Quantifying Aviation Weather Forecast Benefits in a Common Framework

Presented to: Friends of Aviation Weather Forum

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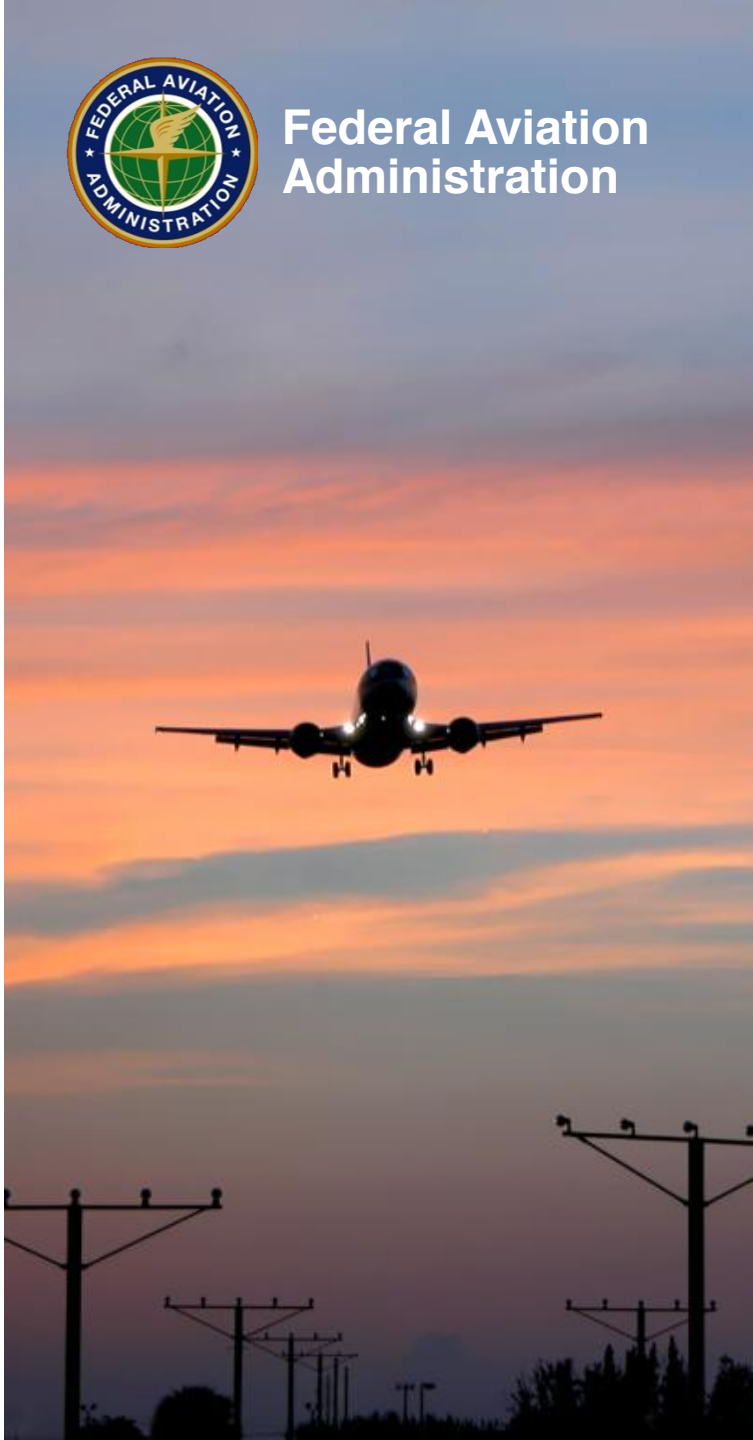
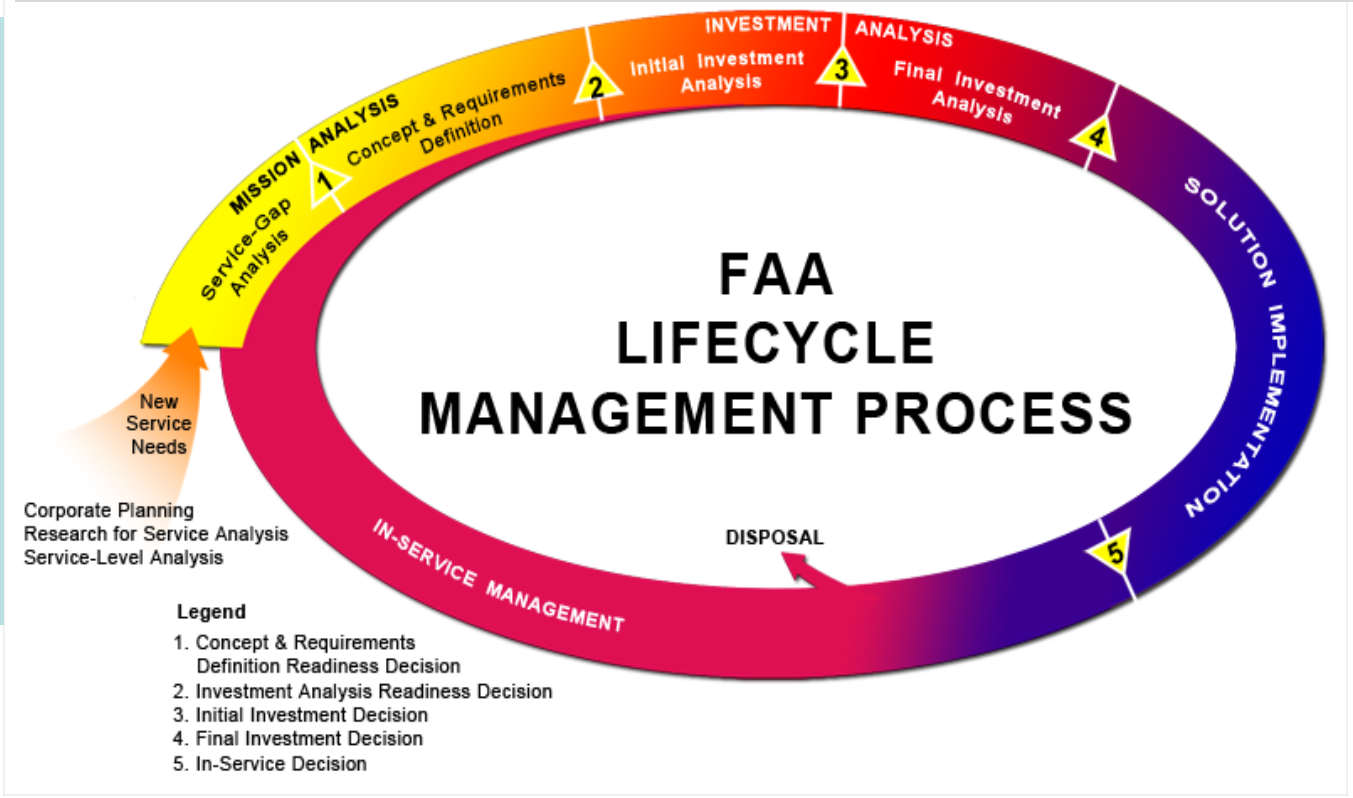


