Twenty Eighth Meeting of the
Informal South Pacific ATS Co-ordinating Group
(ISPACG/28)

Papeete, Tahiti
5-7 March 2014

Agenda Item 5: Review Work Programs

Automatic Dependent Surveillance – Contract (ADS-C) Climb/Descend Procedure (CDP) Project Overview

Presented by Federal Aviation Administration

SUMMARY

This paper presents the U.S. Federal Aviation Administration (FAA) activities associated with the ADS-C CDP.

1. INTRODUCTION

1.1 The ADS-C CDP is designed to improve service to properly equipped aircraft by allowing an oceanic air traffic controller to have an option for granting an altitude change request when other standard separations, such as ADS-C distance-based 30 nautical miles (NM) longitudinal separation minima, do not allow for a climb or descent through the altitude of a blocking aircraft. It is an air traffic control (ATC) tool to be applied between manoeuvring and blocking aircraft pairs.

1.2 The United States (U.S.) FAA developed the ADS-C CDP to utilize existing user equipage and ATC capabilities to allow more oceanic flights to achieve their preferred vertical profiles. The ADS-C CDP is a component of the Oceanic Trajectory Based Operations (OTBO) program, a critical Next Generation Air Transportation System (NextGen) capability that addresses current performance gaps in the area of capacity, productivity, and efficiency in the oceanic environment. Integral to ADS-C CDP is the use of advanced communication, navigation, and surveillance (CNS) capabilities; e.g., ADS-C, Controller-Pilot Data Link Communications (CPDLC), and Required Navigation Performance (RNP).

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 the Advanced Technologies and Oceanic Procedures (ATOP) automation system, using near simultaneous ADS-C demand contract reports. As with the existing DME procedure, responsibility for separation assurance remains with ATC.

1.4 ADS-C CDP enables oceanic airspace users to benefit from the surveillance provided by ADS-C, and thus to more efficiently use airspace. Specifically, ADS-C surveillance enables climb-through and descend-through manoeuvres with less than standard separation.

As such, controllers can clear qualified aircraft to climb or descend through the altitude of what would otherwise be a blocking aircraft. This ability to manoeuvre around blocking aircraft will allow aircraft to optimize flight levels over long distance flights, thus reducing fuel burn and emissions. This CDP supports the FAA's goals for fuel efficiency, emission reductions, and increasing air traffic capacity with existing equipment (Attachment – ADS-C CDP Benefits for New York and Oakland Oceanic Flight Information Regions).

2. DISCUSSION

2.1 To achieve early benefits, ADS-C CDP was demonstrated in operational trials by manually applying ADS-C CDP requirements without changes to the FAA ATOP automation system and was limited for use between Required Navigation Performance 4 (RNP 4) qualified aircraft.

2.2 Figure 1 shows a basic depiction of the associated procedure. During execution of the procedure, the controller is responsible for ensuring separation with all aircraft at the blocking altitude and target CDP altitude by using the ATOP conflict probe decision support tool. Lateral, longitudinal and vertical separation minima for aircraft not eligible for ADS-C CDP will not change.

