15.8 An Update on Activities of the Joint Planning and Development Office (JPDO) Weather Integrated Product Team (IPT) supporting the Next Generation Air Transportation System (NGATS or NexGen)

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1. INTRODUCTION

The Vision 100 – Century of Aviation Reauthorization Act (P.L.108-176) laid out a mandate for the multi-government agency Next Generation Air Transportation System (NGATS or NexGen) initiative and proposed a unique public/private partnership managed by the Joint Planning and Development Office (JPDO) to carry it out. In December, 2004, a NGATS Integrated National Plan was submitted to the U.S. Congress (Joint Planning and Development Office 2004). NexGen will transform the way our entire air transportation system works today, through the year 2025 and beyond. The overarching vision is for a system that addresses critical safety and economic needs in civil aviation, such as a two-to-three fold increase in capacity, while fully integrating national defense and homeland security improvements – and in a cost effective manner.

The Department of Transportation, Department of Commerce, Department of Homeland Security, the Federal Aviation Administration, the National Aeronautics and Space Administration, the White House Office of Science and Technology Policy, and other experts from the public and private sector all are participating in a joint effort to achieve NGATS. The JPDO organization includes eight interagency integrated product teams (IPT), one of which, the Weather IPT, addresses the impact of weather on the safety, efficiency, and capacity of the air transportation system. This paper provides an update of the activities, accomplishments, and future plans for the weather IPT.

2. WEATHER INTEGRATED PRODUCT TEAM

The weather IPT is supported by over 150 experts from the JPDO government agencies, aviation industry, academia, and private sector enterprises. During the past year the IPT has developed a set of core values, a vision for the future aviation weather support system, and a NGATS weather concept of operations (CONOPS), which will be folded into a larger total system NGATS CONOPS, scheduled for release in the Spring of 2007.

A major focus has been on “Early Victories” for NGATS weather for the year 2012, while also developing a list of desired Operational Improvements and Capabilities. Highlights of this developmental work include (1) integration of weather information into air traffic management systems, viewed as the driving force behind the Weather IPT under the assumption that automated decision support tools will be the backbone of the new automation system; (2) the development of a 4-dimensional cube of weather data which becomes the authoritative information source for (eventually) global air traffic management, including civilian and military needs, utilizing a push/pull web-based concept to provide gridded basic and forecast aviation weather parameters accessed by multiple system users for various tailored product generation tools and decision aids; (3) advanced concepts of aviation forecasting that include a high degree of automation, and forecaster “over the loop” to insure quality products when necessary: (4) the development of a means of generating probabilistic forecasts and measures of information reliability; and (5) an optimized suite of observation systems utilizing latest advances in ground, air, and space-based sensors to improve both situational awareness and as inputs to improved numerical forecast models.

3. WEATHER IPT “CORPORATE PRODUCTS”

3.1 Weather Concept of Operations

The Weather CONOPS poses a new way of looking at the role of weather information. It is not about the weather products themselves; rather it is about enabling better air transportation decision-making. The concept of an authoritative source for weather information promotes common situational awareness and relieves stakeholders of the need for deciding between potentially competing or conflicting sources for flight planning and air traffic management decision-making.

The envisioned streamlined architecture for information access in a network enabled operations framework reduces operations and maintenance costs for both the government and users, since today's complex (and tangled) maze of point-to-point communications interfaces become a thing of the past. Direct integration of weather information and decision support tools ensure that NGATS is supported by both NGATS-relevant weather information and "weather savvy" decision support automation.

This powerful combination better informs decision makers of options, assists in the automated identification of potential decision risks, and poses suggested operational solutions along with projections of NGATS impacts. This national vision, which is described in more detail in another paper/presentation to be presented during this conference, provides the core set of concepts and ideas the weather IPT will use as it moves forward in developing system requirements, including pre-implementation and implementation tasks.

3.2 Policy Plans

Since the JPDO formed it has been known NGATS will not merely require or become a transformational endeavor--based solely on technological improvement(s); in fact, the technological barriers may be the easiest to overcome. Instead, to be successful, NGATS will require significant changes in aviation policy and cultural behavior, and this applies to the area of weather services as well. The Weather IPT has formed a policy team to identify and address two main areas: (1) Governmental agency roles, responsibilities, and boundaries; and (2) Government and Private Sector roles, responsibilities, and boundaries. Additional policy areas, which will be worked at the JPDO level, include the increasing role of automation in complex decision making processes, and how the system in financed (who pays), will have implications to the weather services community. The first round of policy reviews are scheduled to be completed in 2007.

