

NextGen Gap Analysis

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Gap Analysis Background

- **Purpose** - Conduct agency based discussions on fiscal years 2010 through 2014 and identify “big items” not connected to an Operational Improvement in the Integrated Work Plan
- Information extracted from agency planning documents
- Information “vetted” by agency representatives
 - Presented to industry representatives on working groups

Funding

- In general, planned FAA investments assessed are well-aligned with NextGen research objectives
 - Funding for transitioning of research to operations is a concern
- But, FAA must ensure adequate funding for:
 - 4D common trajectory work
 - Standards
 - Common trajectory exchange model
 - Avionics standards development
- Need clear Roll-out on what is required in the mid-term to enable NextGen transition
 - No data available beyond first Initial Operational Capability date

FAA Gaps (1)

- Avionics issues requiring attention:
 - 4DTs / FMC upgrades
 - Collision Avoidance paradigm changes
 - When do TCAS & ground proximity warning break?
- Trajectory-Based Operations
 - Need to bound/define the scope of Common Trajectory standards
- Data Communications
 - Applications are underfunded and not being built
 - Need agreement on what constitutes core capabilities
 - Need to define the benefits of data communications and why industry should invest
- Human Factors
 - Need to ensure FAA's human factors investments are focused on addressing key NextGen issues regarding planned capabilities (e.g. roles and responsibilities of humans and automation)

FAA Gaps (2)

- Flight and Flow Community of Interest
 - Need more activity from government and stakeholder community to determine FO requirements
- Airspace Resource Management System (ARMS)
 - Capability is critical to the FAA being able to manage dynamic airspace operations/concepts
 - Need to ensure that this is adequately funded
- Weather
 - Need to raise this on NextGen priority list
 - Need to integrate across agencies investments
 - Need to scope it, lay out a plan in phases on an entire portfolio that makes sense; understand how the FAA's planned SWIM, NNEW and NextGen Weather processor programs integrate to support the 4-D data cube concept
 - Need to determine if sufficient levels of funding exist in all agencies participating or having requirements
 - Need to determine future weather sensor requirements
 - Need aircraft work tied closer into weather plans

Gaps (3)

- Environmental
 - FAA's planned environmental investments seem generally consistent with IWP for these priority OIs
 - Gap exists in funding for implementing Environmental Management System (EMS) framework and for conducting key policy assessments

FAA Actions

- System engineering/integration needs to be strengthened
 - Scope and complexity of NextGen strains FAA resources, especially, human resources
 - Applies to Safety, Environment, and Airports as well as ATM
- Need improve information flows from programs to Integrated Work Plan
- Need to do a feasibility analysis of Integrate Work Plan targets
- Need to document enterprise architecture needs across FAA
 - NAS and “Non-NAS”
- Need to ensure sufficient funding to address NextGen objectives
- Need to strengthen methodology of analysis to ensure it is repeatable
 - Including better process for considering non- ATM program funded initiatives
- Over time, work to rationalize IWP dates with plans and funding, and where necessary identify additional resources needed

DHS Gap Analysis Summary

April 7, 2008



DHS Gap Analysis

- **Analysis Summary**

- TSA strategic process not aligned to JPDO; R&D effort fragmented making analysis difficult.

- **Findings**

- **OI 4106** has policy implications concerning whether TSA could mandate airports to use the universal TWIC Card (Transportation Workers Identification and Credentials). Each airport is held accountable for its own security. In the past, airports have pushed back hard adopting an universal card.
- **OI 4500** needs to include Customs and Border Protection (CBP) who also has a role in Airspace Security
- **OI 4400**
 - Last gap statement is partially filled by Known Shipper/Secure Shipper programs. Need to re-examine the gap.
 - Agreed with the assessment that this OI is too ambitious. Explosives threat is DHS's current focus. Until the threat changes, technologies to detect other threat materials will not be a priority.
- **OI 4520** with an IOC in 2014 is too ambitious.

