Overview of NextGen Weather (AKA Shock and Awe)

Mark Andrews
Weather Working Group
Federal Co-Chair

Mark.Andrews@faa.gov

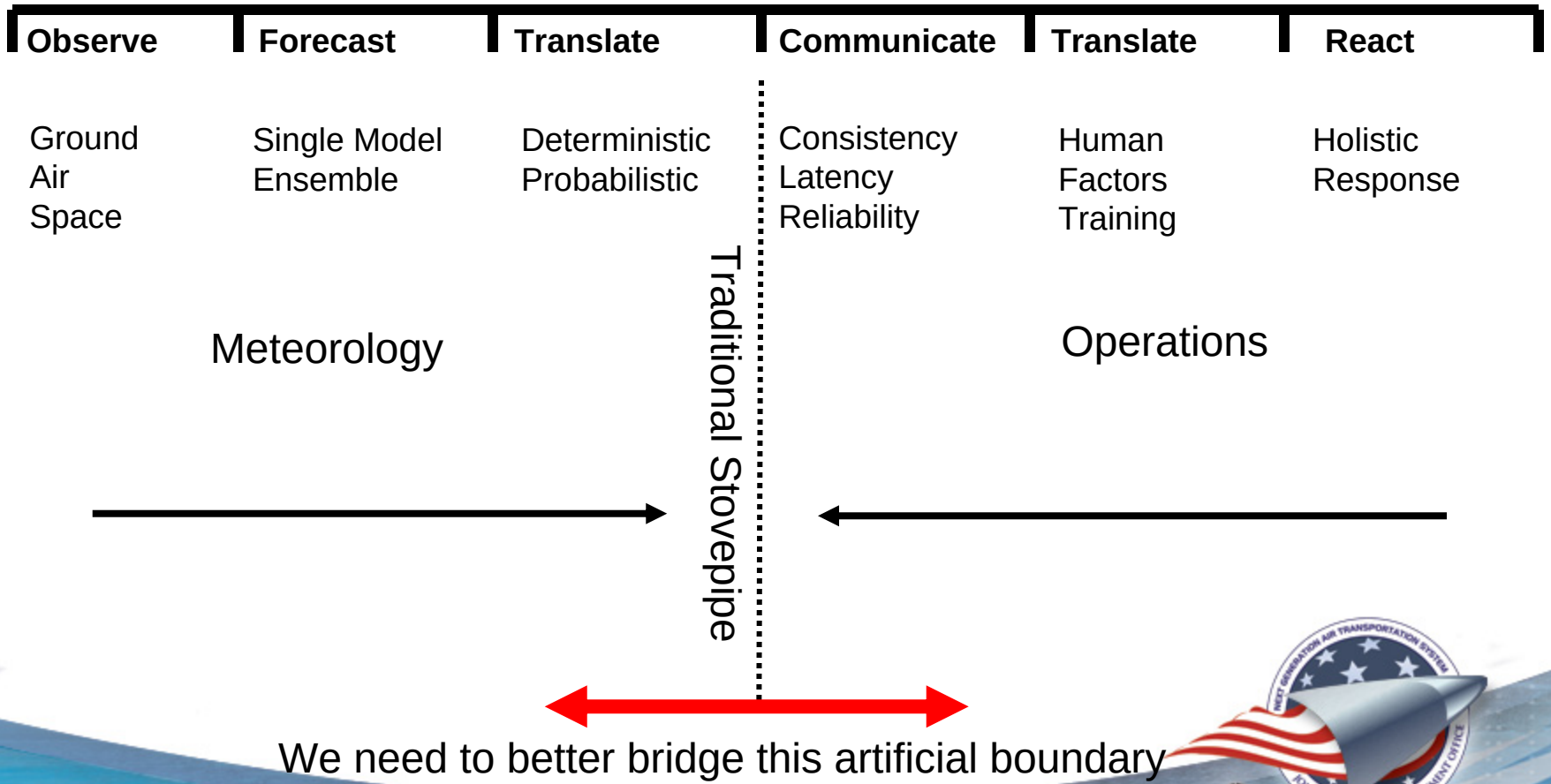
April 14th, 2009

WWW.JPDO.GOV

So what is NextGen?

