Twenty Fifth Meeting of the
Informal South Pacific ATS Co-ordinating Group (ISPACG/25)

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Agenda Item 4: Review Open Action Items (AI 17-5)

Federal Aviation Administration Surveillance and Broadcast Services Program Update

Presented by the Federal Aviation Administration

SUMMARY

The purpose of this information paper is to summarize the status and plans of the Federal Aviation Administration's Surveillance and Broadcast Services Program.

1. INTRODUCTION

1.1. The U.S. Federal Aviation Administration (FAA) created the Surveillance and Broadcast Services (SBS) Program in September 2005 to develop a multi-segment, lifecycle-managed, and performance-based strategy that aligns with the Next Generation Air Transportation System (NextGen) and generates value for the U.S. national airspace system (NAS). The FAA's SBS program office is overseeing and directing the acquisition of a number of surveillance and broadcast services, in specified volumes, on a NAS-wide basis.

1.2. At the 24th. meeting of the Informal South Pacific Air Traffic Services Co-ordinating Group (ISPACG/24), the United States provided information on the status of the FAA's program plan and activities for the deployment of Automatic Dependent Surveillance-Broadcast (ADS-B) technology across the U.S. NAS. The presentation provided an overview of the work undertaken by the SBS program office to establish separation standards for the use of ADS-B in a mixed radar environment within the NAS. The preliminary analysis demonstrated that the combination of ADS-B avionics, which are compliant with the FAA Final Program Requirements, the ground infrastructure as specified in the ADS-B service specification, and the automation assumptions made by the FAA program office, can meet the current performance baseline for use in non-radar and radar environments.

1.3. The purpose of this paper is to summarize the current status and plans of the SBS Program.

2. OVERVIEW

2.1. On 9 September 2005, the FAA officially committed to establishing ADS-B as the basis for air traffic control in the United States. Moving to ADS-B allows the agency to eventually decommission approximately half of the current infrastructure of secondary surveillance radars in favor of a system that uses precise location data from satellites and provides greater benefits to users of the NAS. A reduced network of secondary radars will be maintained at high-density airports to ensure a back-up in case of a Global Positioning System (GPS) outage.

2.2 The FAA is following a dual-track strategy of building the ADS-B ground infrastructure and mandating avionics equipage in designated airspace. A rule was necessary since ADS-B will be used for air traffic control as aircraft are equipped to broadcast their locations to ground stations and other equipped aircraft. In 2007, the FAA proposed a rule that would mandate "ADS-B Out" avionics to fly in certain designated airspace – generally the same busy airspace where transponders are required. The final rule was issued in May 2010 and mandated a compliance deadline of 2020. The FAA expects most operators to equip by 2015.

2.3 The FAA is deploying ADS-B surveillance services for the 50 US states and the territories of Puerto Rico and Guam. The FAA-specified system provides services on two ADS-B frequencies; one on 1090 MHz (Mode S Extended Squitter) and one on 978 MHz Universal Access Transceiver (UAT). ITT Corporation was selected in August 2007 as the vendor for providing ADS-B surveillance and broadcast services.

2.4 In September 2010, the FAA made the In-Service Decision that commissioned ADS-B surveillance and broadcast services for use in the NAS, giving the "green light" for the deployment to proceed. As of February 2011, approximately 300 ground stations are operational. The national deployment is expected to be complete by 2013, with nearly 800 ground stations.

2.5 The ADS-B ground infrastructure allows the FAA to provide surveillance for air traffic control separation services and pilot advisory services to aircraft equipped to receive ADS-B broadcasts (known as "ADS-B In"). ADS-B ground stations receive ADS-B signals from aircraft within line-of-sight and broadcast information to properly equipped aircraft.

2.6 ADS-B traffic broadcasts consist of radar-derived position reports for non-ADS-B equipped aircraft within a certain radius and location data for ADS-B-equipped aircraft. This service is known as Traffic Information Service-Broadcast, or TIS-B. ADS-B also broadcasts free, real-time graphical weather products from the National Weather Service and aeronautical information, such as temporary flight restrictions and special-use airspace. This is known as Flight Information Service-Broadcast, or FIS-B. Note that while TIS-B is available on both ADS-B links, FIS-B is available on the UAT link only. The FAA made the In-Service Decision commissioning TIS-B and FIS-B in November 2008.

2.7 By the fall of 2010, the FAA had attained Initial Operational Capability for ADS-B air traffic control separation services at all four key sites (Louisville, Kentucky; the Gulf of Mexico; Philadelphia, Pennsylvania; and Juneau, Alaska); published the rule that mandates ADS-B Out by 2020 in certain airspace; and issued the In-Service Decision commissioning ADS-B for use in the national airspace system.

