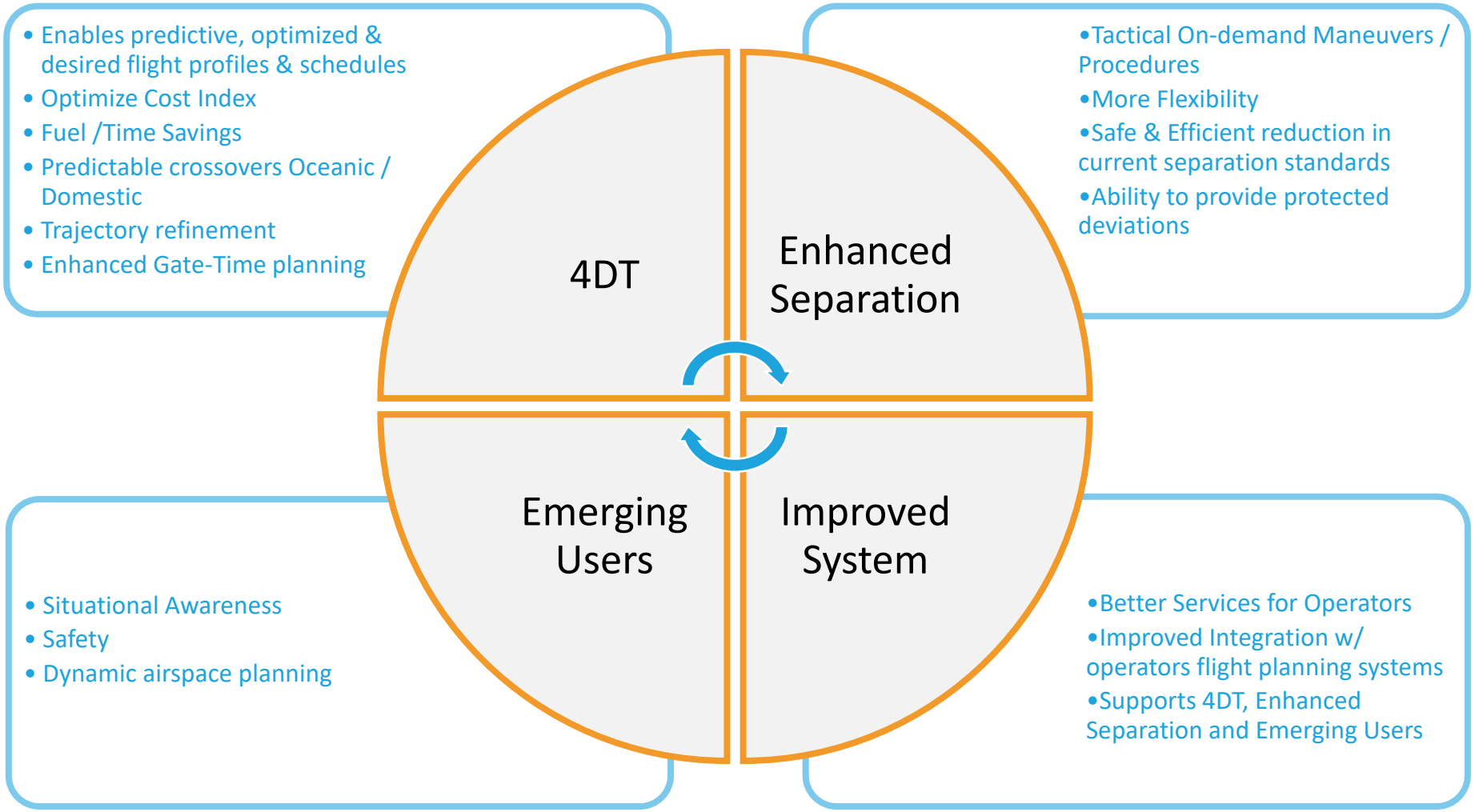
4 Implement new/improved Oceanic ATM System

DESIRED OUTCOMES

1) Cloud-based, automation system that improves seamless, efficient, safe oceanic operations
   - 4DT and Enhanced Separation Procedures
   - Reduced interface complexity and controller workload
   - Increased safety with outage detection and improves conflict resolution capabilities
   - Increased resiliency, adaptability, and enables portability during emergencies

FOTO35

FOTO35 Benefits to Industry



Planned ATDP Activities FY21 & FY22 (Tentative)

1 Implement Optimal 4DT Operations

Activities:

1) Establish FAA 4DT Work Group
2) Begin 4DT Stakeholder Outreach
   - ✓ Technical Interchange Meetings
   - ✓ Industry Day
3) Coordinate and draft Globally Agreed Definition of 4DT
4) Begin Stakeholder Needs Report

2 Enhance FAA's Oceanic Separation Procedures

Activities:

1) Develop a concept of operations for application of tactical on-demand operations
2) Conduct an operational assessment of the Cleared Weather Deviation Procedure
3) Initiate assessment of performance requirements necessary to support future enhanced separation procedures

3 Safely Integrate Emerging Users & Space Operations

Activities:

1) Begin Stakeholder Outreach Program - Technical Interchange Meetings
2) Begin Draft Operator Needs Analysis
3) Begin Draft Operator Data Sharing Assessment

4 Implement new/improved Oceanic ATM System

Activities:

1) Begin Stakeholder Outreach Program - Technical Interchange Meetings
2) Research Service Level Requirements

Note - Activities are dependent on conducting in-person testing. Target dates could be delayed due to COVID travel restrictions

Thank you!

For more information, contact

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