- An acknowledgement aviation demand will continue to increase
- An understanding the current methodologies for command and control of aviation are not scalable to support envisioned demand
- Concurrently the existing business model for aviation weather will not support the NextGen model
- A reason to overhaul both systems
- A challenge for relevancy of weather providers

Perfect Forecast Process
The neglected problem



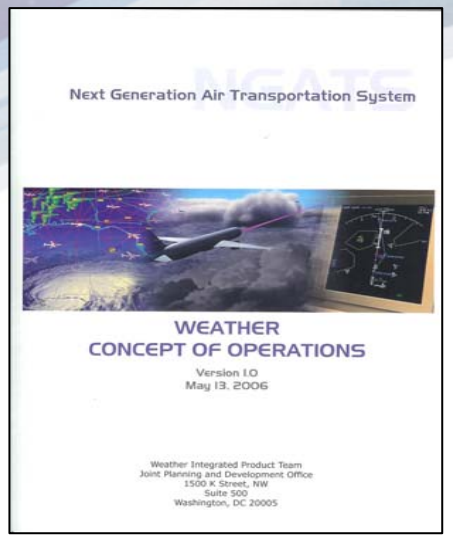
Today/NextGen Weather Information Attributes

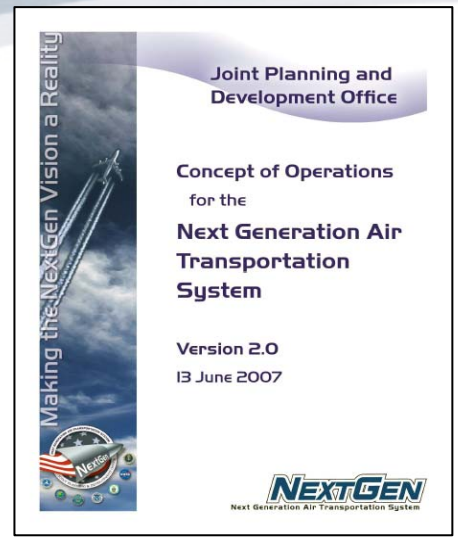
Today

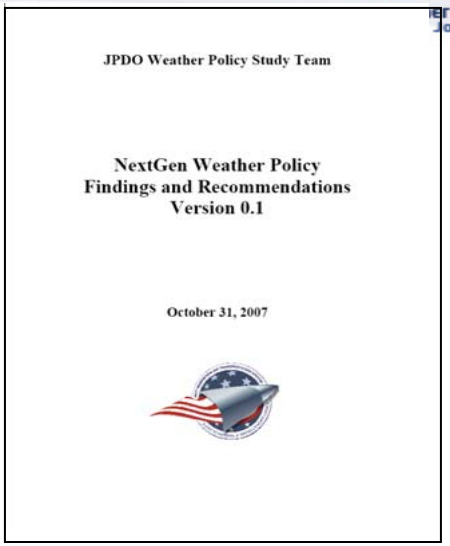
- Not integrated into aviation decision support systems (DSS)
- Inconsistent/conflicting on a national scale
- Low temporal resolution (for aviation decision making purposes)
- Disseminated in minutes
- Updated by schedule
- Fixed product formats (graphic or text)
- “File and forget”

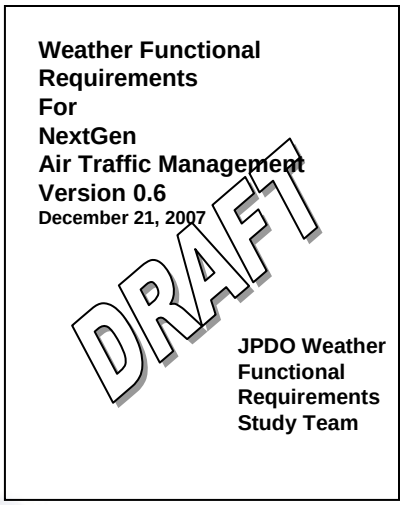
NextGen (new requirements)

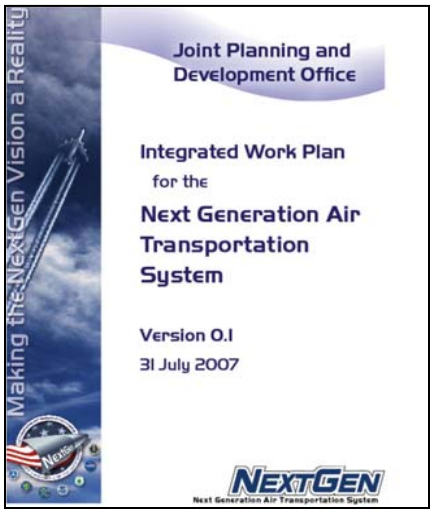
- Totally integrated into DSS
- Nationally consistent
- High temporal resolution
- Disseminated in seconds
- Updated by events
- Flexible formats
- Proactive monitoring

