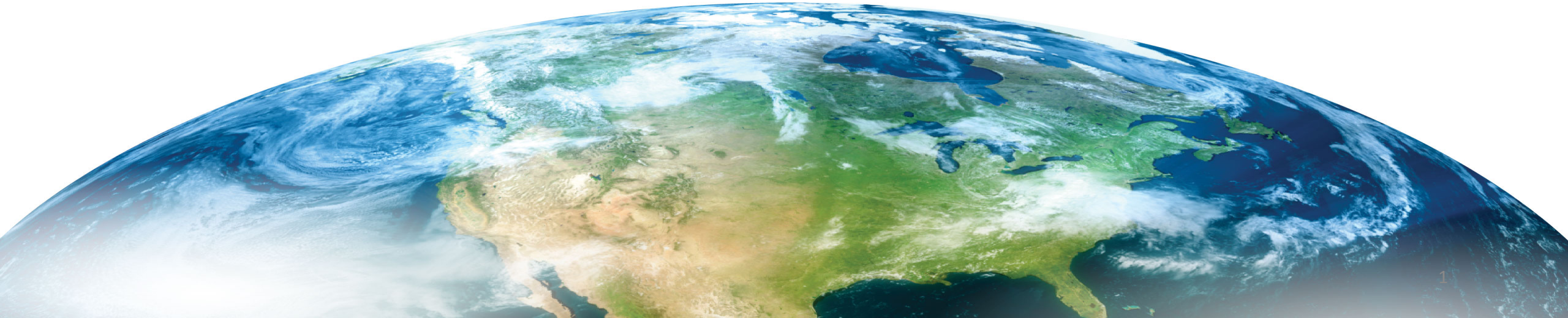
Policy and Requirements Service Overview

November 2023



Agenda

- Policy and Requirements Service Overview

- EWRS Project Overview
- SFO specific work
- WIMAT Project Overview
- Distinct deliverables

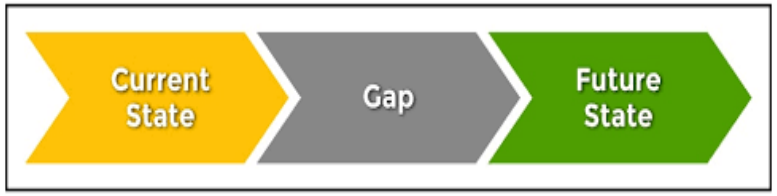
AWD Requirements Service

The FAA Process Is Divided Into Four Main Phases:

1. Needs/Gap Analysis
2. Operational Concept & Use Description
3. Requirements Development & Validation
4. Formal Requirements Allocation & Transmittal
5. Post-Transmittal

