Operational Weather Needs Analysis (OWNA) in Support of FAA Weather Requirements Development

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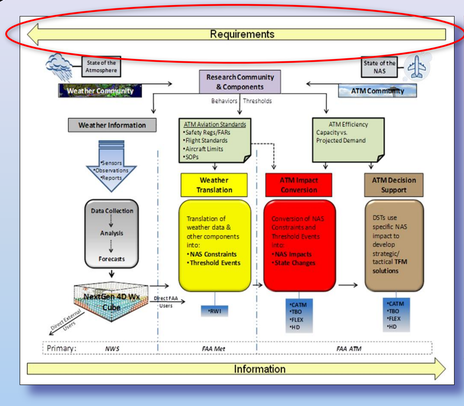
1 ATM-Weather Integration and Requirements (Background):



The ATM-Weather Integration Requirements Dilemma:

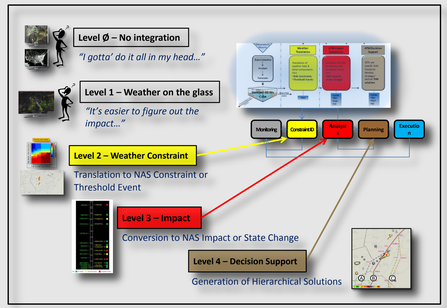
Requirements are depicted as flowing from right to left, from the ATM decision makers to the aviation weather community, in the ATM-Weather Integration concept diagram (aka Ketchup-Mustard chart). However, getting these requirements has proven difficult – "you don't know what you don't know."

ATM-Weather Integration Decision Model

Operational Decisions, the key to determining weather attribute needs:

- Iterative process, five phases
- Monitor and Identify Constraint both directly involve and require weather information
- Analyze Impact uses weather and air traffic information to quantify the extent of the demand/capacity problem
- Plan and Act do not require the same weather information

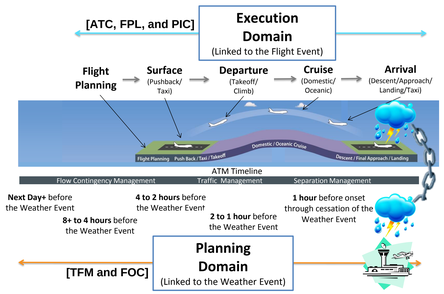
Levels of ATM-Weather Integration
(Everything in Alignment)



Planning and Execution:

ATM decisions of interest take place in one or more of the five timeframes or stages of the Planning (Flow) and Execution (Flight) domains. Each has its own set of ATM decision-making actors. These asynchronous domains are linked when a weather event that constrains capacity and a flight are co-located.

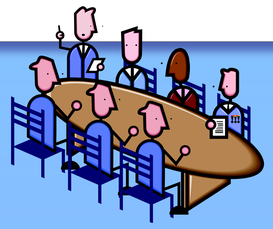
Planning and Execution Domains – Linked by Weather and Flight Operations



2 The OWNA Process:

Operational Weather Needs Analysis (OWNA)

- Formalized, operationally-based analysis process
- Repeatable for different scenarios and air traffic management (ATM) capabilities and processes
- Output is traceable
- Goal: identify weather information needs based on operational decision-making by members of the ATM community



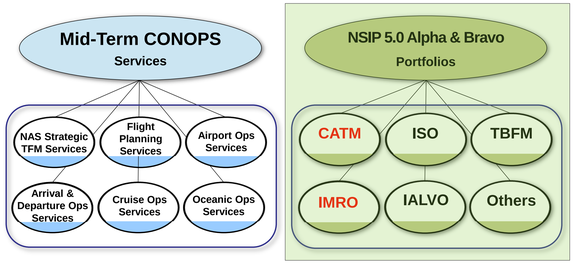
How Does OWNA Work?

Discussions with a group of ATM experts, focused on domain-specific capabilities and processes that involve weather-impacted operational decision-making, are used to identify both "as-is" and "to-be" weather information attributes, which are recorded, interpreted, compared, and reported out.