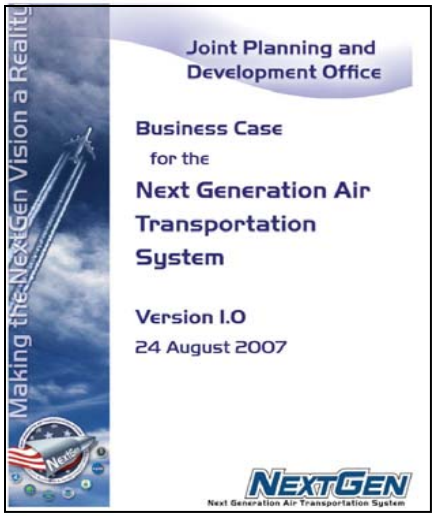

Next Generation Air Transportation System
WEATHER
CONCEPT OF OPERATIONS
Version 1.0
May 13, 2006
Weather Integrated Product Team
Joint Planning and Development Office
1500 K Street, NW
Suite 500
Washington, DC 20005


Making the NextGen Vision a Reality
Joint Planning and Development Office
Concept of Operations
for the
Next Generation Air Transportation System
Version 2.0
13 June 2007
NEXTGEN
Next Generation Air Transportation System

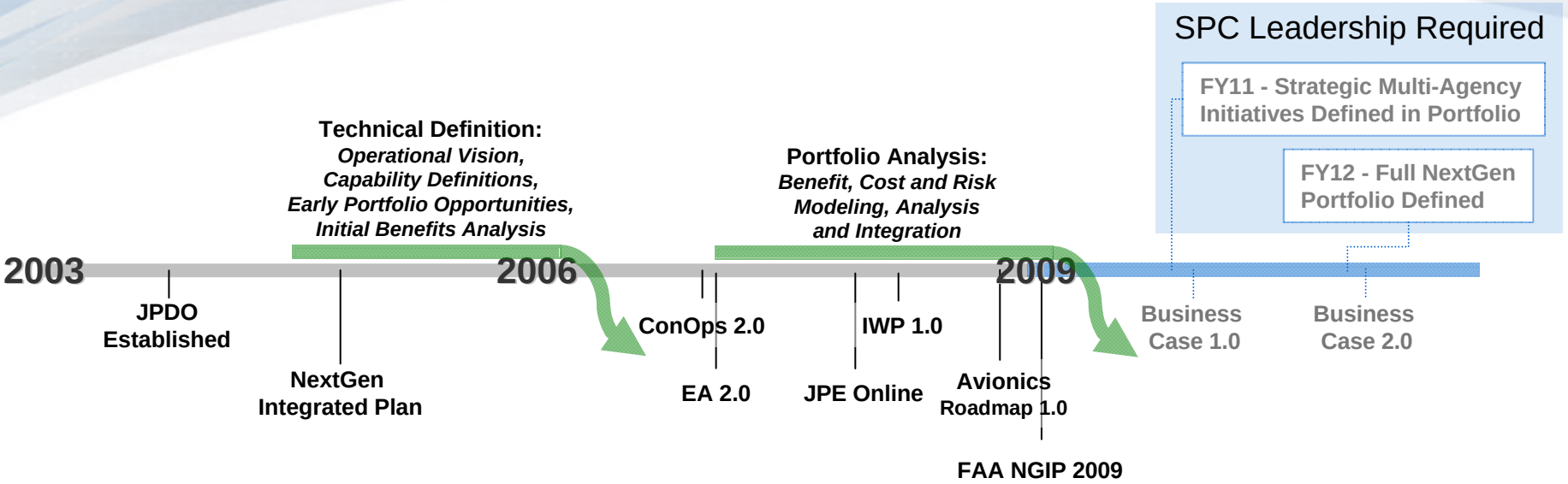

JPDO Weather Policy Study Team
NextGen Weather Policy
Findings and Recommendations
Version 0.1
October 31, 2007