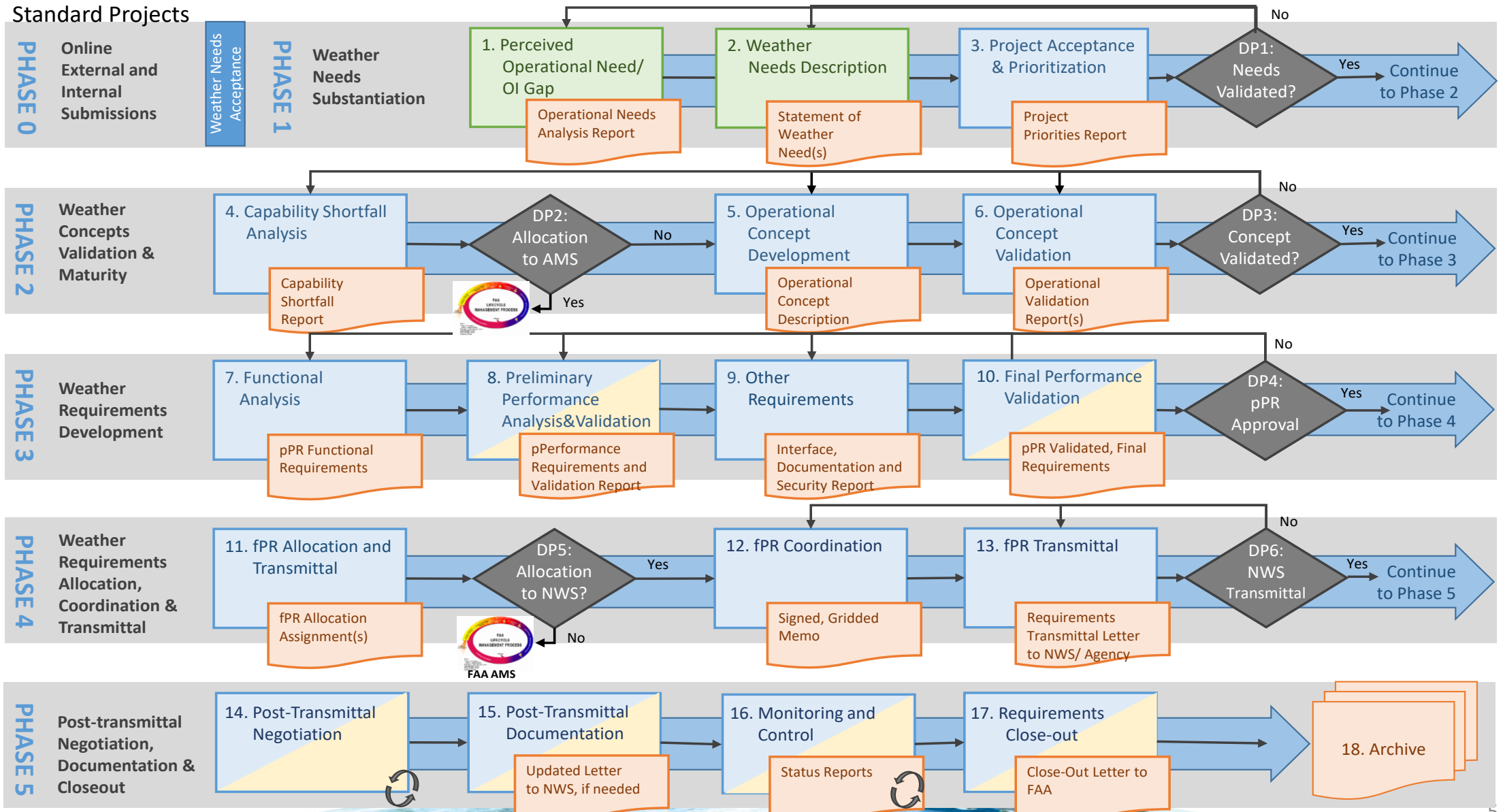
Problem Statement Development

- Key to implementing any processes. There is no implied solution or cause.



- What do you need?
- What are you trying to accomplish?
- What can you not do because of this (safety or efficiency?)