3.3 Operational Improvements

The JPDO is presently completing a comprehensive list of Operational Improvements (OIs), which are a list of needed capabilities to ensure NGATS success. The Weather IPT has defined OIs in five major areas – observation, forecast, dissemination, integration and mitigation:

1) An adaptive observing system will meet needs of weather forecasting, ATM, and other NGATS systems for observations. It will dynamically negotiate access to observing platforms and configure itself to optimize information from integrated ground, airborne, and space based sensors.

2) Improved forecasts of all aviation relevant weather phenomena, that address four nested spatial scales (airport and metro area, regional, continental, and global), allows users to safely plan and conduct 4-D, gate-to-gate, trajectory-based operations that avoids hazardous weather and provides safe and comfortable flight conditions

3) Net-centric 4-D weather information is available to systems users. NEO architecture will facilitate access to weather information for all users. This information will provide users a virtual, authoritative weather datacube that allows generation of a consistent weather picture giving true common situational awareness. All users will have access to real-time critical hazardous weather information (diagnostics and forecast) to facilitate weather avoidance and efficient flight operation. Aircraft will become nodes on the network. The information will support all phases of the flight include pre-flight planning, in-flight updates, and post flight review

4) NexGen decision support tools utilize probabilistic, net-centric weather information while new Federal Aviation Regulations accommodate technological advancements. NexGen performance is improved through the proactive use of weather forecasts to plan operational change (e.g., traffic reroutes, runway reconfigurations, gate assignments and cockpit decision making).

5) Aircraft weather mitigation capabilities enable aircraft to safely traverse greater intensities of adverse weather such as turbulence, icing, and obstructions to visibility, thus reducing operational delays and reroutes.

The Weather IPT has compiled a list of 42 "tasks" which fit underneath the 5 Operational Improvements, and conducted a first set of reviews to prioritize those tasks. The prioritized list of tasks lay out specific actions and deliverables with funding estimates to complete by fiscal year. Importantly, a combined convection and winter storm product has the highest priority. Third, fourth, and even fifth order level of detail descriptions for each task are currently under development and that information will be used to generate weather related pre-implementation plans.

3.4 Pre-Implementation Plans

Utilizing information from the NGATS CONOPS and Operational Improvements, the JPDO is compiling Pre-Implementation Plans (PIPs), from which research prioritization, funding, and milestone guidance, by agency, can be developed. Once completed, the JPDO will deliver research and funding guidance to each JPDO, and in coordination with industry, lay out where funding and research opportunities exist to further validate and update initial JPDO assumptions.

3.5 NGATS Integrated Work Plan

Once the CONOPS, OIs, PIPs, Policy Plans, and Enterprise Architecture are developed, the information from those documents will be rolled up into a master Integrated Work Plan (IWP), becoming a NGATS strategic blue print for the duration of the effort. Refinements to the IWP will occur on a regular basis and as research and analysis updates the assumptions contained with the original document. Weather will be fully integrated into the blueprint and serve as the national plan for aviation weather activities, including aviation weather research and development.

4. FUTURE WEATHER IPT ACTIVITIES

The weather IPT will be engaged in all activities related to the development of the first IWP during 2007. Initial research and validation of the concepts related to the 4D weather information system are planned, as well as collaborative efforts in several planned JPDO sponsored demonstration projects.

5. SUMMARY

In the U.S., a Next Generation Air Transportation System is envisioned that can handle up to three times the current level of operations. A key to achieving this level of operations is minimizing the disruptions due to adverse weather. Significant improvements in weather observing systems, forecasts, communications, information integration, and aircraft performance to operate in more demanding environments and even worse weather conditions than are currently possible, so as to enable further increases in the efficiency and capacity of the air transportation system are envisioned. Several national-level documents are under development to serve as the foundation for transformational changes in the way aviation weather services are prepared, disseminated, and integrated into NexGen systems. The solution is seen as an integrated system of observations, forecasts, information integration and dissemination, and aircraft enhancements that provide the greatest overall operational benefit for the least cost.

Perhaps the most significant issue facing not only the Weather IPT, but the JPDO as a whole iss the extent to which the various partiicipating agencies (i.e., FAA, NASA, etc.) will embrace and conduct the research and development,and operational improvements that make up the components of the NGATS vision. In the next year, the success of the JPDO will depend on this this needed emerging relationship.

6. REFERENCES

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