FAA's Acquisition Management Process

The FAA's Investment Planning and Analysis Office works closely with the program offices to ensure a defensible business case moves forward

METRICS are identified, developed, and transformed into *benefits.* A large number of acquisition programs go through the investment analysis process, e.g., weather programs - ITWS, WARP and other programs such as CATMT, TMA/TBFM, ERAM, Data Comm and ADS-B



Metrics – Conversion to Benefits

- **Several NAS Programs claim user benefits (delay savings, flight efficiency) from enhanced capabilities**
  - Many of these programs acquire benefits from weather forecasts either directly or indirectly (as enablers)
- **Quantified benefit estimates are required for all major investment decisions during phase 2, 3 or 4 of the FAA's Lifecycle Management Process**
  - User benefits
    - Might have a case for reduced cancellations and diversions, fuel savings and safety improvements
    - The following metrics are converted into **TIME SAVINGS**
      - Distance savings
      - More efficient capacity utilization, recovery of the runway
      - Increased throughput (en-route and terminal)
      - More uniform flow separations
    - From **TIME SAVINGS** the benefits are monetized and projected over the life cycle

Claimed Benefits (Weather Programs)

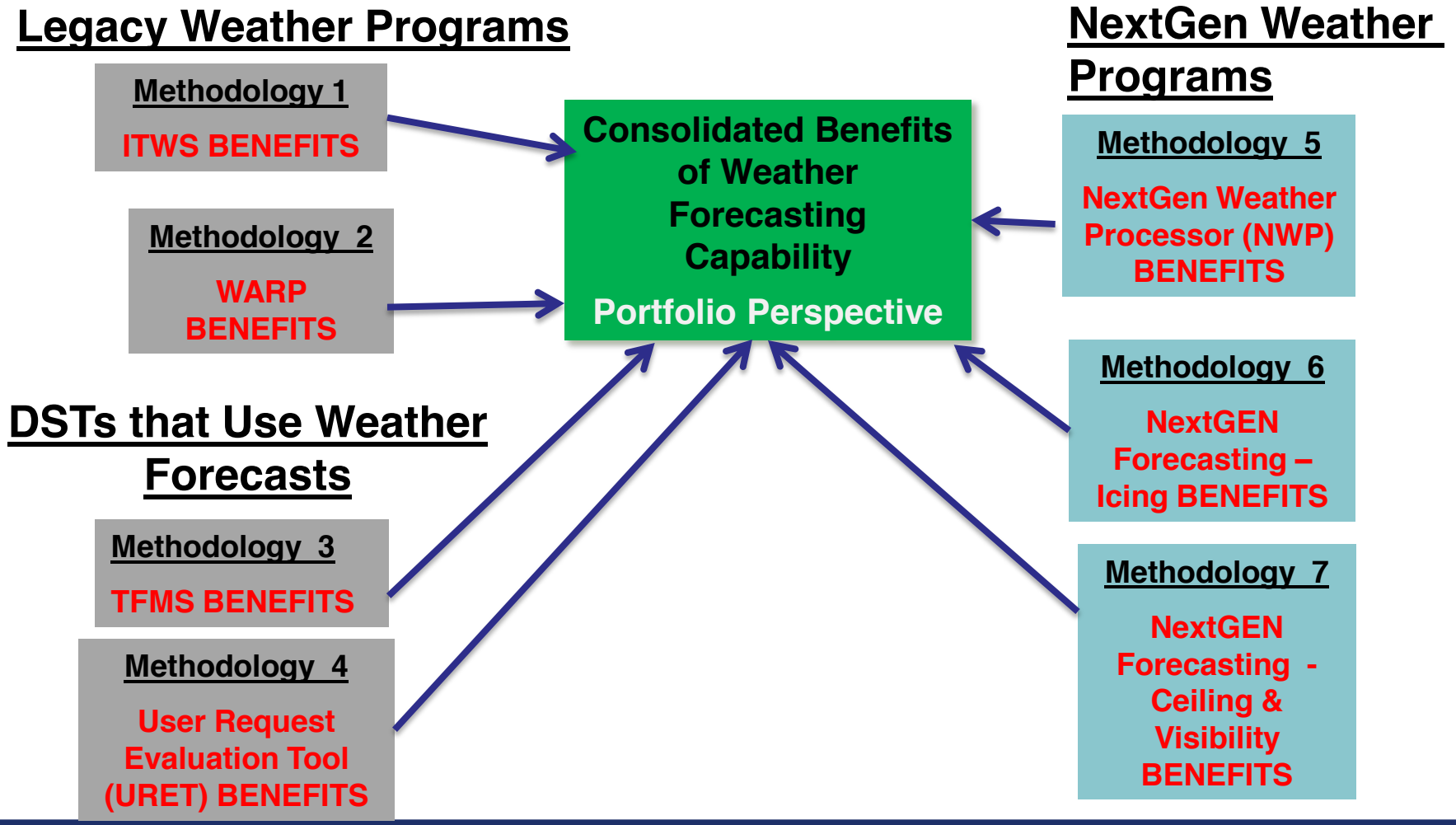
Program	Forecast Mechanism	Identified Benefit Categories	Primary Metrics/
Weather Radar Processor (WARP)	Updated mosaics from NexRADS to en-route controller displays	1) Navigating through holes, 2) deviating further upstream, 3) avoiding storm cells behind a front in en-route airspace	**Delay savings (en-route weather-related delay)**
Corridor Integrated Weather System (CIWS) – *prototype*	ARTCC based tool 0-2 hr forecast tops, includes winter weather	1) Keeping routes open, 2) pro-active rerouting	**Delay savings (airborne and ground)**
Integrated Terminal Weather System (ITWS)	0-1 hour forecast using integrated data from FAA and NWS sensors for terminal and TRACON airspace	1) Arrival transition areas, 2) departure transition areas and 3) runways (better capacity utilization)	**Delay savings (airborne and ground)**
NextGEN Weather Processor (NWP) *CoSPA* – *prototype*	Longer term forecast – 2 to 8 hours	1) Airspace Flow Program (AFP) execution management, 2) enhanced playbook reroute planning and execution and 3) enhanced reroute planning	**Delay savings (airborne and ground) and distance reduction**
Terminal Doppler Weather Radar (TDWR)	Aviation weather products: precipitation, microburst, gust fronts, and related hazardous wind shear thru better detection	increased aviation safety	**Reduced accidents, fatalities and hull damage**