WRS Process Overview

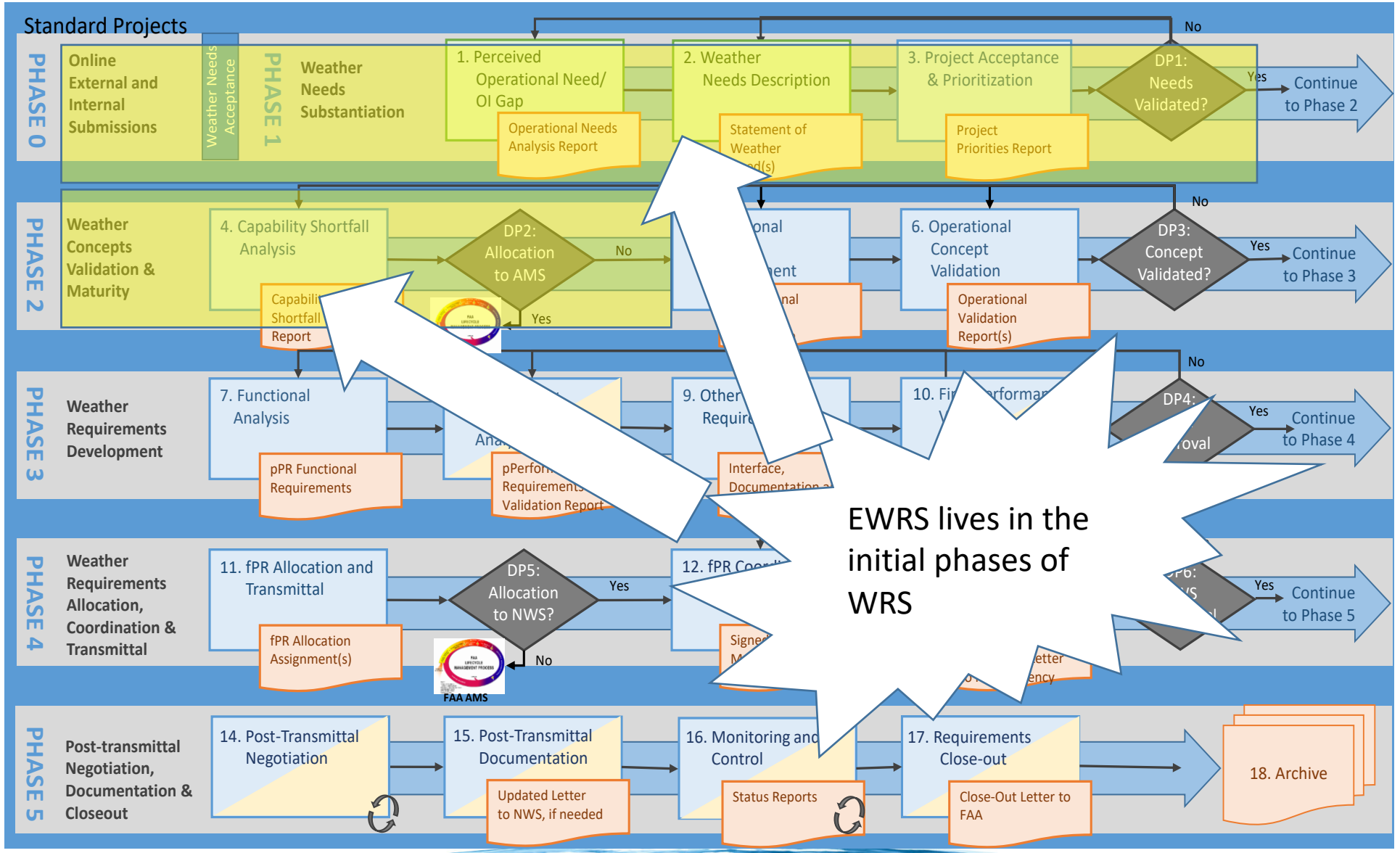


WRS Process Overview

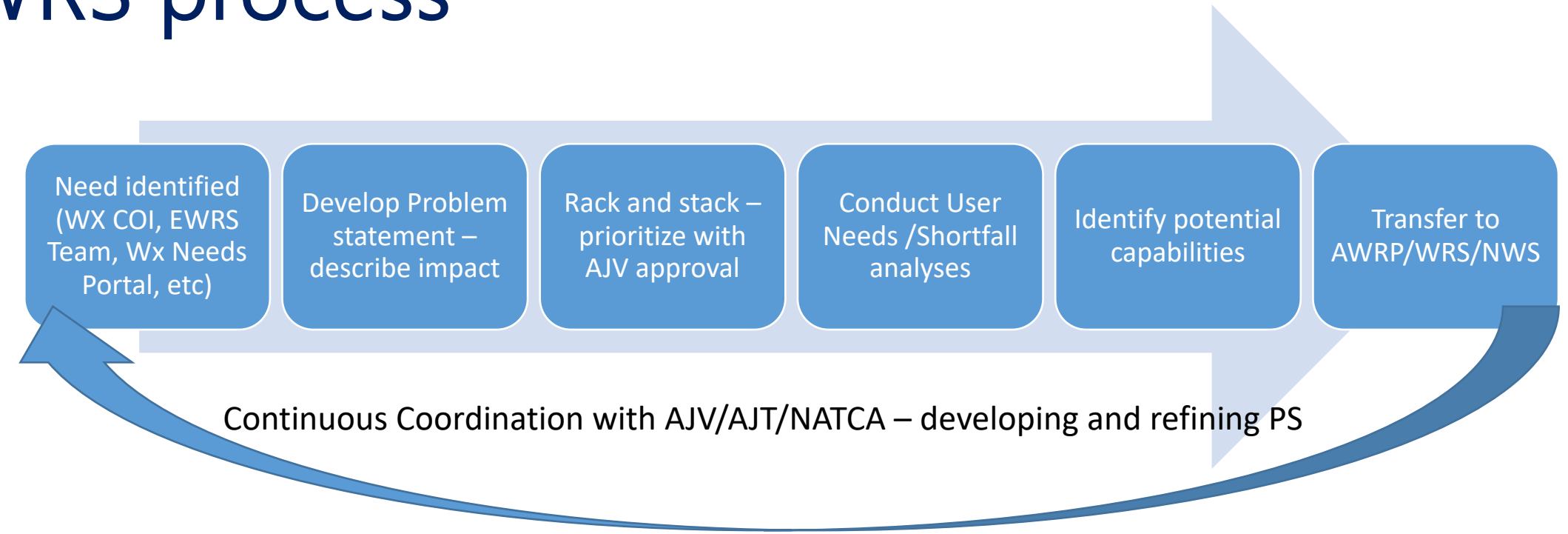
EWRS program overview

- 1 of 3 projects under the WX Transition PLA (WRS, WIMAT, EWRS)
- EWRS generally follow the WRS process
- Purpose: Looking over the horizon to identify and prioritize unmet weather needs/shortfalls and identify potential solutions
- Diverse team (AJV, AJT, NATCA, ANG, AJM) meets bi-weekly to develop problem statements. Overall validation comes from AJV.
- Regular communication with WX COI SWATs
- Deliverables
  - Identification and prioritization of needs in coordination with AJV
  - Needs Validation
  - Shortfall Analysis
  - Alternatives description and costs
  - Tech Transfer

WRS Process Overview



EWRS process



EWRS Concept Definition

- Based on findings from a number of base documents
  - 2019 Dynamic Weather Operational Needs Assessment
  - 2019 Final Impact Analysis for Emerging Weather Requirements, Phenomena, and Needs
  - 2018 Mapping Advanced Weather Capabilities to Air Traffic Management Decision Support Tools
- Previous work Identified 3 potential focus areas
  - Improved turbulence information over Oceanic Airspace
  - Wind impacts to Trajectory Based Operations (TBO)
  - Winds impacts to Time-Based Flow Management (TBFM)

2019 Dynamic Weather Operational Needs Assessment

Gaps	Needs
Weather information presented to air traffic controllers can be inadequate under rapidly changing adverse weather conditions.	**There is a need to provide an accurate and timely depiction of precipitation weather data on an air traffic controller's primary display.**
Conflicting or different weather information between en route and terminal controllers and pilots.	**There is a need to provide precipitation weather data on an air traffic controller's primary display where Next Generation Weather Radar (NEXRAD) or other weather radar coverage are not available.**
Some weather information such as turbulence, cloud tops/echo tops, wind shear, icing, and hail, is not currently available to air traffic controllers on their primary displays.	**There is a need to depict adverse weather information such as turbulence, cloud tops/echo tops, wind shear, icing, and hail on an air traffic controller's primary display.**
The current dependence on the ASR weather channel for the presentation of weather is not ideal, and ASRs may be decommissioned.	**There is a need to provide a similar depiction of precipitation weather data on bordering TRACON and En Route air traffic controllers' displays.**

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EWRS Concept Operations

- Identifies the highest priority needs from the Concept Definition
- Wind impacts to TBFM was identified as top priority
- Problem statement – (AJT-3, AJV, NATCA)

Inaccurate or untimely wind information fed into trajectory-based systems can result in significant delays and reduced efficiency. *There is a need for more timely, frequent, and accurate real-time winds that better integrate with trajectory algorithms to increase safety and efficiency.*

Background information

Automated trajectory-based systems use a wind ingest that is generally at a resolution of 40 kilometers (km) and is updated every hour, except for two periods per day when the interval is two hours. This is often adequate in the cruise environment and when wind conditions are relatively stable.

