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INFORMATION PAPER

FIFTH MEETING OF THE ALLPIRG/ADVISORY GROUP

(Montreal, 23 – 24 March 2006)

Agenda Item 2.1: Framework for global planning

NEXT GENERATION AIR TRANSPORTATION

(Presented by the United States of America)

SUMMARY

Our current air transportation system continues to use highly inefficient, ground-based technology and relies almost entirely on antiquated voice communications. In light of our present situation, we are transforming our current system into a Next Generation Air Transportation System (NGATS). In December 2004, Secretary Mineta and Administrator Blakey delivered the Integrated National Plan for NGATS to the U.S. Congress. The plan contains a transformed vision for a modern, agile system that can quickly respond to change and will simultaneously meet safety, security, mobility, efficiency and capacity needs through the year 2025 and beyond. The NGATS will be harmonized globally to be completely interoperable.

Action by ALLPIRG/5 is in paragraph 4.

1. INTRODUCTION

1.1 Our current air transportation system continues to use highly inefficient, ground-based technology and relies almost entirely on antiquated voice communications. In light of our present situation, the idea of transforming our current system into a Next Generation Air Transportation System has been welcomed in various fora. Numerous blue ribbon panels, including the National Research Council and the Aerospace Commission have urged such an approach. In 2003, Congress took action. It passed and the President signed into law the VISION 100 FAA Reauthorization Act which provides for the development and implementation of an integrated plan for a Next Generation Air Transportation System. Subsequently, Secretary Mineta sent a letter to President Bush asking to include this initiative in

the administration's agenda. In December 2004, Secretary Mineta and Administrator Blakey delivered the Integrated National Plan to Congress. The plan contains a transformed vision for a modern, agile system that can quickly respond to change and will simultaneously meet safety, security, mobility, efficiency and capacity needs through the year 2025 and beyond.

2. DISCUSSION

A Potential Crisis in the Air Transportation System

2.1 Air transportation projections in the near and long-term are staggering. Passengers are coming back in a big way with more to follow. Three-fold increases in air traffic, passengers and cargo in the next 25 years have been predicted. Some estimates put the numbers even higher. Also, the whole industry is changing and will continue to do so. In a post 9-11 world, passengers are experiencing long lines at security checkpoints and at Customs and Immigration for international passengers. Passengers now have to arrive at the airport 3 hours before flights and departure and arrival boards are full of delays.

Vision/Goals

2.2 Working with international partners, as well as industry and other stakeholders, a vision can be sketched out for what a future system might look like. The Next Generation Air Transportation System will deliver a system with the capacity to allow travelers to choose how, where and when they want to travel while making their experience as safe, secure and as hassle free as possible. The Next Generation System must also be flexible enough to encourage the exploration of new business models and a more dynamic set of services for air travelers, which have the potential to shorten curb-to-curb travel time.

Strategies

2.3 To achieve the Vision and Goals discussed above, eight specific areas have been identified. They are: airport infrastructure development, security, the air traffic system, information technology, safety management, environmental stewardship, weather forecasting, and global collaboration.

The NGATS oncept

2.4 The NGATS concept for 2025 envisions the safe, efficient and reliable movement of large numbers of people and goods throughout the air transportation system in a way that is consistent with national security objectives. It is a system founded on an underlying set of principles that permeate every aspect of the vision. These underlying principles, combined with a cohesive fabric of key capabilities that we envision, will permit the NGATS to remove many of the constraints in our current system, support a wider range of operations, and deliver an overall system capacity up to 3 times that of current operating levels. The NGATS will respond to changing user needs and provide cost-effective services that scale up and down as needs change.

Design Principles

2.5 The 2025 NGATS anticipates a shift in the historical focus of air transportation from a system focused on established physical/technical infrastructure and the ability of the service providers, to a system focused on the "user." NGATS status and capabilities are flexible in nature, adaptable to the varied needs and capabilities of its users. The vision encompasses a system-wide transformation, envisioned as multi-dimensional in scope—incorporating technological innovation to be sure, but also

addressing the critical aspects of transformation that involve change and innovation in organization, culture, and policy. Safety of the NGATS is approached in a prognostic fashion, establishing a Safety Management System (SMS). It will be based on a supportive new safety culture and a safety risk management methodology, all supported by a robust safety analysis and sharing system that identifies future risk and safety hazards at the precursor level to prevent future accidents in a proactive environment vice a reactive, historical context. Finally, the system will be harmonized globally and environmentally to accommodate both the demands of U.S. users to operate internationally without unnecessary constraint, and similarly, to embrace the needs of global users to operate in the U.S.