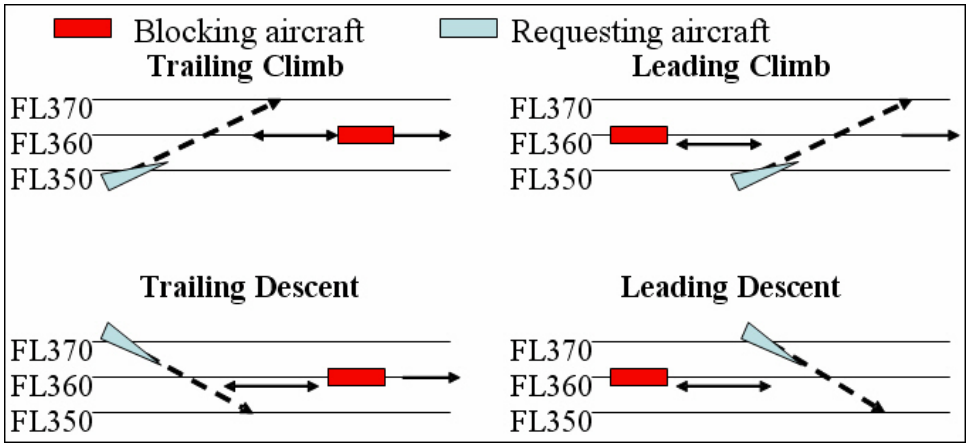


Figure 1: ADS-C CDP 15NM Reduced Separation

2.3 During an Operational Trial, Oakland Air Route Traffic Control Center (ARTCC) applied ADS-C CDP 16 NM separation to appropriately equipped proximate pairs of aircraft throughout the Oakland Oceanic Control Area (CTA) during the operational trial. Aircraft equipment requirements are as follows:

a) Manoeuvring and blocking aircraft are qualified and approved for RNP-4; and,

b) Manoeuvring and blocking aircraft have active FANS-1/A ADS-C and CPDLC connections.

2.4 The operational trials began on 15 February 2011 in the Oakland Oceanic CTA and ended 15 February 2013. During the two-year timeframe of the trials, the ADS-C CDP was successfully utilized eight times.

2.5 Due to the inherent limitations of the manual execution of the procedure, there are no plans to extend the manual trial (Attachment B – 9-Step Controller Checklist). Alternatively,

fast-time simulations are currently being conducted at the FAA William J. Hughes Technical Center (WJHTC). These simulations will model the use of the ADS-C CDP in a more densely populated environment, thereby increasing the opportunity for use and further validating the procedure.

3. ADS-C ITP AIR TRAFFIC CONTROL AUTOMATION REQUIREMENTS

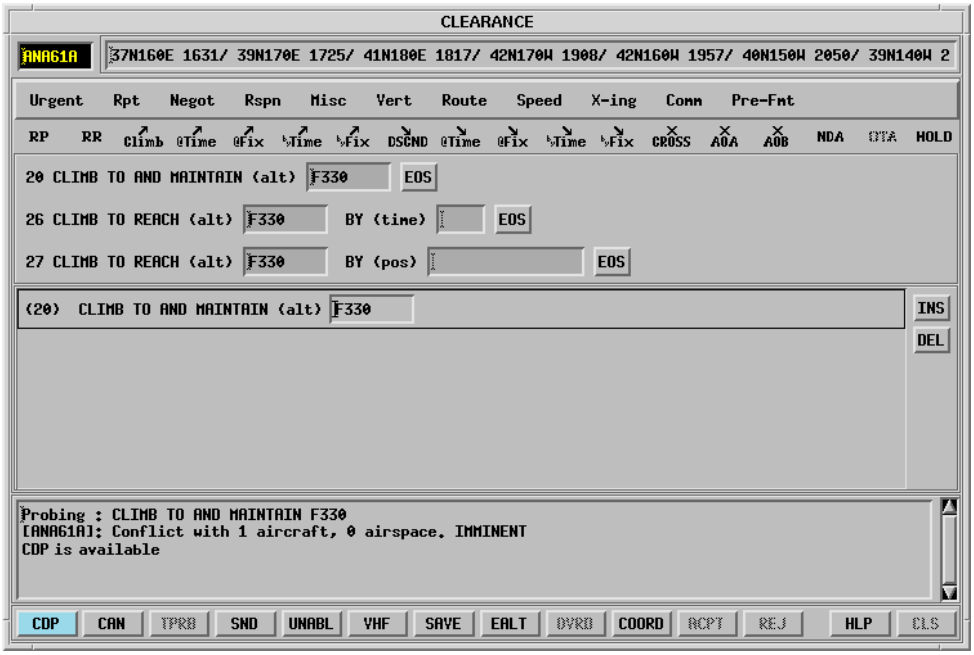
3.1 Implementation of the ADS-C CDP automation will benefit ADS-C equipped aircraft; non-equipped aircraft will continue to receive the current level of service. From the controllers' perspective, the implementation of the ADS-C CDP system will cause no change in workload, as all the separation calculations are performed internally. The controller will either issue the clearance for the climb/descend or UNABLE; thus, from the controller's standpoint there will be minimal change in operations. From a systems efficiency perspective, the proposed ADS-C CDP system will allow for increased efficiency and improved flow for properly equipped aircraft.