However, in the vicinity of arrival airports, in situations where the weather conditions change rapidly, or where very strong jet stream winds exist, the current granularity is insufficient. In these situations, trajectory times become so far off that the trajectories are unsustainable or unrecoverable.

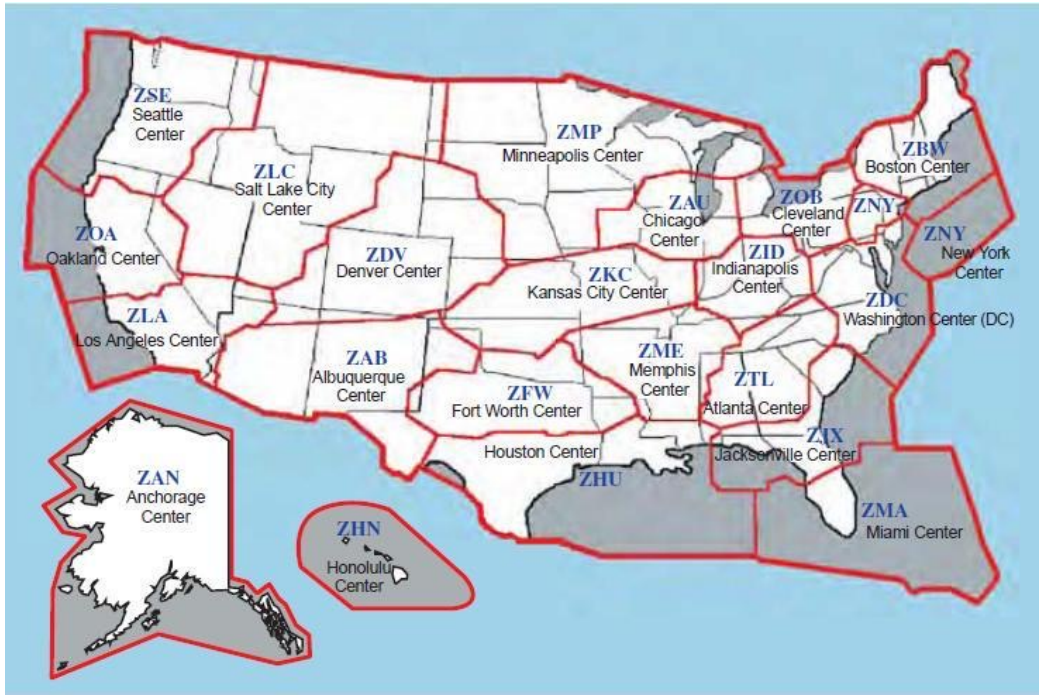
Excess Headwind – underfeeding ***Excess Tailwind – overfeeding***

EWRS Needs Assessment

- Audience:
  - TBO National OPS Team
    - Interviews conducted by NATCA
  - Survey questions
    - Validated needs based on previous work
    - Prioritized needs
    - Clarifying previously stated needs
    - Focusing on 3 primary areas (accuracy, timeliness, frequency)
  - 12 Validate needs identified – mainly related to:
- Improving wind accuracy with respect to stabilizing trajectories
- Increasing ingest updates (15 min near airports, hourly in TRACON airspace)
- Finer resolution of wind data within TRACON airspace
- Better identification of “high impact” days

Completed work –

- Shortfall Analysis
  - Gaps with both validated and unvalidated needs
  - Define terms (improve accuracy, reduce error, ???)
  - Consider current capabilities to meet stated timeliness/frequency needs



- Wind impact analysis
  - Identify and document current thresholds for impacts to trajectories (what measure of inaccuracy is important?)
  - Perform historical analyses of frequency of occurrence
- Alternatives analysis
  - Looks as existing capabilities that can meet the need
  - Provides a ROM cost when able
  - Recommendations as applicable.

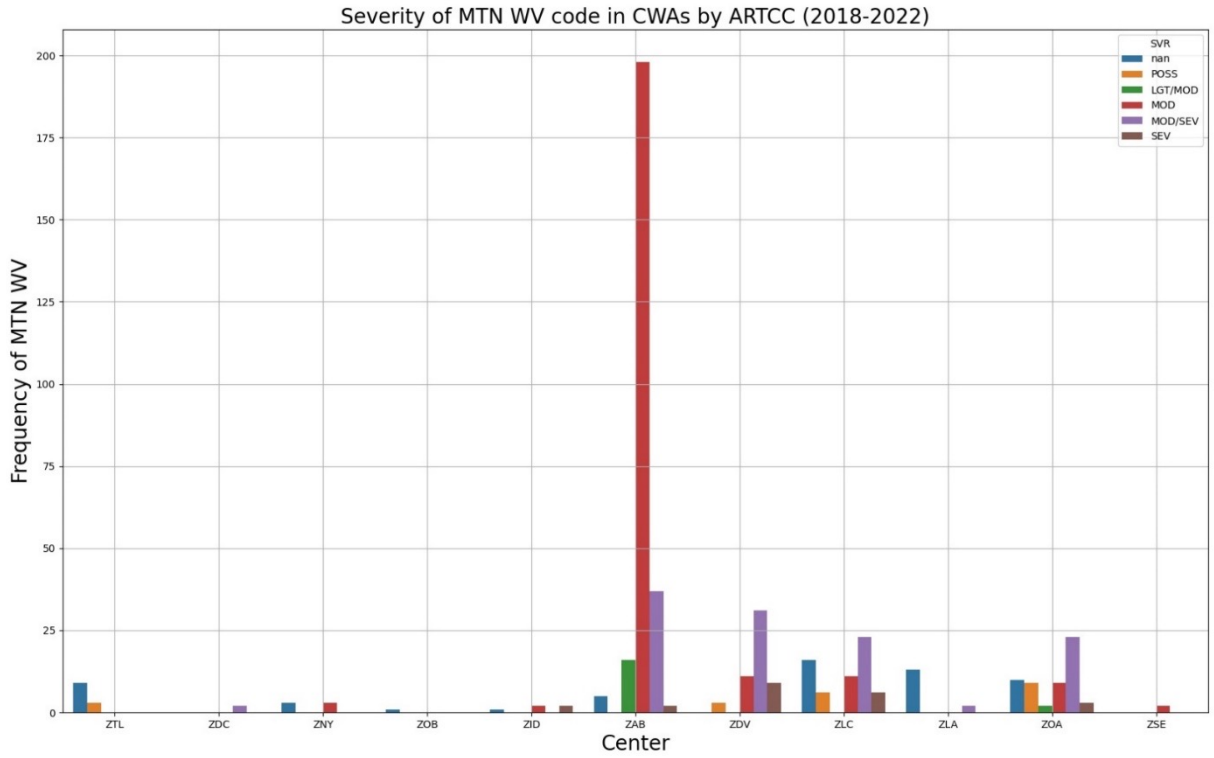
Stakeholder Survey and Shortfall Category Analysis

