



International Civil Aviation Organization

**The Twentieth Meeting of the APANPIRG ATM/AIS/SAR Sub-Group
(ATM/AIS/SAR/SG/20)**

Singapore, 05 – 09 July 2010

Agenda Item 8: Review developments relating to CNS/ATM implementation

**STATUS OF THE DEVELOPMENT AND IMPLEMENTATION OF ADS-C
CLIMB/DESCEND PROCEDURES**

(Presented by the United States of America)

SUMMARY

The purpose of this information paper is to present the U.S. Federal Aviation Administration (FAA) plan for conducting an Automatic Dependent Surveillance–Contract, (ADS-C), Climb/Descend Procedure (CDP) Operational Trial in the Pacific.

1. INTRODUCTION

1.1 The U.S. Federal Aviation Administration (FAA) is continuing the works associated with the development of an in-trail climb through and descend through procedure using ADS-C capabilities.

1.2 ADS-C analysis has determined that this oceanic procedure supports the FAA goals for fuel efficiency, emissions reductions and air traffic capacity.

1.3 This procedure is based on in-trail Distance Measuring Equipment (DME) rules in ICAO Doc 4444, paragraph 5.4.2.3.2. Aircraft pair distance verification is performed by ground flight tracking systems, such as the FAA’s Ocean21 system, using near simultaneous ADS-C demand contract reports. As with the existing DME procedure, responsibility for separation assurance remains with air traffic control.

2. DISCUSSION

2.1 As a result of some confusion surrounding the nomenclature of the ADS-B In-Trail Procedure (ITP) and the ADS-C ITP at the 16th meeting of the ICAO Separation and Airspace Safety Panel (SASP) Working Group of the Whole (WG/WHL), it was recommended that the FAA-originated ADS-C procedure no longer use the term “I-T-P”. The concern from SASP was the probability of pilot/controller confusion when these procedures are utilized in the operational environment. “I-T-P” is ICAO-approved designation of the ADS-Broadcast (B) climb/descend procedure and the ICAO guidance is to use the terminology "I-T-P" when requesting and issuing the ADS-B clearance.

2.2 The ADS-C procedure is designed to improve FAA service to properly equipped aircraft by allowing an oceanic air traffic controller to have another option for granting an altitude change request when other standard separations such as ADS-C distance-based 30 NM longitudinal separation

minima do not allow for a climb or descend through the altitude of a blocking aircraft. It is strictly an air traffic control tool that is controller initiated after a pilot request, to be applied between RNP4 manoeuvring and blocking aircraft pairs.

2.3 Accordingly, the FAA has instituted the name change to ADS-C Climb/Descend Procedure (CDP).

2.4 The objective of ADS-C CDP activities in fiscal year (FY) 2009 was to begin development of operational trials over Pacific airspace. These activities included the refinement of procedures developed in FY 2008, the development of necessary safety case documents and obtaining ICAO endorsement.

2.5 During FY 2010, collision risk modeling has been completed, a demonstration plan and procedure have been finalized and the target operational trial start date within the Oakland Air Route Traffic Control Center (ARTCC) oceanic Flight Information Region is July 2010. The operational trial will be a manual execution of the procedure using Ocean21 displays but without changes to the Ocean21 software. During the operational trial, Safety Management System monitoring will be performed, and benefits metrics will be collected.

2.6 Based on Oakland ARTCC traffic, with a 35% Future Air Navigation System (FANS) equipage rate, benefits analysis projected total combined fuel savings up to 44,000 kilograms (kg) or 139,000 kg of carbon dioxide (CO₂) per day. A FANS equipage rate nearing 100% increased the potential benefits to nearly 88,000 kg of fuel or 278,000 kg CO₂ per day.

2.7 The requirements for an operational trial of ADS-C CDP are listed in the Appendix to this paper.

3. CONCLUSION

3.1 The meeting is invited to note the information presented in this paper.

APPENDIX

Requirements for an operational trial of ADS-C CDP are as follows:

- The maneuvering aircraft is flying level prior to executing ADS-C CDP
- The maneuvering aircraft is approved for Reduced Vertical Separation Minimum (RVSM)
- The maneuvering aircraft has active FANS-1/A ADS-C and Controller-Pilot Data Link Communication (CPDLC) connections
- The blocking aircraft is flying level
- The blocking aircraft is approved for RVSM
- The blocking aircraft has active ADS-C and CPDLC connections
- The blocking aircraft has an assigned altitude that is 1,000 feet above or below maneuvering aircraft assigned flight level
- Blocking and maneuvering aircraft are on same track, same direction
- Blocking and maneuvering aircraft are eligible for distance-based separation
- Neither the maneuvering nor blocking aircraft are on a deviation from course or are requesting a deviation from course
- Neither the maneuvering nor blocking aircraft are out of conformance
- The maneuvering aircraft will execute an altitude change of 2000 feet
- For a manual operational trial, maneuvering and blocking aircraft must be qualified for RNP-4

For a manual operational trial, the following criteria shall be used:

- The controller must set RNP-4 distance-based separation flags for the maneuvering and blocking aircraft.
- ADS-C CDP can be used if the Conflict Probe results for the requested altitude change show a conflict, and either of the following two distance and speed checks is passed.
 - When the maneuvering aircraft is probed for an altitude change, the blocking and maneuvering aircraft display an ACTUAL conflict (NOW indicated in red, to the right of “LOS” in the Conflict Report Window), and all of the following checks are satisfied:
 - The longitudinal separation distance at the conflict start time is greater than or equal to parameter (16) nm
 - The leading aircraft groundspeed is greater than or equal to the trailing aircraft groundspeed, based on the displayed groundspeeds after ADS DEMAND reports are received
 - The leading aircraft reported Mach number is greater than or equal to the trailing aircraft reported Mach number
 - When the maneuvering aircraft is probed for an altitude change, the blocking and maneuvering aircraft have an ACTUAL or IMMINENT conflict (Red box will be displayed to the right of “LOS” in the Conflict Report Window), and all of the following checks are satisfied:
 - The longitudinal separation distance at the conflict start time is greater than or equal to parameter (26) NM

- The trailing aircraft groundspeed is greater than the leading aircraft groundspeed by at most parameter (10) knots, based on the displayed groundspeeds after ADS DEMAND reports are received
- The trailing aircraft reported Mach number is greater than the leading aircraft reported Mach number by at most parameter (.02)
- The uplink clearance shall be a CPDLC message (Appendix A of *ATOP Ops Manual* [5]–UL Messages 26 and 28)
 - CLIMB TO REACH (*alt*) by (*time*)
 - DESCEND TO REACH (*alt*) by (*time*)
 - (*time*) is a parameter (15) number of minutes after the uplink time of the ADS Demand message for the maneuvering aircraft