3.2 ADS-C CDP automation, when ready as an operational capability, will be installed and employed in New York, Oakland and Anchorage oceanic airspace.

3.3 Operational and functional requirements:

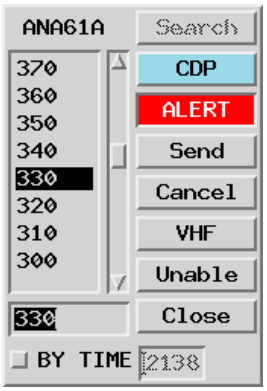
a) The longitudinal distance between the aircraft is determined by ATOP from near simultaneous ADS-C demand reports which contain position accuracy of 0.25 NM or better (Figure of Merit 6 or higher);
b) The longitudinal distance between the aircraft, as determined in a) above, is not less than:
    a. 27.8 kilometers (km) (15 NM) when the preceding aircraft is at the same speed or faster than the following aircraft; or,
    b. 46.3 km (25 NM) when the following aircraft is not more than 18.5 km/h (10 knots) or Mach 0.02 faster than the preceding aircraft;
c) The altitude difference between aircraft is not greater than 600 m (2000 feet);
d) The clearance is issued with a restriction that ensures vertical separation is re-established within 15 minutes from the first demand report request;
e) CPDLC is maintained;
f) The ADS-C CDP system shall determine when reduced separation standards can be applied for climbing/descending aircraft by determining the eligibility of the request for CDP;
g) If the initial ATOP conflict probe indicates a conflict situation, the ADS-C CDP system shall account for the aircraft making the request (the manoeuvring aircraft), the blocking aircraft, and all other traffic in determining the initial eligibility of the maneuver;
h) Following this determination, the system shall build and display the appropriate response for the controller (CLIMB TO [*flight level*] BY [*time*] or DESCEND TO [*flight level*] BY [*time*] message with ADS-C CDP or UNABLE);
i) ATOP will be able to handle multiple manoeuvres in one or multiple sectors.

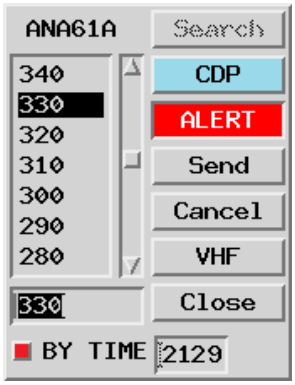
3.4 If ALL criteria are met, the PRB button in the clearance window, or the Probe button in the altitude popup window, will display CDP with a sky blue background as shown below:



CDP enabled from probe initiated from request

or...





Altitude popup window with BY time altitude clearance

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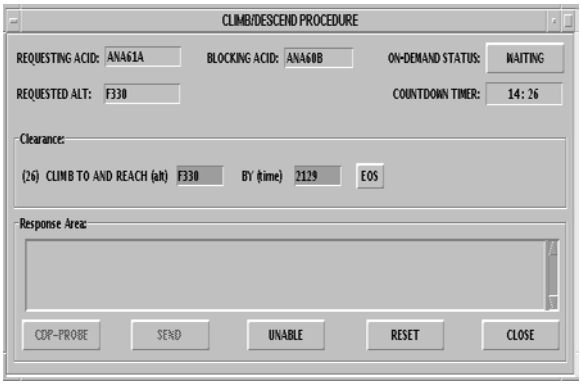

