International Civil Aviation Organization

SIXTEENTH MEETING OF THE COMMUNICATIONS/NAVIGATION/SURVEILLANCE AND METEOROLOGY SUB-GROUP (CNS/MET SG/16) OF APANPIRG

Bangkok, Thailand, 23 – 27 July 2012

Agenda Item 19: Any other business

NEXT GENERATION AIR TRANSPORTATION SYSTEM (NEXTGEN) OVERVIEW WITH A FOCUS ONCOMMUNICATION, NAVIGATION AND SURVEILLANCE

(Presented by the 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. NextGen is producing significant efficiency, environmental and safety benefits with the introduction of improved navigation and surveillance capabilities. 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-5 RNAV and RNP (Performance-based navigation)
GPI-7 Dynamic and flexible ATS route management
GPI-8 Collaborative airspace design and management
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. It is producing significant efficiency, environmental and safety benefits with the introduction of improved navigation and surveillance capabilities. This paper summarizes developments during the past year and planned activity in the near future.

2. DISCUSSION

2.1 RECENT NEXTGEN IMPLEMENTATIONS

2.1.1 Airport Surface Detection Equipment–Model X

2.1.1.1 As a result of previous implementation work, the FAA now monitors ground movements at 35 major airports using Airport Surface Detection Equipment–Model X (ASDE-X) and shares that data among air traffic controllers, traffic managers, flight operations centers, ramp operators and airports. Data sharing enhances safety and traffic flow on runways, taxiways and some ramps, and improves collaborative decision making.

2.1.1.2 To further leverage ASDE-X surface-movement information, the FAA has installed Data Distribution Units (DDU) at many ASDE-X locations. DDU data are shared through a nationwide network that will give operators access to surface-movement information from a single System Wide Information Management (SWIM) interface. In 2011, the FAA installed DDUs at Honolulu, San Diego, Las Vegas, Salt Lake City, Minneapolis-St. Paul, Milwaukee, St. Louis, Miami, Orlando, Fort Lauderdale, Baltimore-Washington, Washington Dulles, Washington National and New York LaGuardia airports.

2.1.2 Automatic Dependent Surveillance–Broadcast

2.1.2.1 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.

2.1.2.1 In collaboration with air carriers, the FAA is gathering data on the benefits of using "ADS-B In" equipment. In August 2011, the FAA initiated a 12-month operational evaluation of In-Trail Procedures (ITP) using ADS-B In over the Pacific Ocean. The evaluation of ITP is based on data from the flights of about a dozen Boeing 747-400s. The FAA is providing the necessary avionics for the air carrier to obtain these ADS-B In data. Pilots of aircraft equipped with ADS-B In can now see the location, identity and speed of nearby aircraft on a cockpit display. Improved situational awareness enables pilots to know when to request a climb from controllers to reach a more fuel-efficient altitude.

2.1.2.2 Preliminary FAA estimates show that with ITP, an air carrier operating between the United States and the South Pacific might earn $200,000 in additional payload revenue per aircraft each year, by carrying less fuel. This benefit translates into approximately 270 pounds of additional payload per flight.

2.1.3 Performance Based Navigation

2.1.3.1 The FAA is 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. PBN 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 Augmentation System (WAAS) Navigation Localizer Performance with Vertical Guidance (LPV) and Optimized Profile Descents (OPD).

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

2.1.4 Wide-Area Augmentation System Localizer Performance with Vertical Guidance

2.1.4.1 Continuing to improve access to general aviation airports, the FAA publishes several hundred WAAS LPV approaches every year. As of May 2012, there are 2, 877 WAAS LPV approaches at more than 1,400 airports.

2.1.4.2 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.

2.2 NEXTGEN BENEFITS

2.2.1 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.

2.2.2 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.

2.3 NEXTGEN AHEAD

2.3.1 Over the next several years, the FAA will build on existing NextGen navigation and surveillance technologies and procedures to offer additional capabilities in the NAS. Forthcoming improvements include expanded data sharing capabilities to enhance surface safety and foster collaborative air traffic management. The FAA is also developing procedures to enable more efficient

use of closely spaced parallel runways to improve airport throughput, particularly during poor visibility conditions. On the communications side, developments using Data Communications (Data Comm) will improve safety and enhance efficiency and flexibility on the airport surface.

2.3.2 Expanding Surface Data Sharing

2.3.2.1 The FAA will provide surface data sharing at nine busy and complex airports using Airport Surface Surveillance Capability (ASSC). While ASDE-X tracks surface movement using radar, multilateration and ADS-B, ASSC collects data from multilateration and ADS-B only. Between 2014 and 2017, ASSC will begin to track transponder-equipped aircraft and ADS-B-equipped ground vehicles on the surface and aircraft flying within five nautical miles of airports at Portland, Ore.; Anchorage, Alaska; Kansas City, Mo.; New Orleans; Pittsburgh; San Francisco; Cincinnati; Cleveland and Andrews Air Force Base, Md.

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

2.3.3.1 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.

2.3.4 Data Communications

2.3.4.1 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, and will be available to aircraft equipped with FANS 1/A+. 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 this happens.

2.3.5 ICAO System Block Upgrades

2.3.5.1 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.

2.4 MEETING CHALLENGES

2.4.1 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. 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.

2.4.2 One of FAA's key challenges is synchronizing its 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. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) discuss any relevant matters as appropriate; and

c) Review 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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