- A survey was created for SMEs
- Ten Survey Validated Needs (five Stated Needs and five Implied Needs) were identified through the survey feedback
- Survey Validated Needs were mapped to the shortfall categories and subcategories, seen in the table below:

Survey Validated Need	Shortfall Categories
1. Primary Need (stated): Sufficient forecast granularity and accurate forecasts (including onset/cessation times, magnitude, and event location) for wind events in the en route airspace are needed in order to increase efficiency and reduce significant delays	Accuracy ○ Yes- Forecast Accuracy ○ Yes- Wind Event Location ○ Yes- Impact to ETA/STA ○ No- Stability and Reliability Timeliness ○ Yes- Forecast Granularity ○ Yes- Impact to ETA/STA
2. Stated: Hourly increments for wind data in en route airspace	Timeliness ○ Yes- Forecast Granularity ○ Yes- Impact to ETA/STA
3. Stated: Tools or resources available to the controller once TBFM are no longer reliable to prevent demand exceeding capacity (i.e., TFMS, FEA, FSM, and proximity to meteorologists)	Accuracy ○ No- Forecast Accuracy ○ No- Wind Event Location ○ No- Impact to ETA/STA ○ Yes- Stability and Reliability

Wind Impact Analysis

- Considered MTN Wave, FROPA and Jet winds by ARTCC
- Looked for measurable events, thresholds and frequency of exceedance that triggered TMIs
- Metric analysis results: No statistically meaningful signal identified
  - Reason for no signal may include the Air Traffic Controllers (ATC) continuing to efficiently sequence arrivals despite not using TBFM
    - There may be minimal impacts of poorly forecast wind events that cannot be captured by general metrics due to the skills of the ATCs
    - Additional work may be conducted in this area to identify specific times TBFM is not used for sequencing
      - There are no known records of when TBFM is "turned off" or ignored due to poor forecasts and when the controller's skill is used to compensate
      - Additional studies may be conducted to witness wind events live and capture impacts (i.e., visiting ARTCCs during anticipated wind events)



Future work –

- Investigate impacts of winds impacting trajectories and when TBFM is shut off (ARTCC visits)

- Develop functional and performance requirements
  - Lots of communications with systems mangers
  - Lots of consideration to time/cost (if it takes 10 years, is it worth it?)