Key Capabilities

2.6 There are several key capabilities that denote the major characteristics of the NGATS that are currently missing from today's system. As a "total system" concept, there are multiple dependencies among these capabilities. These key NGATS capabilities include: Net-Enabled Information Access; Performance-Based Services; Weather Assimilated into Decision Making; Broad-Area Precision Navigation; Aircraft Trajectory-Based Operations; Equivalent Visual Operations; and Super Density Operations. With this foundation, a "capability migration" roadmap is being developed to show how the capabilities of today's system will change over time to reach the envisioned 2025 NGATS capabilities.

Net-Enabled Information Access

2.7 Making information available, securable and usable in real time according to defined "communities of interest" is central to the NGATS vision. Information will be used to distribute decision-making appropriately during normal operations, abnormal events, and system-wide crises -- improving the speed, efficiency, and quality of decisions. Aircraft will become mobile "nodes" integral to this information network, not only using and providing information, but also routing messages or information being sent from another aircraft or a ground source. In the NGATS context, data encompasses all relevant information forms—flight plan information; pilot, passenger and cargo data; aircraft telemetry; surveillance information; weather data, etc. Information might be in the form of records, databases (pilots licenses, aircraft maintenance records, etc), voice communications, images, etc. Information will be both "pushed" to known users and available to be "pulled" by other users including clients not previously identified as needing that data. Data providers will ensure appropriate information protection as necessary to address national defense, security, and privacy concerns. Real-time access will enable system operators and users to exploit risk-management practices to enhance safety.

Performance-Based Services

2.8 Today's system is based on "binary access" (where users meet all of the requirements for access or are denied admission), one level of service (first come, first served), and a regulatory structure largely built around specific equipment types. Performance Based Services will enable a definition of service tiers and allow the government to move from equipment-based regulations to performance-based regulations. Multiple service levels will allow service to a wider range of users and better tailor services to individual needs. As an example, the busiest airspace will have the highest air traffic service level -- thus requiring the highest level of user avionics performance. Implementation of performance-based services will enable a more cost-effective service provider maintenance framework and will encourage private sector innovation. Clearly defined service tiers will allow the service provider to create service guarantees for given performance levels so that users can determine appropriate investments to meet their needs.

Weather Assimilated Into Decision Making

2.9 Leveraging the benefits of *Net-Enabled Information Access*, NGATS will provide a "common" weather "picture" to support decision-making. Thousands of global weather observations - from ground, airborne, and space-based sources − will be used to determine real-time weather status and to feed multiple weather forecast models. Information will be fused into a single, constantly updated, national (eventually global) weather database. Differences between forecasts and actual conditions will be measured and analyzed. "Learning automation" will analyze how well information was used in past decision-making and use this knowledge to improve future performance, making more airspace available for NGATS use. NGATS will move from weather data dissemination of text and graphical products to ingestion of raw weather information into NGATS decision algorithms and processes - bypassing the need for human interpretation.

Layered, Adaptive Security

2.10 Far from the "add-on" dimension of our current security system, layered, adaptive security will integrate security functions into NGATS in a manner that increases security while moving more people/goods and requiring proportionally fewer resources to do it. Building on *Net-Enabled Information Access* and *Performance-Based Services*, security will exist in "layers of defense" designed to detect threats early. Risk assessments will begin before each flight, so that people and goods are appropriately screened as they move from the "air portal" curb to the aircraft, or as they work to support airport and aircraft operations. As technology matures, screening will be unobtrusive and increasingly transparent to the individual. Security changes will be assessed in terms of impacts to and effects from other aspects of the system, such as safety, to ensure they are implemented in a complementary, synergistic way.

Broad-Area Precision Navigation

2.11 Broad-Area Precision Navigation will provide navigation services where and when needed to enable reliable aircraft operations in nearly all conditions. Today's U.S. navigation infrastructure includes over 5,000 FAA operated ground-based navigation aids to support both en-route navigation and precision approaches to airports. The airspace structure and approach/departure procedures are constrained by this navigation infrastructure. When this localized-service model is replaced by a broad-area service, "instrument" landings will be possible at any "air portal" or location within the coverage area. NGATS Broad-Area Precision Navigation (at different required levels of performance) will likely include a next generation of GPS satellites with non-terrestrial navigation augmentation for CAT-I approaches and hybrid GNSS/inertial avionics for CAT II/III approaches. NGATS may also take advantage of other GNSS systems and broad-area navigation services such as enhanced LORAN. Elimination of multiple legacy systems will reduce FAA infrastructure costs and reduce user costs associated with maintaining proficiency over multiple navigation systems.