Weather Functional
Requirements
For
NextGen
Air Traffic Management
Version 0.6
December 21, 2007
DRAFT
JPDO Weather
Functional
Requirements
Study Team


Making the NextGen Vision a Reality
Joint Planning and Development Office
Integrated Work Plan
for the
Next Generation Air Transportation System
Version 0.1
31 July 2007
NEXTGEN
Next Generation Air Transportation System


Making the NextGen Vision a Reality
Joint Planning and Development Office
Business Case
for the
Next Generation Air Transportation System
Version 1.0
24 August 2007
NEXTGEN
Next Generation Air Transportation System

NextGen Maturation



NextGen Definition

- Subject Matter Expert Driven
- Goals & Strategies Established
- Concepts and Capabilities Defined
- Early Portfolio Opportunities Identified
- Key Program Investments Initiated (e.g., ADS-B)

Plan Development

- First Iteration of NextGen Plan Complete
- Web-based Joint Planning Environment (JPE) Available
- First Architecture-Driven Gap Analysis Complete
- Agencies begin to organize implementation mechanisms
  - FAA Integration & Implementation
  - DoD Lead Service Office
  - NASA ARMD
  - DOC 4D Wx Cube Pgm Office
- FAA and NASA Portfolios Mature
- NASA, FAA, JPDO Research Transition Teams Initiated
- FAA Implementation begins
- Initial multi-agency efforts defined

Portfolio Management & Execution

- First Integrated NextGen Business Case by End of FY09
- Ability to Trace from NextGen Plan to Agency Investments and Develop NextGen Budget Cross-cut
- Ability to Develop Multi-Agency Roles and Responsibilities and Investment Priorities

Introduction

- In the NextGen ConOps, weather information will be fully integrated into operations and decision support tools
  - Data, rather than text and graphics becomes the “product”
- Weather providers deliver a four-dimensional set of weather information
  - Operators/Mangers will have a common weather picture by using a subset of this information called the Single Authoritative Source
- 4D weather will facilitate decision-makers by integrating with new tools that will describe the full range of available options to deal with weather issues
  - Identifies risk
  - Suggests strategies
  - Minimizes user disruptions

NextGen Weather Key Themes

- An integrated and nationally consistent weather common operational picture (COP)for observational and forecast data is available to all system users
  - NextGen operational systems are supported by a “single authoritative source”
  - Weather COP fully utilizes envisioned NEO capabilities
    - Data Latency (seconds)
    - Data Refresh (seconds)
    - Data Sharing Standards/Protocols
  - Weather information sharing is two-way
  - Unlimited end-user product formats are made possible

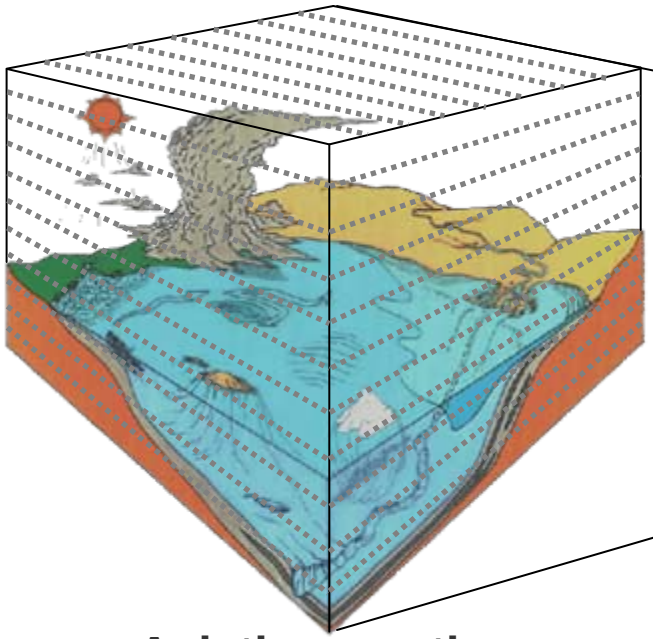
NextGen Weather Key Themes

- Direct integration of improved weather information into operational decision making processes
  - Reduced requirement for government provided weather “products”
    - Weather information sets become the government provided product in most cases
    - Opportunity for tailoring of private sector provided products significantly increase
  - Weather information is translated into operational decision options for human/automated systems
  - Standalone Weather “Systems” become obsolete

