International Civil Aviation Organization

The Twenty-Second Meeting of the APANPIRG ATM/AIS/SAR Sub-Group (ATM/AIS/SAR/SG/22)

Bangkok, Thailand, 25 – 29 June 2012

Agenda Item 5: Provision of ATM/AIS/SAR in the Asia/Pacific Region, including associated CNS matters

NEXT GENERATION AIR TRANSPORTATION SYSTEM (NEXTGEN) OVERVIEW

(Presented by United States of America)

SUMMARY

This paper provides an update on the progress of the Next Generation Air Transportation System (NextGen), including the development and implementation of systems and procedures to improve air traffic management in the U.S. National Airspace System (NAS). A U.S. Federal Aviation Administration (FAA) initiative, NextGen integrates new and existing technologies, policies and procedures to deliver a safer and more efficient air traffic management system and to reduce delays, fuel consumption and aircraft exhaust emissions. This paper summarizes developments during the past year and planned activity in the near future.

This paper relates to –

Strategic Objectives:

A: ***Safety*** *– Enhance global civil aviation safety*

C: ***Environmental Protection and Sustainable Development of Air Transport*** *– Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment*

Global Plan Initiatives:

GPI-1 Flexible use of airspace
GPI-5 RNAV and RNP (Performance-based navigation)
GPI-6 Air traffic flow management
GPI-7 Dynamic and flexible ATS route management
GPI-8 Collaborative airspace design and management
GPI-9 Situational awareness
GPI-10 Terminal area design and management
GPI-11 RNP and RNAV SIDs and STARs
GPI-12 Functional integration of ground systems with airborne systems
GPI-15 Match IMC and VMC operating capacity
GPI-17 Data link applications
GPI-21 Navigation systems
GPI-22 Communication infrastructure

1. INTRODUCTION

1.1 This paper provides an update on the progress of the Next Generation Air Transportation System (NextGen), including the development and implementation of systems and procedures to improve air traffic management in the U.S. National Airspace System (NAS). A U.S. Federal Aviation Administration (FAA) initiative, NextGen integrates new and existing technologies, policies and procedures to deliver a safer and more efficient air traffic management system and to reduce delays, fuel consumption and aircraft exhaust emissions. This paper summarizes developments during the past year and planned activity in the near future.

2. DISCUSSION

Automatic Dependent Surveillance – Broadcast

2.1 The FAA is continuing the installation of the Automatic Dependent Surveillance – Broadcast (ADS-B) network of ground stations. More than 300 ground stations are providing weather and traffic situational awareness information to equipped aircraft. Air traffic controllers are also using ADS-B to provide air traffic separation services in some areas, improving situational awareness with ADS-B's greater accuracy and more detailed information, including aircraft type, call sign, heading, altitude and speed.

Performance-Based Navigation

2.2 The FAA is also making great strides in enhancing its network of Performance Based Navigation (PBN) routes and procedures, publishing hundreds of PBN arrival and departure procedures and high- and low-altitude routes. PBN procedures rely on the global satellite network to provide precise location information for aircraft. This enables aircraft to fly more direct routes and provides access to airports during periods of low visibility and in difficult terrain, thereby improving efficiency, providing greater flexibility in the NAS and facilitating more dynamic management of air traffic. PBN procedures include Area Navigation (RNAV), RNAV with Required Navigation Performance (RNP), RNAV Wide Area Navigation (WAAS) Localizer Performance with Vertical Guidance (LPV) and Optimized Profile Descents (OPD).

2.3 As of May 31, 2012, the FAA has published 154 RNAV routes, 362 RNAV Standard Instrument Departures, 190 RNAV Standard Terminal Arrival Routes and 337 RNP routes and arrival/departure procedures.

Wide-Area Augmentation System Localizer Performance with Vertical Guidance

2.4 The FAA continues to improve access to general aviation airports by publishing several hundred Wide Area Augmentation System (WAAS) Localizer Performance with Vertical Guidance (LPV) approaches every year. As of May 2012, there are 2, 877 WAAS LPV approaches at more than 1,400 airports.