Claimed Benefits

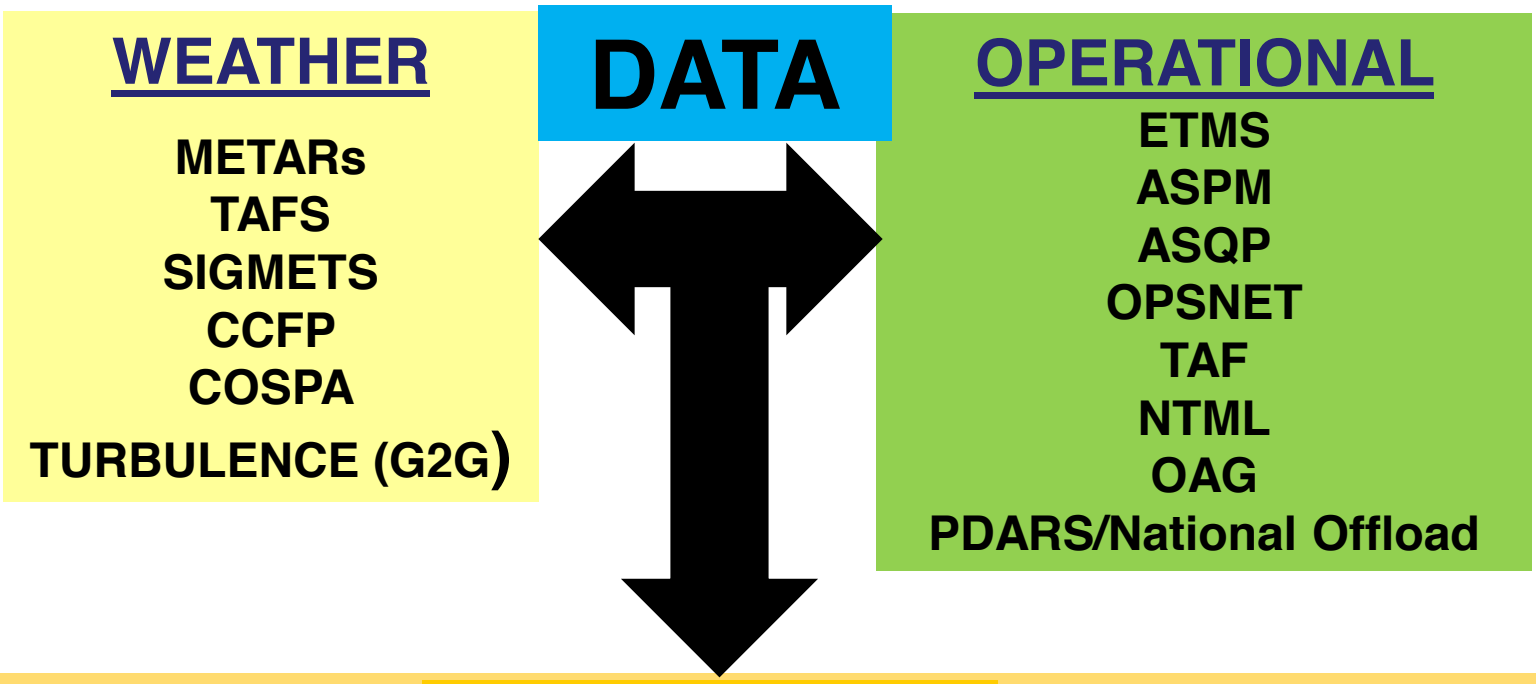
(Sample of Decision Support Tools (DSTs) that Use Forecasted Weather)