Cross Agency Gaps/Issues

- Official forum, process, plan and agreements to coordinate for the inter-agency shared airspace security mission:
 - Integrated Airspace Security Conops
 - FAA has a 2025 Air Domain Security Conops; Need companion DHS and DoD conops to ensure inter-operability
 - Synchronized joint research, systems engineering, and capability implementation to deliver NextGen Airspace security capability
- Inter-agency agreements among FAA/DHS/DoD to coordinate aviation risk management strategies and decision-making such as resource allocation and investments prioritization, across multiple security domains.
- Plans, standards/policy, and execution path for DoD/DHS/DoC/FAA to connect their networks to facilitate information sharing and to enable network-centric operations.

NASA Gap Analysis Summary

April 10, 2008



Findings from Available Data (1)

- NASA Airspace Systems Program is well-aligned with NextGen R&D needs, addressing research questions on key concept elements:
 - Separation management
 - Trajectory management
 - Capacity management
 - Flow contingency management
- Fundamental Aeronautics and Aviation Safety research programs also well-aligned with:
 - Safety management
 - Environmental management framework
- Of 163 NextGen R&D objectives, NASA directly contributes to 84, and many of NASA's efforts are cross-cutting in nature

Findings from Available Data (2)

- More collaboration is needed to determine if a gap exists:
 - With JPDO on 3 of the 32 areas for which NASA is the lead
 - R0370: applied research on traffic spacing management
 - R-0910: applied research on overlapping runway occupancy
 - R-1440: Applied research on V&V of complex systems
 - With lead agencies on 12 R&D elements for which NASA is in a support role
- Major areas where scope of NASA research fall short of R&D need:
 - Integration of weather information into ATM decisions
 - Integrated surface/arrival/departure research
 - Air/ground functional allocation
 - Validation, integration and transition of algorithms and methods for NextGen to implementation
 - Aircraft wake vortex encounter dynamics in terminal operations
 - Dynamic airspace research in terminal redesign
 - Efficient descents and tradeoffs of noise sensitivities

Cross Agency Gaps/Issues

- Issues that were also identified during FAA gap analysis:
 - R&D on human/system integration and human performance modeling
 - Weather integration into ATM decisions
 - Integrated surface/arrival/departure management
- Transition of NASA research to implementation

DoC Gap Analysis Summary

April 15, 2008



DoC Gap Analysis Findings (1)

- DoC is working hard to upgrade its network infrastructure to support digital information
 - New infrastructure will support 4-D Cube
 - Size of dissemination portion of network will need to be addressed as FAA and user needs are refined
- Many observation systems and forecast products exist - no direct programmatic link to developing techniques to integrate multiple data sources into the 4-D weather Single Authoritative Source (SAS)
 - Numerous forecast products exist, but we could not identify specific NOAA programs or model that will produce a common weather picture

DoC Gap Analysis Findings (2)

- Most NOAA programs that were considered in the analysis are unfunded for FY 10 and beyond; need to ensure adequate funding is available
- Some DoC-dependent initial dates in IWP cannot be met
 - Policy issues still need to be worked
 - Slippage on initial dates may well have limited impact to overall schedule, but schedule risk does increase
 - Need for NOAA/JPDO effort to update IWP v1.0 with more realistic dates
- Meteorologist-in-the-loop research related to weather product generation is under funded to meet the need dates for common weather picture IOC

Cross-Agency Gaps/Issues

- The lack of cross agency agreement on synchronizing observations, forecasts, and dissemination efforts increases risk of not having a common weather picture in 2012 / 2013 (and beyond)
 - NOAA, ATO-P, and USAF are now working together on infrastructure
 - NOAA funding for 4-D cube (as OPR) is potential issue due to confusion/overlap with FAA plans and programs (NNEW, NAS Weather Processor, SWIM segments 1/2 weather)
 - Air-to-Air and Air-to-Ground data links
 - SWIM vs AWIPS-II vs GIG
- As OCR, detailed DOC planning cannot proceed without coordination and guidance:
 - From FAA on integrating weather into decision making
 - From lead agency/OPR to determine way-ahead on safety KDs, many of which have 2008 dates

Cross-cutting Gaps from One or More Agency

NextGen 4-D Wx Cube Development & Initial 2012 Implementation

- Agency Results:
 - FAA review indicated that a transition plan for the NAS to move towards this capability is not well-defined (e.g. the roles of SWIM, the NNEW program and the NAS Weather Processors program are not clear)
 - DOC review indicated an urgent need to resolve FAA/DoC roles and responsibilities for development of the 4-D weather cube. The current lack of agreement is hindering progress on budget development in DoC and in gaining inter-agency alignment of plans and budgets.
- Gap:
 - Agency plans and budgets do not appear to be aligned and integrated to implement the 4- D weather cube as defined in the IWP.