2.5 Using LPVs, aircraft often can land in low-visibility conditions, providing more access to those airports throughout the year. WAAS LPVs provide satellite-based approaches primarily to airports and runways where no ground-based instrument landing systems exist. General aviation aircraft are the primary users of LPV procedures and about 30 percent of the general aviation fleet is equipped for LPV approaches.

Optimized Profile Descents

2.6 The FAA has also published 37 PBN approaches with Optimized Profile Descent (OPD) capability. Conventional arrival procedures have multiple segments of level flight during an approach, and each step-down requires a change in power settings. OPD procedures enable arrival aircraft to descend from cruise altitude to final approach at or near idle engine power with few, if any, level-offs. Because aircraft can use lower and steady power settings, OPD procedures result in reduced fuel burn, exhaust emissions and, sometimes, noise.

Tailored Arrivals

2.7 A particular type of OPD for aircraft equipped to receive data transmissions is the Tailored Arrival (TA), which provides fuel, emissions and noise benefits similar to OPDs. The pilot initiates a TA with a request to an air traffic controller while the aircraft still is at cruise altitude. The controller transmits a descent profile to the aircraft, which is loaded into the onboard navigation computer. The transmission is communicated via data rather than voice, so aircraft must be equipped with Future Air Navigation System (FANS) avionics to be able to perform a TA. By contrast, other types of OPDs, such as RNAV arrival procedures, are published for all users and serve a wide variety of aircraft types.

2.8 Because operators generally equip aircraft with FANS only for the over-ocean portion of intercontinental flights, use of TAs has been limited to the approach phase of flights from Europe at Miami International Airport and from Asia and the Pacific to Los Angeles and San Francisco international airports. Thousands of requests for such approaches were granted during demonstrations, many of them by the FAA's international partners in the Atlantic Interoperability Initiative to Reduce Emissions (AIRE) and the Asia and Pacific Initiative to Reduce Emissions (ASPIRE). TAs became operational and available to any FANS-equipped aircraft at these airports in 2011.

Metroplex

2.9 Stakeholder collaboration, as demonstrated in programs like AIRE and ASPIRE, is vital to ensure the effectiveness of NextGen capabilities. Another example of a successful collaborative effort is the Optimization of Airspace and Procedures in the Metroplex (OAPM) initiative. A metroplex is an area where flights into and out of multiple commercial and general aviation airports make for busy airspace and complex traffic patterns. Working with aviation community stakeholders, the FAA is looking to improve the efficiency of airspace in numerous major metropolitan areas throughout the U.S. Collaborative study teams help determine how adding PBN procedures and redesigning airspace sectors can make better use of the available airspace and runways. Design teams then implement those recommendations using a repeatable process that takes no more than three years.

2.10 So far the FAA has completed studies and is conducting design work in seven of 21 metroplexes: Washington, D.C., north Texas, northern and southern California, Houston, Atlanta and Charlotte, N.C. Study teams estimated substantial fuel saving in the Washington, D.C., and north Texas metroplexes, mainly from the systematic application of multiple OPDs and reduced flight distances. For Washington, the estimate is $6.4 - $19 million per year in fuel savings, and the prospective north Texas saving is $10.3 - $21.7 million. In addition, reduced radar vectoring will decrease pilot-controller communications and the complexity of the controller workload.

NEXTGEN Benefits

2.11 NextGen will provide a number of benefits for operators, the environment and the economy. Projections of traffic growth and complexity result in estimates that NextGen improvements will reduce U.S. airspace system delays 38 percent by 2020, when compared to current procedures and structure. These delay reductions will provide an estimated $24 billion in cumulative benefits through 2020, including 14 million metric tons in cumulative reductions of carbon dioxide emissions and 1.4 billion gallons in cumulative reductions of fuel use.

