International Civil Aviation Organization

WORKING PAPER

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ASSEMBLY — 38TH SESSION

TECHNICAL COMMISSION

Agenda Item 32: Air Navigation — Policy

INTEGRATION OF SPACE-BASED RECEPTION OF ADS-B INTO THE GANP

(Presented by Canada)

EXECUTIVE SUMMARY

The *Global Air Navigation Plan* (GANP, Doc 9750), while providing the strategic direction for the technical work programme of ICAO in the field of global air navigation, also serves as guidance for States, the planning and implementation regional groups (PIRGs), service providers, airspace users and industry stakeholders. On 29 May 2013, the Council (C-DEC 199/5) approved the fourth edition of the GANP, which is presented in A38-WP/39 for endorsement by this Assembly.

Considering the foregoing, it is important to ensure that the updated GANP is, to the extent reasonable, complete and correct.

A significant emerging air navigation issue is the potential effect of space-based reception of automatic dependent surveillance - broadcast (ADS-B) signals. This innovative concept leverages two established technologies (satellites and ADS-B) to create global air traffic services (ATS) surveillance coverage. This possibility is currently not reflected in the GANP, which carries with it the potential negative consequence that required actions may not be supported to the extent necessary to fully realize the potential benefits of this emerging initiative.

Action: The Assembly is invited to consider adjustments to the GANP to ensure inclusion of space-based reception of ADS-B.

Strategic Objectives:	This working paper relates to the Safety and the Environmental Protection and Sustainable Development of Air Transport Strategic Objectives.
Financial implications:	No direct costs. Expected benefits from balanced allocations which take account of most likely near term requirements
References:	Doc 9750, Global Air Navigation Plan, Fourth Edition, proposed to the Assembly in A38-WP/39 Report of the 12th Air Navigation Conference (Doc 10007) A38-WP/132 - The Concept of Space-Based ADS-B

[1] English and French versions provided by Canada.

(4 pages)

1. INTRODUCTION

1.1 As detailed in A38-WP/132, it is expected that initial operating capability of space-based reception of ADS-B signals is foreseen as early as 2017. This is well within the near-term planning horizon elaborated in the fourth edition of the GANP, as presented in A38-WP/39. The only mention of space-based reception of ADS-B appears be in Roadmap 3: Surveillance, where "ADS-B Out via Satellite" is mentioned as an enabler for trajectory based operations.

1.2 Although expanded en-route ATS surveillance provides benefits in and of itself, and could therefore be considered as a candidate Aviation System Block Upgrade (ASBU) thread on that basis, it is not considered desirable as it would be necessary to potentially delay the GANP endorsement with such a significant change. Rather, it is proposed to make some relatively straight-forward adjustments to take account of recent developments which indicate that, in the near term, expanded en-route ATS surveillance coverage can be anticipated.

1.3 The proposed GANP includes a detailed description of the expected benefits of implementing performance based navigation (PBN) procedures. It seems equally appropriate to consider including in the GANP a description of the expected benefits which would accompany expanding ATS surveillance coverage for en-route operations. It should be highlighted that the availability of ATS surveillance could very well support advancing the timelines for the implementation of numerous ASBU modules.

1.4 A draft suggested text, for inclusion in the GANP, is provided in the appendix. It is suggested this text could be inserted in Chapter 2, immediately prior to "Flexibility of GANP Implementation".

2. CONCLUSION

2.1 The possibility that, in the near term, global ATS surveillance coverage will be available has not been considered in the GANP. The potential benefits from many of the ASBU modules described in the GANP would be enhanced if ATS surveillance were also available in the airspace concerned. Some ASBU Modules could likely be implemented earlier if ATS surveillance were available to provide for airspace and trajectory monitoring.

2.2 The GANP is meant to support globally coordinated planning for coherent and effective implementation of aviation improvements. Near term (2013-2018) implementation decisions will be heavily influenced by the GANP as well as planning for the medium term (2018-2023). Accordingly, it is particularly important that the GANP reflect likely near term aviation changes.

2.3 The Assembly is invited to consider the proposal that the GANP be adjusted to account for the likelihood that significantly expanded ATS surveillance will be available in the near-term as a result of the expected initial operating capability of space-based reception of ADS-B expected in 2017.