Program	Forecast Mechanism	Benefit Categories	Primary Metrics
Route Availability Planning Tool (RAPT)	Integration of CIWS forecasts for decision making into the departure route status timeline	Better departure route management, improved route impact planning	**Delay savings (ground)**
Traffic Flow Management System (TFMS)	Integration of CIWS products on the traffic situational display (TSD)	Keeping routes open more efficiently, pro-active rerouting	**Delay savings (airborne and ground)**
Collaborative Airspace Constraint Resolution (CACR) (under development)	proposes effective, efficient, and integrated resolutions to airspace congestion problems. Actions are based on forecast weather	More efficient routing	**Delay savings (airborne and ground)**

How it Should Work?



What is Needed?



MODELS and TOOLS

Establish relationship between weather and weather impact

Conduct sensitivity analysis, i.e., more traffic, different regional/local weather areas, different forecasts

Challenges of Measuring and Articulating the Benefits of a Better Weather Forecast

Isolating an Enhanced Capability

- Are there positive signals in the data analysis?
- Are there any metrics that are being used for tracking operational performance since implementation?
- What is the analytical framework for capturing operational impacts of advanced forecasting, e.g., turbulence, icing and echo top forecasts?
- What is the feedback loop between capturing results from modeling and data analysis?
- How do we establish "similar days" for pre-post analysis?

Challenges of Measuring and Articulating the Benefits of a Better Weather Forecast (Cont.)

Portfolio Perspective

- Allocation between programs and NextGen operational improvements
  - How do we isolate added value to one acquisition when multiple tools working collectively might be impacting an air traffic decision?
- What is the value of weather integration into DSTs, e.g., value of CIWS into the TFMS or Traffic Management Advisors (TMAs)

What Should We Be Doing?

- Develop a multi-year baseline of the operational performance of a sample of Origin-Destination (O-D) pairs in various weather conditions
  - Winter precipitation, IMC, convective weather (terminal, TRACON, en-route), terminal winds, etc.
- Understand the current state of the environment, e.g., x # of TMIs occurred in this airspace because of ____
- Integrate relevant databases and data sets into an *FAA-owned relational database/warehouse* that can address the "contribution of the forecast" questions
- Use post-analysis modeling tools to identify opportunities to measure events
- Take advantage of current Weather Impact Traffic Index (WITI) and WITI-Forecast Accuracy (WITI-FA) Toolset
- Continue metrics development work (e.g., similar days and TRACON WITI) with the Aviation Weather Group