Aircraft Trajectory-Based Operations

2.12 To accommodate the projected doubling or tripling of system demand by 2025, today's flight planning and air traffic paradigms must be transformed to a system that manages operations based on aircraft trajectories, regularly adjusts the airspace structure to best meet user (and security/defense) needs, and relies on automation for separation assurance. This capability builds on the *Net-Enabled Information Access*, *Performance-Based Services*, *Weather Assimilated Into Decision Making,* and *Broad-Area Precision Navigation* capabilities. The design must not only improve system efficiency, but also meet goals for security, safety and environmental compatibility. NGATS will use 4D trajectories (time-based paths from block-to-block, including path segments on the ground) as the basis for planning and executing system operations. The planned trajectories will be exchanged among system participants, with

automation continuously analyzing trajectories in a framework that accounts for operational uncertainties, to develop a trajectory plan that keeps aircraft at safe distances from one another. The airspace structure will be matched dynamically (both daily and within the operational day) using a framework that seeks to allocate/configure airspace as a resource to meet demand from user operations, while meeting safety requirements, environmental requirements, etc. This airspace framework will consolidate today's disparate mechanisms for segregating and managing airspace into a single mechanism for implementing Temporary Flight Restrictions, Special Use Airspace, and other requirements. The airspace framework will seek to both provide the maximum available airspace to all users while meeting national security needs for airspace restriction.

Equivalent Visual Operations

2.13 Net-Enabled Information Access, certain aspects of Performance-Based Services, and Broad-Area Precision Navigation will provide aircraft with the critical information needed to navigate without visual references and maintain safe distances from other aircraft during non-visual conditions. We expect that the Equivalent Visual Operations capability (equivalent to those experienced under visual operations) will be operational in the mid-term, with controllers delegating responsibility to aircraft to "maintain separation" when the aircraft is in the airport area. The ability to conduct Equivalent Visual Operations at all "air portals," combined with appropriately capable landside services (including security) will permit more airports to reliably serve their community or region, whether for commercial service, business aviation, air taxi services, air cargo, or general aviation. The ability to conduct Equivalent Visual Operations at busier airports will also provide greater, more predictable operating levels and lead to improved performance of the commercial service network.

Super Density Operations

2.14 Key to the complete success of NGATS is our ability to match land and airside throughputs of an airport in order to meet future demand. The realization of the previously described capabilities will enable peak throughput performance at the busiest airports while protecting the environment of the surrounding communities. Airport taxiway and runway configuration requirements will be specified to enable high capacity traffic operations on the airport surface. Arrival and departure spacing will be reduced, as a result of enhanced surveillance and navigation performance and the development and integration of tools to detect and avoid wake vortices. Capacity will be increased with closely-spaced and converging approaches at distances closer than currently allowed and through simultaneous operations on a single runway. The airport "landside" (including security systems) will be sized to match the passenger and cargo flow to the airside throughput.

International Collaboration

2.15 NGATS must not only transform the US National Air Transportation System, but must also be capable of transcending borders. This will need to occur almost simultaneously in terms of the North American continent, as key transportation and security interests are already multi-national in nature. As NGATS evolves, the concept will be harmonized globally. This harmonization goes well beyond the core concept of air traffic management—it applies to environmental concerns, safety management and security. The FAA intends to identify international partners to collaborate on NGATS activities. Since there are a number of different international documents that contain future concepts for the next generation air transportation system, collaboration will prove to be mutually beneficial. Thus far, all of the existing plans have consistent perspectives and are in accordance with the NGATS vision. However, we are studying these plans to insure that no gaps will exist when the concepts go into the implementation phase.

3. CONCLUSION

3.1 The strategy for NGATS is to define what the future system will look like, knowing full well that it is highly unlikely that the concept presented here will emerge exactly as the NGATS of 2025; rather, this vision of the future will define a target direction and continue to develop the scope and depth of the elements of the future system. The Joint Planning and Development Office is building a roadmap that will lay out the migration strategy from today to 2025 for each of the capabilities. Over time, as policy decisions are made and as research results to better understand the details of NGATS are obtained, the capability descriptions and the roadmap will be refined, policy decisions will be made, and detailed implementation plans will be developed and carried out.

4. ACTION BY ALLPIRG

4.1 The ALLPIRG/5 Meeting is invited to note the U.S. plan to implement NGATS.

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