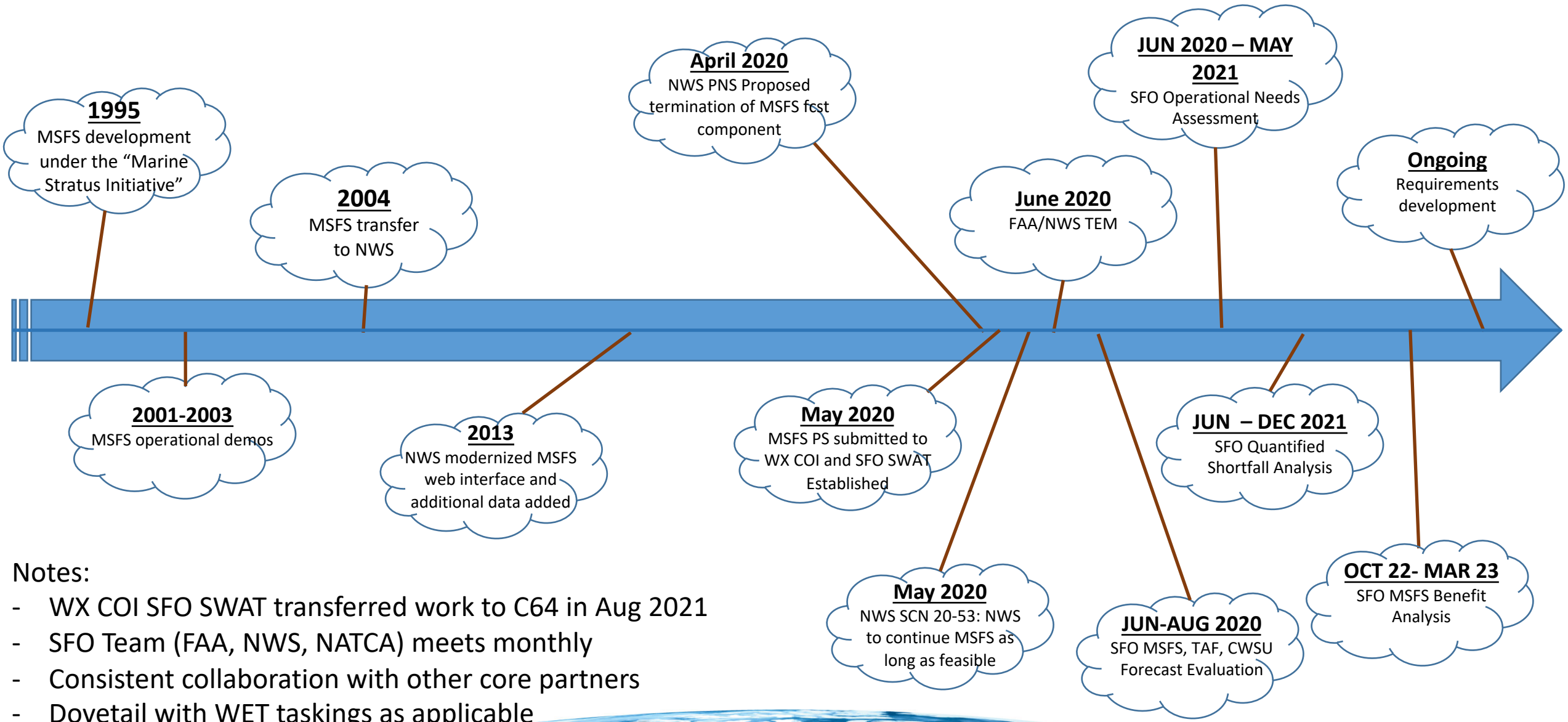
- Echo Tops Information Available to Controllers
  - Highest priority effort on the Dynamic Weather ONA
  - Concept of Operations
  - Needs/Shortfall analyses

SFO Problem Statement

Problem Statement presented during interviews and asked for confirmation and/or modification:

In recent years, the MSFS observational and numerical model components have become degraded. Newer technologies and capabilities necessitate an analysis of current TFM requirements and subsequently, a redefined needs statement to help determine what kind of system/tool is optimal for the unique TFM and weather demands (low/marine stratus and fog, especially during May to October) at SFO.

SFO Efforts Timeline and ANG-C6 efforts



Notes:

- WX COI SFO SWAT transferred work to C64 in Aug 2021
- SFO Team (FAA, NWS, NATCA) meets monthly
- Consistent collaboration with other core partners
- Dovetail with WET taskings as applicable

MSFS/TAF/CWSU Forecast Assessment

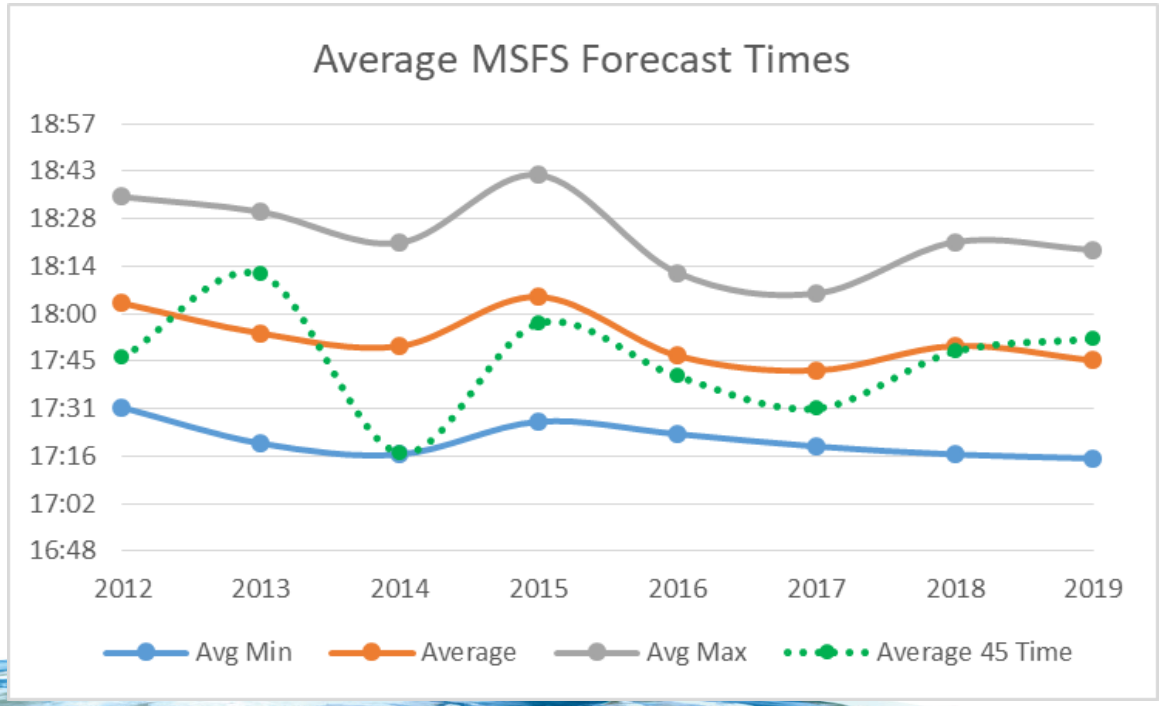
- Summarized findings:

