NOAA NextGen 4-D Weather Data Cube

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Agenda

- Key Themes
- NOAA NextGen Weather Program
- NextGen 4-D Weather Data Cube
- Current Status
- Collaboration with FAA
Key Themes

- All aviation relevant weather information must be:
  - Discoverable
  - Available to known users on demand
  - In common data formats they can understand

- Weather “information” vice “products”
  - Weather information is translated into operational decision options for human and automated systems

- Four-dimensional grids of aviation weather information
  - Net-enabled system of systems
  - Leveraging existing and planned capabilities in NOAA, FAA and others

- Single Authoritative Source (SAS) of “official” weather information for use by Air Traffic Management community
  - Ensures that all decision makers are using the same information sets and that all users know what info is being used to manage the NAS
  - Formed by merger of model data, automated gridded algorithms, climatology and observational data, and meteorologist input
NOAA NextGen Weather Program

- Multi-year effort to improve accessibility and quality of aviation weather information
- Focused on two main areas
  - IT Services
    - 4-D Cube architecture and design
    - Integrating existing systems
    - Prototype systems
    - Production and deployment of 4-D Cube
    - Enhancement of NWS infrastructure
  - Contents include
    - Forecast process technology enablers
    - Aviation weather parameter generation (e.g., thunderstorms, icing, turbulence, etc.)
    - Model improvement and development
    - Single Authoritative Source techniques and technologies
NOAA NextGen Weather Program
Phased Approach

❖ Initial Operational Capability (2014)
  ➢ Integrated environmental information sources
  ➢ Common data standards and protocols

❖ Intermediate Capability (2018)
  ➢ Improved modeling and science enables higher resolution more accurate information
  ➢ Full Network compatibility of environmental information
  ➢ Initial integration of diverse weather elements into basic decision support tools

❖ Full Operational Capability (2022)
  ➢ All NextGen requirements met and benefits achieved
  ➢ High resolution, nested scale forecasts available for all elements
  ➢ Direct integration of weather into Air Traffic Management Systems
  ➢ Full network connectivity ensures consistent information use across service areas and user groups
NextGen 4-D Weather Data Cube will contain:

- Continuously updated weather observations (surface to low earth orbit, including space weather and ocean parameters)
- High resolution (space and time) analysis and forecast information (conventional weather parameters from numerical models)
- Aviation impact parameters for IOC (2014)

NextGen 4-D Weather Data Cube will not be a big database, but a “system of systems” with metadata tagged, 4-dimensional, gridded weather information
NextGen 4-D Weather Data Cube
A Conceptual Model

Observations
- Satellites
- Radars
- Aircraft
- Surface
- Soundings

Private Sector

Forecasting
- Numerical Modeling Systems
- Statistical Forecasting Systems
- NWS Forecaster
- Forecast Systems
- Forecast Integration

4-D Wx Cube

Enabled

Integration into User Decisions

Decision Support Systems
Custom Graphic Generators
Custom Alphanumeric Generators
NextGen 4-D Weather Data Cube
Notional Base Architecture
Current Status

- Executed first formal year of program
- Completed successful multi-organization Capability Evaluation in Sep 2010
- Entering into acquisition in FY11 for IT infrastructure improvements
- Working R&D for:
  - Single Authoritative Source
  - Verification techniques
  - Higher resolution modeling
- Evaluating advanced forecast systems and techniques
Collaboration with FAA

- NOAA’s NextGen Weather Program is working closely with FAA efforts to ensure alignment of timelines and requirements

- NextGen Network Enabled Weather (NNEW)
  - FAA’s platform for universal access to aviation weather and weather translation information
    - Enables integration of weather information into automated DSTs
  - Provides common standards for weather to support universal user access to needed weather information

- NextGen Weather Processor (NWP)
  - Provides Corridor Integrated Weather System (CIWS), Weather And Radar Processor (WARP) and Radar And Mosaic Processor (RAMP) functionality in a common weather processing infrastructure
  - Provides advanced aviation specific weather information through assimilation of extended NWS forecast models
  - Performs weather translation which will enable use of weather information by automated decision support tools (DSTs)

* FAA Aviation Weather Services – FPAW brief (July 14, 2011)
Backup Slides
NNEW – Aviation Weather Dissemination System

 있지 NNEW is the FAA’s platform for disseminating aviation weather and weather translation information.

 Information provided from NWS’s NextGen 4-D WxData Cube & internal FAA sources (e.g., NWP, RASP)

 있지 NNEW provides common standards for weather data discovery and data query

 Software that provides capabilities for locating, retrieving, and filtering of weather information
 Service adaptors to support legacy systems

 있지 Key Benefits:

 Provide network-enabled weather information services
 Provide the capability to automatically locate and retrieve data using global and open standards
 Provide the capability to retrieve weather information in various ways, e.g., along flight-trajectory-specific airspace volumes
NWP Program Scope

- NextGen Weather Processor (NWP) establishes a common weather processing infrastructure that will functionally replace the legacy FAA weather processor systems and host new capabilities:
  - NWP will consolidate weather product generation by weather processor systems such as:
    - Weather and Radar Processor (WARP)
    - Corridor Integrated Weather System (CIWS)
    - Integrated Terminal Weather System (ITWS)
    - NWP will provide advanced aviation specific weather information through the assimilation of extended National Weather Service (NWS) forecast models with real time radar extrapolation
      - NWP will perform Weather Translation which will enable the use of weather information by automated decision support tools (DSTs)
  - NWP will address consolidation solutions for weather displays
Vision for Data Services to and from FAA

[Diagram showing the flow of data services between FAA and data providers, including interfaces and security services.]
As-Is: How FAA Gets Weather Data

Actual and estimated to be about 60% of the current configuration.
FAA targeted first because of mandates, then offer to NWS internally.
Testing the Theory-Notional Base Architecture