2.8 With ADS-B stations operating on oil rigs in the Gulf of Mexico, ADS-B surveillance is available now over the Gulf for both low and high-altitude aircraft. Air traffic controllers at the Houston air route traffic control center are using ADS-B to separate aircraft tracked by radar and ADS-B, bringing significant safety and efficiency improvements to the Gulf.

2.9 The next area to receive ADS-B will be New York. Initial Operational Capability for John F. Kennedy International Airport, LaGuardia Airport, and Newark Liberty International Airport is planned for spring 2011. The New York terminal airspace is expected to reach Initial Operational Capability at the New York TRACON (Terminal Radar Approach Control facility) in 2011.

2.10 The FAA has signed agreements with several airlines (JetBlue, United Airlines, and US Airways) to demonstrate the benefits of advanced ADS-B applications and procedures during revenue service. These operational evaluations will give the agency detailed cost and benefit data, and encourage airlines to equip early to capitalize on ADS-B benefits.

2.11 The FAA is adapting ADS-B for use with vehicles on airport surfaces to improve runway safety. Any vehicle – e.g., aircraft, tug, fuel truck, snowplough, or aircraft-rescue-and-fire fighting vehicle – can be equipped to transmit location information to controllers, pilots, vehicle drivers, or airport operators. In the U.S., ADS-B transmissions will only be permitted from ground vehicles that are in the airport movement area (and subject to air traffic control). While not currently mandating vehicle ADS-B, the FAA is encouraging airport operators to equip appropriate vehicles. In addition to significant improvements in runway safety, airport managers can use the system to track assets and direct surface operations more efficiently. This would be especially useful with rescue vehicles in case of an accident. The FAA is beginning early implementation of vehicle ADS-B at key airports that are using ASDE-X (Airport Surface Detection Equipment, Model X). Both the 1090 MHz and the 978 MHz UAT frequencies have been approved for vehicle ADS-B.

2.12 The FAA has begun work to enable the use of ADS-B for three (3) nautical-mile en-route separation services. The agency is evaluating the safety of applying three-nautical mile lateral separation between aircraft in en route airspace where the current standard is five (5) nautical miles (NM).

3. ADS-B IN

3.1. The Aviation Rulemaking Committee for ADS-B Out recommended that the FAA should, in partnership with industry, define a strategy for ADS-B In, ensuring the

strategy is compatible with ADS-B Out avionics. In response to this request, the FAA chartered a new Aviation Rulemaking Committee that will make recommendations for moving forward with high-value ADS-B applications that would require cockpit displays. This committee is scheduled to make its final report to the FAA by September 2011, and detail recommended next steps by June 2012.

3.2. The SBS program is developing a number of airborne ADS-B applications that will provide benefits to operators who choose to equip their aircraft with ADS-B In. ADS-B In provides the capability to receive, process, and display ADS-B data from surrounding aircraft. In addition to providing benefits to customers who equip, these applications will help accelerate the understanding and acceptance of airborne ADS-B and provide a path to future applications. While the FAA is evaluating a number of airborne applications, the program is currently investing in three applications: Surface Indications and Alerting, In-Trail Procedures, and Interval Management.

3.3. Surface Indications and Alerting (SURF-IA)

3.3.1. The United States Congress added funding for ADS-B in the fiscal year 2008 Conference Report in which it appropriated $9.3 million to expedite air-to-air capabilities. The FAA determined that expediting surface conflict detection and cockpit alerting would motivate airlines to equip earlier for ADS-B to obtain the significant safety benefits. SURF-IA would improve runway safety by providing enhanced situational awareness and direct alerting of potential conflicts to pilots.

3.3.2. The FAA awarded contracts for this effort in November 2008 to Honeywell and Aviation Communications and Surveillance Systems (ACSS). Honeywell was to develop requirements and standards, and perform human factors analyses. Honeywell's demonstration tests took place at Seattle-Tacoma Airport and at Snohomish County Paine Field. The demonstration used a Cessna Sovereign and a Beechcraft King Air flown by Honeywell test pilots.

3.3.3. ACSS developed draft standards and performed flight demonstrations. ACSS equipped a few Airbus 330s with ACSS's SafeRoute product with Electronic Flight Bag displays. The ACSS demonstration testing at the Philadelphia International Airport involved an ACSS Beechcraft King Air flown by an ACSS test pilot and a US Airways A330 operated by US Airways fleet pilots. The A330 remained on the airport surface during the demonstration testing.