1) Problem is almost all CIG and almost no VIS

2) MSFS was pretty good – despite degradation of components

3) Satellite imagery was helpful, but probably less then we thought (~15% improvement)

4-Year Average (2015-2018) Visibility in SFO METARs	
Visibility (SM)	Occurrence
10.0	90.4%
9.0	5.6%
8.0	2.4%
7.0	0.9%
6.0	0.3%
5.0	0.1%
4.0	0.2%
3.0	0.1%
2.0	0.0%
1.0	0.0%



User Needs Analysis/Shortfall

- Needs

1) Prediction of clearing time

2) Confidence in clearing time prediction

3) Adequate surface and lower atmospheric (stratus) observations

- Shortfall

1) Operational users lack sufficient weather observations needed to maximize arrival capacity (dual approaches of aircraft) into SFO and efficiency during the stratus season

2) Operational users lack accurate forecasts of stratus clearing time and stratus return in the evening
   a. Do not have access to localized, high-resolution SFO C&V forecasts needed to efficiently issue traffic management initiatives (TMIs) and maximize SFO capacity and efficiency during the stratus season

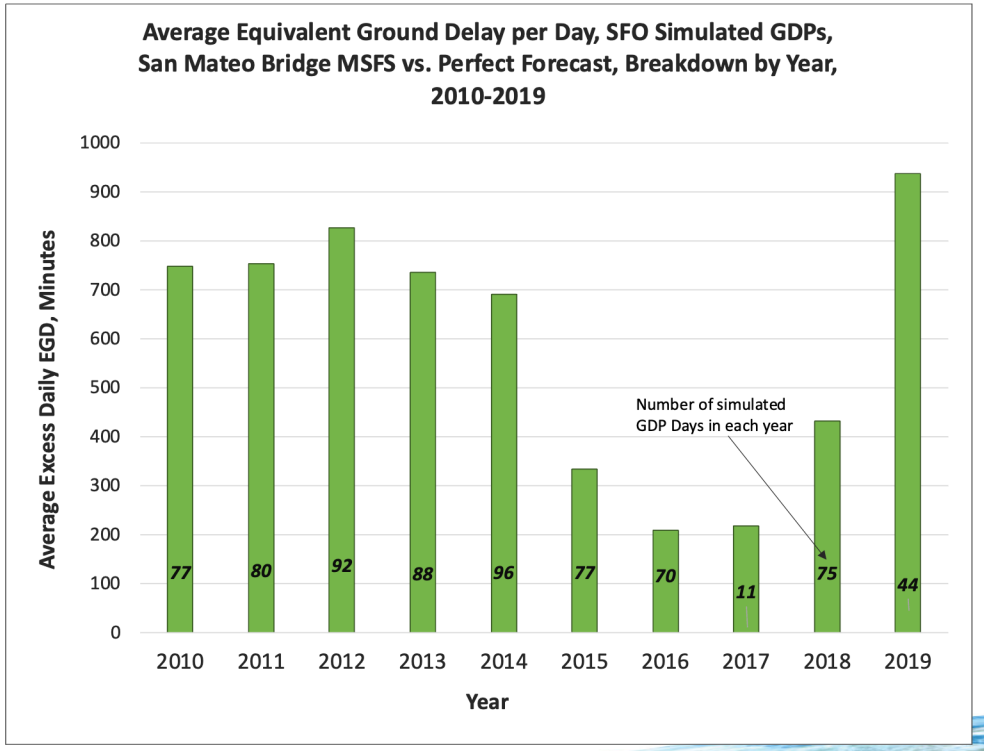
3) Operational users do not have access to a centralized capability housing all pertinent weather information, observations, webcam feeds, and forecasts needed to efficiently evaluate, issue, and adjust TMIs and maximize SFO capacity and efficiency during the stratus season.

MSFS Benefit Analysis

- Considered the operational impact to having the MSFS capability

1) Looked at the amount of excess delay (actual forecast clearing time vs the "perfect forecast" (no delay)

2) Computed delay information in terms of time periods where the MSFS was fully functional



KSFO

SMB	SMB/SFO	Below	1600'	Above
	Below	20.1	0.2	6.8
	1600'	1.9	0.3	0.9
	Above	12.6	2.6	54.6

SMB/SFO Ceilings Above/Below 1600 ft (%)
5/9/10 through 10/28/18 - GDP times only
~2200 comparisons

- SMB and SFO are within the same ceiling category 75% of the time [GREEN]
- SMB and SFO are within 1 ceiling category 5.6% of the time [YELLOW]
- **SMB greater 17.1% of the time**
- **SFO greater 7.9% of the time**

Current and Future Work

C&V Alternatives Description Report

- Define and describe feasibility and economic options for capabilities that can meet C&V-related traffic needs
- ROM Cost
- Describe any known capabilities
- Compare SFO thresholds with TFM requirements

Preliminary Performance Analysis

- Describe attributes that are considered essential to meeting SFO Stratus/Traffic Management needs
- Describe qualitative/quantitative requirements

WIMAT Overview

- Federal Aviation Administration (FAA) led via NextGen Aviation Weather Policy and Requirements Branch
- Born out of previous Requirements Working Groups
- Close coordination with National Weather Service (NWS) and user community
  - Steering Committee (FAA, NWS) - Monthly meetings
  - Full Team WIMAT Committee - As needed