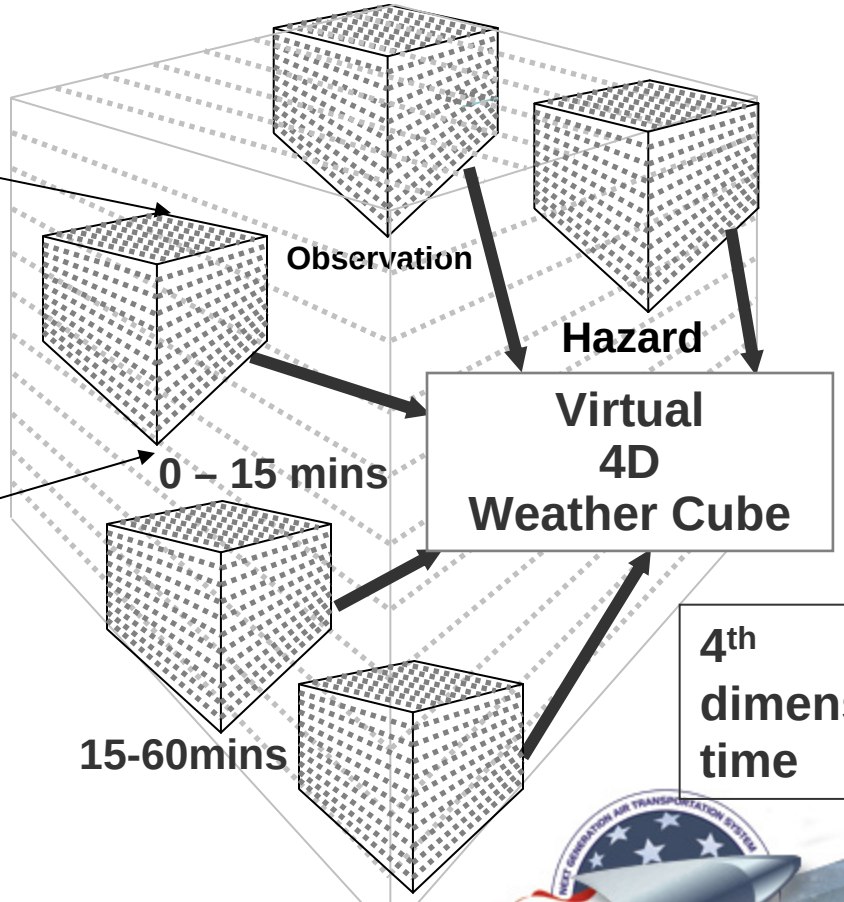
NextGen Weather
Key Themes

- NextGen **proactively** adjusts on multiple strategic and tactical time scales to probabilistic weather information
  - Operational decision making utilizing uncertainty based information
    - Weather-influenced 4D trajectory updates “on the fly”
  - New operational weather paradigms (business models) are required
    - Strategic adjustments to departure/arrival planning
  - Areas (volumes) of weather constrained airspace are reduced

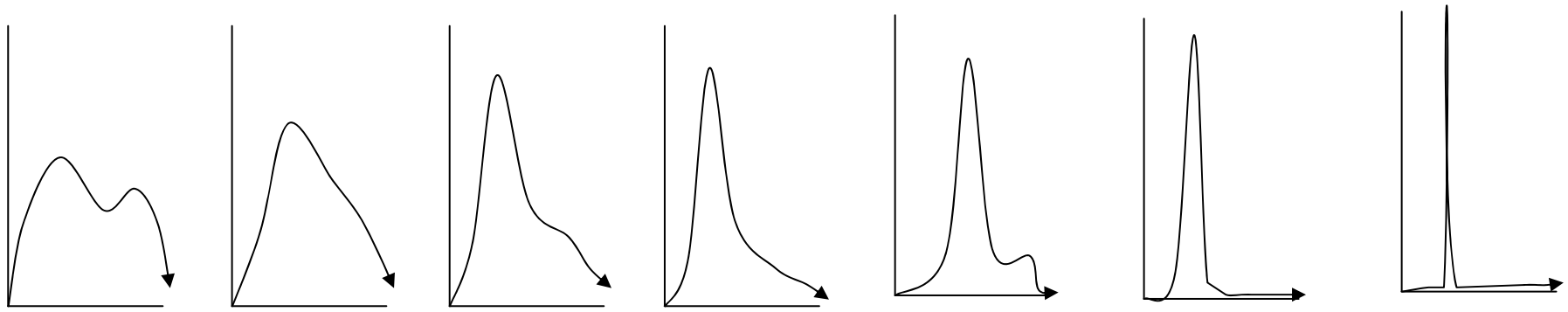
Virtual 4D Weather Cube



Aviation weather information in 3 dimensions (latitude/longitude/height)



