NextGen 101

Addressing the NextGen Challenge

Version 1.0
NextGen Challenge

• The current system
  – is not performing adequately
  – is not scalable

• The NextGen plan offers a transformational approach to resolving current inadequacies

• Cost of not transforming to NextGen – billions annually
NextGen: The Short Story

• 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: The Short Story (Cont’d)

- These 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
## NextGen Transformation

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground-Based Navigation and Surveillance</td>
<td>Satellite-Based Navigation and Surveillance</td>
</tr>
<tr>
<td>Voice Radio Control</td>
<td>Digital Data Exchange</td>
</tr>
<tr>
<td>Disconnected Information Systems</td>
<td>Net-Centric Information Access</td>
</tr>
<tr>
<td>Human-Centric Air Traffic Control</td>
<td>Automation Assisted Air Traffic Management</td>
</tr>
<tr>
<td>Fragmented Weather Forecasting</td>
<td>Probabilistic Weather Decision Tools</td>
</tr>
<tr>
<td>Visibility Limited Airfield Parameters</td>
<td>Equivalent Visual Operations</td>
</tr>
<tr>
<td>Forensic Safety System</td>
<td>Prognostic Safety System</td>
</tr>
<tr>
<td>Inefficient Security Screening</td>
<td>Integrated Security Risk Management</td>
</tr>
<tr>
<td>Current Aircraft Environmental Footprint</td>
<td>Reduced Aircraft Environmental Footprint</td>
</tr>
</tbody>
</table>
Savings to Users: Advanced Procedures

Tracks of aircraft prior to implementing Area Navigation (RNAV) at Dallas-Fort Worth

Tracks of aircraft after implementing RNAV at Dallas-Fort Worth
Reducing Environmental Impacts

Noise pattern with Optimized Profile Descent

Noise pattern without Optimized Profile Descent

Reduced Fuel Burn

Reduced Flight Time

All aircraft at cruise altitude 180 nm from runway.
Values corrected for wind and merge point.

Fuel from 180 nm to 35L, lb

Time from 180 nm to 35L, sec
System Efficiency Through Direct Routing: Data Communications

Without data communications

With data communications

More direct routes with Air Traffic Data Communications to aircraft

<table>
<thead>
<tr>
<th></th>
<th>Ave Miles/flt</th>
<th>Ave min/flt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good Day:</td>
<td>846</td>
<td>107</td>
</tr>
<tr>
<td>Bad Day with Data Link:</td>
<td>895</td>
<td>125</td>
</tr>
<tr>
<td>Bad Day:</td>
<td>922</td>
<td>135</td>
</tr>
<tr>
<td>Savings (Bad Day):</td>
<td>27</td>
<td>10</td>
</tr>
</tbody>
</table>
Improving General Aviation Safety

Aircraft in clouds

Aircraft seen with display in cockpit

40% + reduction in fatal accidents for ADS-B users
The Next Generation Air Transportation System Partners

- Department of Transportation (DOT)
- Department of Defense (DoD)
- Department of Homeland Security (DHS)
- Department of Commerce (DOC)
- Federal Aviation Administration (FAA)
- National Aeronautics and Space Administration (NASA)
- White House Office of Science and Technology Policy (OSTP)
- Office of the Director of National Intelligence (ODNI) *(ex officio)*
## Coordination

<table>
<thead>
<tr>
<th>Governance</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAA</td>
<td>NextGen Review and Management Boards</td>
</tr>
<tr>
<td>DoD</td>
<td>U.S. Air Force Lead Service Office</td>
</tr>
<tr>
<td>DOC</td>
<td>Senior Executive Weather Panel (with USAF, USN, FAA, and JPDO)</td>
</tr>
<tr>
<td>NASA</td>
<td>Aeronautics Research Mission Directorate, Research Transition Teams</td>
</tr>
<tr>
<td>DHS</td>
<td>Investment in Network-Enabled Operations Demonstration (w/DoD and FAA) Integrated Surveillance Integrated Product Team (IPT)</td>
</tr>
<tr>
<td>ODNI</td>
<td>Integrated Surveillance IPT</td>
</tr>
<tr>
<td>OSTP</td>
<td>National Plan for Aeronautics R&amp;D</td>
</tr>
</tbody>
</table>
NextGen Institute
Mechanism for Industry Involvement

• Primary Role of the Institute
  – To provide a mechanism for private sector to actively engage with government in defining, developing, and implementing NextGen with the JPDO
    • 16-member Institute Management Council (IMC)
    • 250+ private sector Working Group participants

• Nine Working Groups
  – Each has a Government and an Industry Co-Chair
# JPDO Working Group Co-Chairs

## Aircraft
- *Steve Van Trees, FAA (Acting)*
- *TBD*

## Air Navigation Services
- *James Wetherly, FAA*
- *Bob Beard, CSC*

## Global Harmonization
- *Carey Fagan, FAA*
- *Mike Marsili, Lockheed Martin*

## Safety
- *Jay Pardee, FAA*
- *Paul Russell, Boeing*

## Weather
- *Mark Andrews, NOAA*
- *Steve Brown, NBAA*

## Airports
- *Benito DeLeon, FAA*
- *Tom Browne, TJB Aviation*

## Environment
- *Lourdes Maurice, FAA (Acting)*
- *Betty Hawkins, ATA*

## Net-Centric Operations
- *Col. Douglas Wreath, DoD*
- *David Sweet, Boeing*

## Security
- *Paul Polski, TSA*
- *Paul Druckman, Global Initiative Inc.*
NextGen Weather Concept

• Integrated and consistent common weather data picture for observation, analysis, and forecast available to all system users

• Net-centric (net-enabled) capability is envisioned:
  – Information network that makes information available, securable, and usable in real time
  – Information may be pushed to known users and made available to be pulled by others

• “Virtual” repository, no single physical database

• Integration of weather information into operational decision-making processes
The Cost Of NextGen

• JPDO has reviewed several initial outside estimates:
  – FAA’s Research, Engineering, and Development Advisory Committee (REDAF)
  – MITRE Avionics Estimate
  – FAA’s Air Traffic Organization (ATO)

• The First Five Years – $4.6 billion:
  – $4.3 billion in ATO capital appropriation
  – $300 million in research, engineering, and development

• Longer-Term Cost Estimates:
  – Next 10 years: $8-10 billion
  – End-state or through 2025: $15-22 billion

• Avionics costs = $14-20 billion
Summary of Improvements in Key NextGen Modeling Areas

Airport capacities increased 40 to 60%

Future individual A/C (airframes, engines, and ATC) exhibit
- 30-40 dB noise reduction
- 30-40% reduction in fuel burn
- 60-75% reduction in emissions

Delays attributable to Wx reduced by over 80% through Improved A/P capacity in Wx, improved aircraft capability in Wx, and advanced, probabilistic decision making

Trimming flights to reasonable D/C ratios
Global Harmonization

- International collaboration is essential to ensure compatible standards
- Reducing the cost of equipage
- Strategic partnerships with:
  - Europe
  - Japan
  - China
  - North America: Canada and Mexico
- Cooperation with the International Civil Aviation Organization (ICAO)
  - Review of key NextGen products
  - Collaboration in the development and acceleration of standards
- Partnership Expansion - Second Phase
  - India
  - Australia
  - Brazil