2.12 To achieve timely NextGen benefits, the FAA needs to synchronize its investments with those of aviation stakeholders. To encourage operator equipage and validate concepts, the FAA conducts simulations, demonstrations, trials and flight evaluations as part of developing NextGen systems and procedures.

NEXTGEN Ahead

2.13 Over the next several years, the FAA will build on existing NextGen technologies and procedures to offer additional capabilities in the NAS. Forthcoming improvements include expanded surface data sharing capabilities to enhance surface safety and foster collaborative air traffic management. Also under development are procedures to enable more efficient use of closely spaced parallel runways to improve airport throughput, particularly during poor visibility conditions.

Point-in-Space/Point-in-Time Metering

2.14 Building on ADS-B's precise surveillance ability, the FAA is developing arrival interval management, a capability that will improve the predictability and efficiency of traffic flow into busy airports. Controllers will begin merging and spacing (metering) aircraft more than 200 nautical miles away from the airport by assigning each flight a speed that will ensure its arrival at a precise point-in-space/point-in-time position at the airspace boundary between an air route traffic control center and a terminal radar approach control facility. The objective is to achieve initial operating capability for the extended metering and ground automation components of arrival interval management in 2014. In parallel, a flight deck capability is being developed that will enable flight crews to establish and maintain precise spacing relative to a preceding aircraft, providing additional fuel-saving optimized descent opportunities. Avionics standards for the flight deck capability are scheduled to be completed in 2014.

Data Communications

2.15 The FAA is continuing its transition to a predominantly digital textual mode of communication. Using Data Communications (DataComm) as a foundation, NextGen will enable digital communications infrastructure and technologies to provide a supplemental means for two-way exchange of information between air traffic controllers and flight crews. An initial DataComm tower capability for revised departure clearances is expected in 2015, available to aircraft equipped with FANS 1/A+.

2.16 The increasingly global face of aviation requires that airplanes be able to use avionics with common standards to conduct similar operations and reap benefits around the world. The FAA is collaborating with international air navigation service providers to make sure that happens.

ICAO System Block Upgrades

2.17 The FAA's harmonization work supports ICAO's Aviation System Block Upgrades initiative, which aims to harmonize global upgrades to air traffic management that can be achieved in 5-year blocks. The first block of aviation system advances comprises existing capabilities and those planned for implementation in 2013, including PBN and flexible use of airspace. These advancements do not require development of new technology, standards or infrastructure and they use avionics that are already available. The next block includes well-defined capabilities planned for implementation by the end of 2018.

Meeting Challenges

2.18 NextGen is a complex undertaking requiring detailed management of interdependencies and integration of capabilities into an active air traffic system that operates around the clock.

2.19 The FAA uses a portfolio management system to ensure that interdependencies are identified and addressed and to effectively leverage research and development work. Implementation of an expanded acquisition management process has facilitated a coordinated and collaborative transition to NextGen that involves the various FAA lines of business, with their various responsibilities, from the very beginning. It provides the necessary structure and governance to address changes to NAS policy, procedures, programs and systems throughout their lifecycles.

2.20 One of the key challenges is synchronizing FAA investments with those of other government agencies and aviation stakeholders in order to maximize timely benefits from NextGen deployments. If the FAA fails to deploy NextGen capabilities by the time stakeholders equip for them, or if stakeholders fail to equip when capabilities become available, the aviation community will not fully realize a timely a return on investments. The FAA is working with its aviation community stakeholders through advisory committees and demonstration projects to set NextGen priorities and pursue effective solutions.

3. CONCLUSION

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) discuss any relevant matters as appropriate; and

c) Find additional information about NextGen development in the 2012 NextGen Implementation Plan, which can be downloaded from the FAA's NextGen website at www.faa.gov/nextgen. Send detailed questions or request printed copies of the Plan at NextGen@faa.gov.

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