CDP window with BY time value

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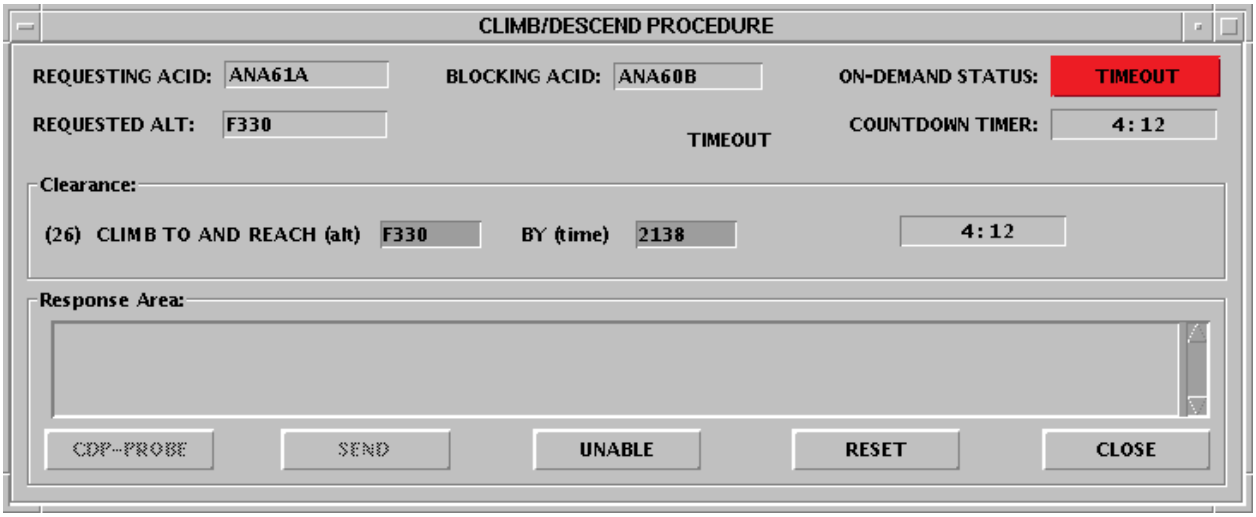

CDP window with on-demand timeout

4. ADS-C CDP IMPLEMENTATION SCHEDULE

4.1 The current working schedule is as follows:

ADS-C CDP Master Schedules - 7/9/13

Milestones & Tasks	Working Schedule
ICAO Procedure Change	**12/31/2014**
Repurpose analytical model with changes recommended by the Panel	-
Develop simulation model to explore the interactions between principal random variables whose effects are confounded within sampled data	-
Conduct data collections to describe variable distributions and parameter estimates	-
Report analytical results to the Panel	-
Obtain Panel concurrence or critical comments	-
Describe operational limits for the application of the procedure	-
Propose draft ICAO document or circular material to the Panel for its recommendation	-
Initial Brief to ANC w/timeline	6/20/2013
Hazard Panel	9/15/2013
Draft Circular	10/15/2013
SASP November 2013 Meeting - Report	10/31/2013
ICAO Proposal for Amendment (PFA)	
Develop ICAO Proposal for Amendment and Impact Statement	10/15/2013
ICAO Proposal for Amendment	3/31/2014
Develop ICAO Proposal for Amendment	3/31/2014
Deliver ICAO Proposal for Amendment	4/30/2014
Deliver ICAO Proposal for Amendment and Impact Statement	5/1/2014
SASP Work Backlog/schedule	
SASP May 2014 Meeting - Report/Final Approval	5/30/2014
ADS-C CDP Automation Collision Risk Model	6/30/2014
Conduct ADS-C CDP Automation Collision Risk Model Assessment	5/31/2014
Deliver ADS-C CDP Automation Collision Risk Model	6/30/2014
FAA Procedure Change	
Develop regional application material for the subject airspace	-
Suggest on-going monitoring requirements (if any) to support SMS	-
Prepare FAA implementation materials for application (SRMD and facility application limits)	-
SRMD	
Site Test, Run, Report	
FAA Handbook 7110.65 procedure change	6/30/2014
Develop documentation for the FAA Handbook procedure change	5/31/2014
Receive approval for the FAA Handbook procedure change	12/31/2014
Finalize Circular or other material	
Support the briefing of the procedure to the ANC	
Briefed to the ANC/ Procedure Approval	11/1/2016

5. ACTION BY THE MEETING

5.1 The meeting is invited to note the information provided.