3.3.4. The FAA received final reports from ACSS and Honeywell on their respective demonstration tests and made these available to SC-186 and other interested parties. These reports are public and available on request.

3.3.5. The ACSS and Honeywell demonstrations validated a suspected line-of-sight issue and identified an unexpected ADS-B "drop-out" issue for surface operations. The line-of-sight issue occurs where terrain obstructs the full runway length (when the middle of the runway is elevated relative to both ends) or terrain and/or buildings obstruct portions of intersecting runways that may be used simultaneously in operations, such as at LaGuardia, Philadelphia, etc. The drop-out issue is due to radio

frequency multi-path interference and can cause ADS-B transmissions of aircraft within line-of-sight of another aircraft to not be received. The FAA is studying these issues to determine their scope and develop potential mitigations.

3.3.6. The RTCA Program Management Committee approved the SURF-IA SPR as DO-323 in December 2010. Because of the technical issues described above, funding limitations, and the challenging performance requirements of this application, the FAA does not plan to initiate MOPS until 2014 or later.

3.4. In Trail Procedure (ITP)

3.4.1. The objective of ITP is to increase the efficiency of long-haul flights while maintaining the current level of safety. The concept takes advantage of ADS-B In to show traffic on cockpit displays. In addition to increasing flight crew awareness of surrounding traffic, ITP offers the capability of climbing or descending to more operationally optimal altitudes that are currently blocked by traffic due to procedural separation standards. After flight crews gain experience with the ITP display and the capability of the ITP to optimize altitude, there is an expectation that they will be comfortable with reducing the amount of contingency fuel reserves, allowing more payload for cargo. In addition, operating at more optimal altitudes will reduce aircraft fuel burn and carbon emissions.

3.4.2. The FAA has agreements with United Airlines and Honeywell to advance the ITP concept. The FAA and United Airlines plan to conduct in-service flight evaluations of ITP on 12 United Airlines Boeing 747-400s on routes between the U.S. west coast and Australia beginning in the summer of 2011, and subsequently in other suitable oceanic airspace managed by Oakland Center.

3.5. Interval Management (IM)

3.5.1. The initial implementation of IM introduces a new method for flight crews, air traffic control, and airline operation centers to achieve a desired spacing between paired aircraft in all phases of flight. The initial applications of these operations will take place in the en route phase of flight down to the runway threshold in a manner consistent with today's IFR procedures and criteria. Later, more mature implementations of these operations include the possibility of delegating separation responsibility to the flight deck for the interval management function only. IM operations consist of a ground capability called Ground Interval Management-Spacing (GIM-S) to schedule and "pre-condition" the arriving traffic flow, and a flight-deck capability called FIM-S to allow aircraft to efficiently manage the interval assigned by air traffic control.

3.5.2. The SBS program office is coordinating requirements for the capabilities in Ground Interval Management-Spacing (GIM-S) with existing and future FAA automation platforms, and completed an alternatives analysis to determine the best solution(s) to meet requirements. The GIM-S requirements will be implemented via two FAA automation programs: Time-Based Flow Management and En Route Automation Modernization.

3.5.3. The FAA is working with several airline partners to gather operational data and validate concepts as initial capabilities are established. The FAA is supporting the efforts of a joint RTCA/EUROCAE working group to develop the SPR document for FIM-S by March 2011.

4. WIDE AREA MULTILATERATION (WAM)

4.1. The FAA has deployed WAM in Juneau, Alaska, and several airports in Colorado that are popular ski destinations. The rugged terrain makes it impossible for air traffic controllers to maintain radar surveillance over aircraft in these areas. Limitations to aircraft operations are compounded by bad weather that results in flight delays and cancellations. WAM provides surveillance through a network of small sensors deployed in remote areas. The sensors send out signals that are received and sent back by aircraft transponders. This data is transmitted to screens viewed by air traffic controllers for separation of aircraft. WAM reached Initial Operating Capability at Denver Center in September 2009. The WAM system at Anchorage Center, which services Juneau, reached Initial Operational Capability in January 2010.

4.2. WAM improves safety, efficiency and capacity by allowing controllers to see aircraft that are outside radar coverage. It saves time and money that would otherwise be lost due to flight delays and cancellations or diversions to other airports. The improved surveillance also translates into more efficient flight paths that save time and fuel.

4.3. WAM serves as a backup to ADS-B in the event of a GPS outage in high-value airspace. It will also serve as an additional source for traffic broadcasts to aircraft equipped with proper avionics. The FAA is working with the state of Colorado to expand WAM to additional mountain airports.

5. ACTION BY THE MEETING

5.1. The meeting is invited to consider the content and to comment on this information paper.