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APPENDIX

Suggested new section for inclusion in chapter 2, just prior to “flexibility of GANP implementation”:

Emerging Innovation - Global ATS Surveillance Coverage

As this edition of the GANP was being finalized, the aviation community was advised of a development which could potentially have global consequences. A space-based system is under development by a consortium of ANSPs and industry partners to operate automatic dependent surveillance - broadcast (ADS-B) receivers on a polar orbiting satellite system. This innovative concept leverages two established technologies (satellite communications and ADS-B) to create global air traffic services (ATS) surveillance coverage. There are vast regions of the world where ground based infrastructure to support ATS surveillance is not possible, due to physical constraints, logistical challenges or security concerns.

The launches of the satellites are planned to begin in 2015 with initial operational capability foreseen for 2017. This is within the 2013-2018 implementation horizon for Block 0 and planning horizon for Block 1. It can be foreseen that the availability of global ATS surveillance would have a significant impact on future planning for the global aviation system.

ADS-B is a proven technology that supports both ground-based and airborne surveillance applications. The satellite network will have the capability of receiving ADS-B position, velocity data and message integrity from aircraft routed via inter-satellite links to terrestrial gateway stations in near real time, before being transferred to terrestrial data networks for availability to air traffic management for processing and display. This will enable the use of ATS surveillance to support separation provision in areas where, currently, only procedural separation minima, based on voice or automated position reporting, is applied. Procedural separations are generally applied by restricting the altitude, route and/or speeds at which aircraft operate to achieve and maintain specified vertical, lateral or longitudinal spacing between projected flight profiles.

The planned satellite-based service will extend and augment the current ground-based ATS surveillance (ADS-B and radar) systems to include oceanic and remote regions on a global basis and in a seamless manner. The direct operational benefits are expected to include:

- reductions in the separation minima applied between aircraft or projected flight profiles
- operations closer to the preferred flight profile
- reduced fuel burns and operating costs
- reduced emissions
- increased safety
- increased airspace capacity and ANSP efficiency

Another benefit of ATS surveillance is its role in supporting ground-based airspace and flight profile monitoring. This has a direct safety benefit, but also provides an operational environment where other implementations can be supported or enhanced. The availability of ATS surveillance could very well be a deciding factor in whether or not to implement some of the ASBU Modules described in the GANP.

Space-based reception of ADS-B signals is being considered mainly to support en-route applications. It should be highlighted that numerous of the ASBU Modules would provide even more benefits if they were implemented in an environment where en-route ATS surveillance were available. These include:

B0-FRTO: Improved Operations through Enhanced En-route Trajectories

B0-NOPS: Improved Flow Performance through Planning based on a Network-wide view

B0-ASUR: Initial Capability for Ground Surveillance

B0-ASEP: Air Traffic Situational Awareness (ATSA)

B0-OFPL: Improved Access to Optimum Flight Levels through Climb/Descent Procedures using ADS-B

B0-SNET: Increased Effectiveness of Ground-Based Safety Nets\

B0-CDO: Improved Flexibility and Efficiency in Descent Profiles using Continuous Descent Operations (CDO)

B0-TBO: Improved Safety and Efficiency through the Initial Application of Data Link En-route

B0-CCO: Improved Flexibility and Efficiency Departure Profiles - Continuous Climb Operations (CCO)

B1-ACDM: Optimized Airport Operations through A-CDM Total Airport Management

B1-RATS: Remotely Operated Aerodrome Control

B1-FRTO: Improved Operations through Optimized ATS Routing

B1-NOPS: Enhanced Flow Performance through Network Operational Planning

B1-ASEP: Increased Capacity and Efficiency through Interval Management

B1-SNET: Ground-based Safety Nets on Approach

B1-CDO: Improved Flexibility and Efficiency in Descent Profiles (CDO) using VNAV

B1-TBO: Improved Traffic Synchronization and Initial Trajectory-based Operation

B1-RPAS: Initial Integration of Remotely Piloted Aircraft (RPA) into Non-segregated Airspace

B2-FICE: Improved Coordination through Multi-centre Ground-Ground Integration (FF-ICE, Step 1 and Flight Object, SWIM)

B2-SWIM: Enabling Airborne Participation in Collaborative ATM through SWIM

B2-NOPS: Increased User Involvement in the Dynamic Utilization of the Network

B2-ASEP: Airborne Separation (ASEP)

B2-CDO: Improved Flexibility and Efficiency in Descent Profiles (CDOs) Using VNAV, Required Speed and Time at Arrival

B2-RPAS: Remotely Piloted Aircraft (RPA) Integration in Traffic

B3-FICE: Improved Operational Performance through the Introduction of Full FF-ICE

B3-NOPS: Traffic Complexity Management

B3-TBO: Full 4D Trajectory-based Operations

B3-RPAS: Remotely Piloted Aircraft (RPA) Transparent Management

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