NextGen

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Office of Science and Technology
Overview

- NextGen 101
- The Weather Information Database (WIDB)
- Launching NextGen
- S&T Needed for NextGen; Strategies for Effective R2O/O2R
- Broader benefits to NOAA
- The Way Ahead
NextGen is a Congressionally mandated initiative to modernize the U.S. Air Transportation System in order to:

- Increase capacity and reliability
- Improve safety and security
- Minimize the environmental impact of aviation
NextGen 101

Improvements to the air transportation system will be achieved by applying:

- Space-based navigation and integrated surveillance
- Digital communications
- Layered adaptive security
- Weather integrated into decision-making
- Advanced automation of Air Traffic Management
- Net-centric information access for operations

DOC has a role in all of these activities!
Weather accounts for 70% of all air traffic delays within the U.S. National Airspace System (NAS)

- The Federal Aviation Administration (FAA) has determined two thirds of this is preventable with better weather information

"A key finding, based on an analysis of several 2005-2006 convective events, is that as much as two-thirds of the weather related delay is potentially avoidable."

“The total cost of domestic air traffic delays to the U.S. economy was as much as $41 billion for 2007.”

- Air-traffic delays raised airlines' operating costs by $19 billion.
- Delays cost passengers time worth up to $12 billion.
- Indirect costs of delay to other industries added roughly $10 billion to the total burden.

Your Flight Has Been Delayed Again; Congressional Joint Economic Committee; May 2008
NextGen goals are not achievable without improving integration of weather information into decision support systems.

NextGen weather vision (a major paradigm shift) is focused on:

- Providing a multiple user common weather picture
- Consistent and reliable weather information
- An improved weather information data storage approach containing observation and forecast data (i.e., the WIDB or the “4 Dimensional Weather Data Cube”) enabling NextGen dissemination capabilities
The WIDB: A Conceptual Model

Observations
- Satellites
- Radars
- Aircraft
- Surface
- Soundings

Private Sector

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

Integration into User Decisions
- Decision Support Systems
- Custom Graphic Generators
- Custom Alphanumeric Generators

4D Wx SAS

Network

Data Integration

Enabled

Operations

Grids

WIDB
What’s in the WIDB?

The WIDB (aka the 4-Dimensional 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 (2013)**
  - Turbulence
  - Icing
  - Convection
  - Ceiling and visibility
  - Winds (surface and aloft)
- **The WIDB of the future will contain “all” weather data, not just aviation parameters.**
### Launching NextGen

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#### Initial Operational Capability (2013)
- Integrated environmental information sources
- Common data standards and protocols
- Initial integration of diverse weather elements into decision support tools

#### Intermediate Capability (2016)
- Improved modeling and science enables higher resolution more accurate information
- Full Network compatibility of environmental information
- Direct integration of weather into Air Traffic Management Systems

#### Full Operational Capability (2022)
- All NextGen requirements met and benefits achieved
- High resolution, nested scale forecasts available for all elements
- Full network connectivity ensures consistent information use across service areas and user groups
Launching NextGen

OST aligning organizational resources and science investments around NextGen

- MOBI branch to handle obs – model – post-processing end-to-end planning
- SEC – NextGen IT infrastructure
- MDL – Transition of new forecast tools to operations

NextGen Program Office

- More refined implementation strategy and plans
- New Program Manager as of September, 2009
- Chief Engineer and 3 support staff FTEs in FY10

Outreach – Regions/Center must help define future

- NextGen web site
- NextGen Roadshows
- Corporate Board updates

OCWWS to exploit NextGen investments for broader applications across other service areas
S&T Needed for NextGen

- Today’s forecast operations not tuned to the resolution, refresh and latency requirements of NextGen
- Temporal and Spatial resolution requirements will require advanced modeling, post-processing algorithms and forecaster tools
- NextGen funding initial NOAA R&D to address these challenges
S&T Needed for NextGen

- NextGen S&T needs collected in NextGen S&T Roadmap, linked to NWS S&T Roadmap
- OAR addressing NextGen S&T needs
  - Science-service focus: aviation weather research
  - Enabling Capabilities foci: obs, models, post-processing, forecaster applications research
- NWS and OAR increasing coordination in DSS
  - OAR research (ESRL, NSSL) increasing: e.g. technologies for meteorologist-over-the-loop, Single Authoritative Source, communicating forecast uncertainty
  - Other Research Partners: FAA
  - FY 12 $ for enhanced DSS in LFW, AWX, STI
  - Challenge: Managing interagency research targeted for NOAA operations
**Strategies for Effective R2O/O2O**

- **Build a little, test a little by field forecasters in a simulated operational environment**
  - Holistic, end-to-end approach that includes modeling improvements, user tool improvements and the interaction between national centers and forecast offices

- **Test beds and Operational Proving Ground will be built on the AWIPS II and NextGen architecture**
  - Common software development platforms (R20 and O2R)
  - Collaboration
  - Data Sharing
Operational Proving Ground

- Hazardous Weather Testbed (HWT)
- Aviation Weather Center Testbed (AWC)
- Hydro-meteorological Testbed (HMT)
- Developmental Testbed Center (DTC)
- NOAA Climate Testbed
- Hurricane Testbed (TPC)
Science-Service Improvements: Broader Benefits to NOAA

- Aviation driven consistency and accuracy requirements will improve all NWS services
  - Consistency challenges not unique to aviation

- More accurate public forecasts because of aviation driven high resolution modeling requirements

- Improved severe weather lead times because of aviation driven convective forecasts
  - Implements “Warn on Forecast” technologies
NextGen Enabling Capabilities: Broader Benefits to NOAA

- Improved access to all NWS products and services via the cube
  - Supports automated decision assistance tools for other agencies and entities beyond FAA

- IT and Data Management enhancements
  - Establish a central repository and access for critical NWS products and services beyond aviation
    - Support GEOSS requirements
    - Enhances continuity of operations

- Extends the AWIPS enterprise services into a ‘system of systems’ linking AWIPS, MADIS, NDFD, CCS and NEXRAD
The Way Ahead

- NOAA is building the S&T advances and infrastructure needed for Next Gen
  - *NWS relying on OAR research to for S&T needs*
  - *Transitioning research to operations*
    - Testbeds & proving ground to assure the most effective S&T implemented: maximizes benefit to users of NWS information and forecast services
  - *NWS and OAR planning for additional coordination in DSS*

- **NexGen Benefits Apply to a Wide Spectrum of NOAA products and service**