Participants	
Federal Aviation Administration (FAA)	National Weather Service (NWS)
Aircraft Owners and Pilots Association (AOPA)	Airline Dispatchers Federation (ADF)
Air Line Pilots Association, International (ALPA)	Airlines For America (A4A)
MITRE	Harris
Helicopter Association International (HAI)	National Air Traffic Controllers Association (NATCA)
National Business Aviation Association (NBAA)	National Transportation Safety Board (NTSB)
Regional Airlines Association (RAA)	

WIMAT Overview

- Improve FAA decision-making by:
  - Enhancing consistency among weather products
  - Reducing conflicting information
  - Exploiting higher resolution information
- By examining a wide range of aviation weather information that is used and/or supported by the FAA and FAA supported activities (e.g., Flight Service Station (FSS)-Leidos, Flight Information System Broadcast (FIS-B)

WIMAT Overview

- Identify information that could be used as the ***principle*** source within FAA supported activities
  - Remove conflicting information
  - Identify products that can be retired
  - Determine impacts on proposed retired products
  - Implement mitigation strategies
  - Users create displays for their unique decision-making purpose

WIMAT Principles

1. Future operational products: gridded or objects formatted in International Civil Aviation Organization (ICAO) Meteorological Information Exchange Model (IWXXM
   - Traditional Alphanumeric Code (TAC) will become IWXXM products
2. Graphics integrated into user systems and phase out static images.
3. Consistent weather information
4. WIMAT will not address products used by FAA systems that are not within firm control of FAA requirements

Retirement of the CONUS Text AIRMETs

- FAA Safety Risk Management Panel (SRMP) occurred in October 2020
- Implementation Plan written to address on-going work needed to reach the retirement milestone in August 2022
- Document Change Proposals (DCPs) were updated to reflect changes in FAA documents
  - The DCPs were signed and will be published in April 2023 coincident with the retirement date
- FAA and NWS are planning to retire the TAC AIRMETs over the CONUS by early 2025.

Retirement of the OCONUS Text Area Forecasts

- CONUS Text Area Forecast Safety Risk Management Document (SRMD) from 2017 will be referenced for the retirement of the OCONUS domains (Gulf of Mexico, Caribbean and Hawaii)
- Implementation plan was submitted in May 2022 to address on-going work needed to reach the retirement milestones
- FAA and NWS are planning to retire the OCONUS Text Area Forecast by 2024

Convective Aviation Weather Product Review

- Multi-year effort which began on Sept, 2022
- Sub-team formed and meets Bi-Weekly
- Goal: Conduct a convective weather product review; develop a modernization plan as needed
  - Determine if any convective products need to be retired and/or identify which projects should be further developed/enhanced
  - AWDE conducting a comprehensive user survey
  - Completed an initial Operational Services and Environment Document (OSED) July 2023
  - Conducting a final analysis (product use, recommendations, metrics considerations, etc)

Summary - WIMAT

- WIMAT is FAA led with NWS and user community coordination
- Repeatable processes which includes:
  - Assess current products
  - Leverage human factors as appropriate
  - Complete process to retire and/or consolidate products if needed
  - Encourage focused research and development on remaining products and sources

Questions?

Contact Brandon Smith with any questions

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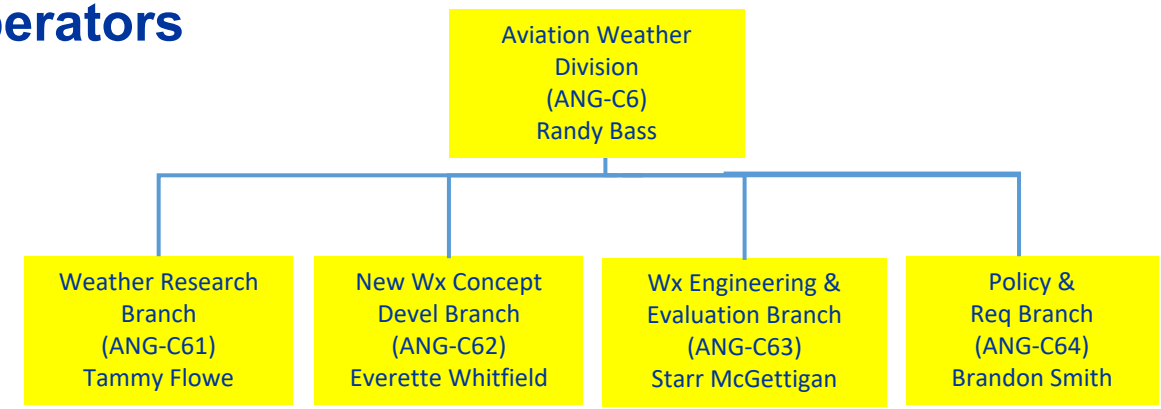
Aviation Weather Division

- **Mission: Assure the development, enhancement, dissemination, and integration of productive weather information into Air Traffic Management decisions by pilots, controllers, flight operations and airport operators**



- Four branches comprise the division
  - Weather Research Branch: Conducts research to mitigate the impact of weather on aviation by transitioning the research to operations
  - New Weather Concept Development Branch: Bridges the gap between available and/or emerging weather products and services with operational weather requirements for Air Traffic Managers Decision Support Processes/Decision Support Tools through weather integration
  - Weather Engineering and Evaluation Branch: Provide engineering, evaluation, and technical services to support aviation weather initiatives. Capabilities include weather system and user laboratories as well as Airport Operations Area testbeds
  - Policy and Requirements Branch: Identifies and coordinates domestic and international weather requirements. Oversees the Weather Needs Portal