Weather Integration into Operations: R&D

- **Agency Results:**
 - FAA review indicated the need for development of operational requirements and weather information needs with regard to direct integration into decision support tools (and companion aircraft capabilities)
 - DOC review indicated that its detailed NextGen planning cannot proceed without coordination and guidance from FAA on integrating weather into decision making
 - NASA review indicated gap exists on impact of weather with respect to safety (transversibility due to structural and safety limitations). Continued investment is a high risk due to 1-year funding by augmentation resources.
- **Gap:**
 - agency plans for researching and implementing capabilities for integrating weather into decision making do not appear adequately defined or resourced.

Integrated Surveillance

- Agency Results:
 - Both DoD and DHS reviews indicated importance of cross-agency cooperation in establishing NextGen surveillance capabilities
- Gap:
 - no agreed upon cross-agency (DoD, DHS, & FAA) requirements or implementation plans exist for NextGen surveillance (cooperative & noncooperative) capabilities

Airspace Security

- Agency Results:
 - DHS review highlighted need for cross-agency concept of operations, with emphasis on roles and responsibilities; FAA has an initial concept but DoD and DHS need a similar effort, and the agency concepts need to be integrated
 - DHS review also highlighted need for alignment of agency investments to achieve implementable capabilities, including near-term
- Gap:
 - no cross-agency integrated concept, including roles and responsibilities, exists for NextGen airspace security

Transition R&D Capabilities to Implementation

- Agency Results:
 - FAA review indicated that funding for implementing the results of key NextGen research by the FAA seems to be inadequate. (Although not covered in the review, deployment bandwidth (the FAA's ability to implement and utilize multiple capabilities in a time period, such as annually) is also a significant consideration)
 - NASA review highlighted concern related to lack of FAA resources to implement NextGen capabilities being developed by NASA. A Technology Transition process between JPDO/NASA/FAA, and the associated validation studies, are supported by 1-year augmentation funds and pose a risk.
 - DoD review indicated the opportunity to transition DoD development and research to FAA to ensure best use of all government assets
- Gap:
 - mechanisms and funding for transitioning cross-agency research and other assets to implementation in the NAS appear to be inadequate

Integrated Surface/Arrival/Departure Management Research

- Agency Results:
 - FAA review indicated this topic area is underfunded
 - NASA review indicated there are strong programs for individual concepts, but no evidence of 4DT research for departures; or of integrated system connectivity of separation assurance studies with TFM
- Gap:
 - the agency plans for research on and implementation of these key NextGen capabilities appear to be inadequate to accomplish IWP objectives.

Development of Alternative Fuel & Aircraft Technologies

- Agency Results:
 - FAA review with Environmental Office emphasized the key role alternative fuels, and aircraft technologies (e.g. engines) will play in achieving NextGen goals. Also, need for inter-agency (DoD, NASA) and industry joint investments was noted
 - DoD review also noted alternative fuel initiatives as a focus area
 - NASA review identified key fundamental Aeronautics efforts aimed at aircraft technologies
- Gap:
 - plans and funding for this cross-agency initiative are necessary to ensure continued progress on this key research topic

Environmental Considerations for NextGen Development

- Agency Results:
 - FAA review with Environmental Office emphasized the need for increased cross-agency focus on considering environmental factors as a constraint to achieving NextGen objectives
 - FAA review also highlighted need for greater top-level EPA involvement in NextGen development
- Gap:
 - the definition and development of NextGen capabilities do not appear to adequately consider the environmental factors that will impact the feasibility of such capabilities

NCO Operations

- Agency Results:
 - Partner agency reviews indicated that net-centric availability of information (e.g. common weather, flight data, surveillance) is critical to the accomplishment of NextGen objectives/capabilities
 - Alignment of, and capitalization on, current and planned agency activities necessary to address this need
- Gap:
 - No cross-agency plan exists for integrating agencies' net-centric capabilities development to ensure their inter-operability, and interoperability with users and global partners