Probabilistic information (reliability vs accuracy)



12 hrs | 9 hrs | 6hrs | 3hrs | 2hrs | 1 hr | 30min

New weather paradigms

- Dynamic cornerposts adjusted by weather
- Advanced preparation to “turn” an airport based on forecast windshift prior to windshift
- Anticipation of ground operations
  - Deicing (length of stay/fluid type/exposure)
  - Fuel operations (lightning/other)
  - Precipitation removal
- Wake Vortex/Windshear/Crosswind limitations
- Strategic adjustment to departure times?

DRAFT

Weather

2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025

NextGen Weather Information Concepts

Align Agency Policy and Resources

- Identify, align, or eliminate duplicative weather research and acquisition programs (FAA,NASA,DOC,DOD)
- Redirect existing research programs towards implementation of a national weather information collection and dissemination capability (FAA, NASA, DOC, DOD)
- Stand up interagency program “4D” weather program office (FAA, DOC, DOD)
- Revisit and update decades old weather operational policies (FAA)

Direct & implement agency-wide policy, governance, standards and solutions for NextGen Weather Information

NextGen Weather Information Initial Capability

Build Initial 4D Weather System

- Develop and implement weather information protocols and standards (FAA, DOC, DOD)
- Design and Acquire 4D Weather Infrastructure (FAA, DOC, DOD)
- Migrate legacy weather systems towards 4D CONOPS (FAA)
- Develop and implement technologies to populate weather information system under “Single Authoritative Source” concept (FAA,DOC, DOD)

Synchronize existing and planned future agency and industry efforts

NextGen Weather Decision Support Tools And Proactive Weather Decision Making

Optimize/Integrate

- Weather Information sharing sources and products with decision tools are the core of a layered, risk-based operations approach (FAA, NASA)
- Weather Event Information is well characterized & consistently passed across organizational / agency boundaries (FAA, NASA, DOC, DOD)
- 4D trajectories are enabled and routinely updated through the use of integrated weather information (FAA,NASA)

Transform operational system weather decision making processes

Full Integration of Weather Information into NextGen Operational Decisions

Manage/Enable

- Common situational awareness for all users of the NextGen System, promoting both improved system capacity and safety (FAA, DOC, DOD)
- Streamlined weather information architecture reduces operations and maintenance costs for both government and users (FAA, DOC, DOD)
- Direct integration of weather information and decision support tools ensure NextGen is supported by both NextGen relevant weather data and “weather savvy” decision support automation (FAA, NASA, DOD)
- Informs decision makers of options, assists in the automated identification of potential decision risks, and poses suggested operational solutions along with projections of NextGen impacts (FAA, NASA, DOD)

Risk based decision making, supported by information sharing measures with continuous feedback loops

Backup Slides

Benefits of End-State NextGen

Phase of Flight	Flight Situation	Flight Time Reduction	Total Dollar Savings per Year	Portion of Savings Due To Fuel
Surface-Taxi out and Taxi-in	Small Airports	30 seconds	$328 million	$79 million
	Large Airports	2 minutes	$1.3 billion	$315 million
Terminal area, including departure, landing	Small Airports, Good Wx	10 minutes	$6.5 billion	$1.6 billion
	Large Airports, Bad Wx	30 minutes	$19.7 billion	$4.7 billion
Enroute (cruise phase)	Good Weather	10 minutes	$6.5 billion	$1.6 billion
	Severe Weather	20 minutes	$13.1 billion	$3.1 billion

Based upon FAA estimates of $2,736/hour of airline direct operating costs, includes variable (fuel is assumed to cost $722/hour) and fixed costs (such as depreciation), and $1,090/hour of general aviation direct operating costs (GA fuel is assumed to cost $114/hour).

Assumes 36,000 airline flights/day, 16,000 general aviation IFR flights/day.

Assumes all flights accrue the benefits. Benefits across flight phases are not additive due to overlapping assumptions and correlation.

Source of cost data: GRA Inc., "Economic Values for FAA Investment and Regulatory Decisions, a Guide," FAA APO, December 2004.