1. **Gather ATM SMEs (CDM perspective)**
   - TFM, AOC, ATC, DSP, PIC
2. **Arm SMEs with foundational information**
   - Weather products, CONOPS, NSIP
3. **Identify OWNA target(s)**
   - Increments with DIRECT weather dependency
4. **Set up OWNA context/framework (scenario light)**
   - Domain (Operational/Execution) Timeframe Pairs
5. **Drive out Operational Weather Requirements**
   - Current needs vs. Future needs
6. **Validate Results**
   - CDM WET, FAA (AJV-7) SMEs, NWS
7. **Report Results**
   - FAA and NWS

Aviation Weather Requirements Process Overview

Objective → To develop validated operational performance requirements that address user needs and achieve the successful implementation of mid-term service capabilities.



Process Steps:

- Decompose CONOPS and NSIP capabilities
- Assess user needs (OWNA)
- Operational validation of user needs
- Convert operational needs/requirements to performance requirements
- Approve requirements
- Validate through M&S/HITLS
- Allocate to FAA and NWS

NextGen Segment Implementation Plan V. 5.0:

The NAS Segment Implementation Plan (NSIP) is the blueprint for achieving near- and mid-term Operational Improvements (OIs).

OIs are high-level descriptions of a specific operational transformation or an improved level of performance needed to achieve the NextGen vision, as defined in the NextGen Mid-Term CONOPS.

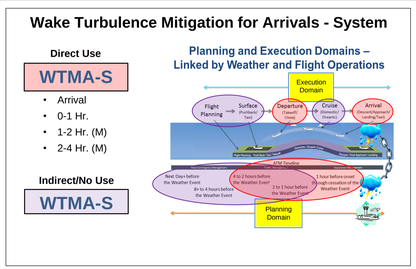
To create the NSIP, the OIs from the NextGen Mid-Term CONOPS were disassembled into incrementally deployable capabilities with measurable benefits, and each is called an Increment.

Select NSIP Increments arranged into functional groups are called Portfolios.

3 Sample Findings:

Improved Multiple Runway Operations Portfolio: WTMA-S

Wake Turbulence Mitigation for Arrivals - System



Key Decisions Being Made

Monitor:
When will winds meeting WTMA-S (along the final approach path to touchdown) criteria exist?

Identify Constraint:
When WTMA-S operations are in effect, can one identify, with sufficient advance notice, when required wind conditions will cease and operations will return to normal separation criteria?
Will there be any sudden change in weather conditions that would require discontinuation of WTMA-S operations?

Analyze Impact:
Will the use of WTMA-S allow for an increased Airport Arrival/ Acceptance Rate (AAR)?

Needed Weather Attributes (WTMA-S)

Execution Domain:

- A forecast area at least 20 flying miles (where aircraft are sequenced, but not delivered to final) from the arrival airport. This would be the minimum transition time to move from "Plan A" to "Plan B" at most airports.
- A configurable loss/gain alert time ("amber") to accommodate shorter or longer final segments.
- An accuracy indicator to assist with risk assessment, possibly a score tied to current conditions (e.g., real-time verification score).

Planning Domain:

- A longer lead-time for the Wind Forecast Algorithm (WFA) forecast (8-16 hours) to allow WTMA-S to provide information that will align with the Airport Arrival Rate Decision Support (AARDS) capability.
- An indicator ("amber") of likely WTMA-S use throughout the operational day (8+ hours).
- An increased area of forecast; up to 5k feet and out to 15+ miles to provide better coverage of the arrival corridor.
- Frequent updates of forecast conditions, possibly triggered by a threshold change (a divergence between forecast and current observation) - fed by new information (e.g., profilers, MDCRS, Tropospheric Airborne Meteorological Data Reporting [TAMDAR]).
- Configurability by geographic location, facility, and individual position.

Shortfall Analysis (WTMA-S)

Attribute	Current	Needed	Short fall
Attribute Category - Content			
Automated Alerting	WFA 2-level (red/green)	Additional heads-up (amber)?	M
Attribute Category - Level of Detail			
Spatial (area of forecast coverage and resolution)	WFA 5nm, 1,000ft	WFA 20nm, 5,000ft	Y
Temporal (update rate, valid time, standard forecast time)	Adequate for short range planning, execution	Longer WFA forecast times for longer range planning (e.g., to align with AARDS)	Y

Attribute	Current	Needed	Short fall
Attribute Category - Properties			
Onset/ Cessation	O/C is part of WFA	O/C needed for more than 2 hours	M
Scoring	None	Explicit - Wind information from aircraft could be used	M
Trend	None	Explicit - Wind information from aircraft could be used	M
Update Rate	Adequate	Variable rates triggered by actual/forecast differences greater than predetermined threshold	M