

## Twenty Ninth Meeting of the Informal South Pacific ATS Co-ordinating Group (ISPACG/29)

Santiago, Chile 4-6 March 2015

### Agenda Item [6.2]

### **Dynamic Airborne Reroute Procedure (DARP) Automation**

Presented by The Boeing Company and Air New Zealand

## **SUMMARY**

This paper presents the operational concept and preliminary results of research being conducted by Boeing and Air New Zealand in automation of the existing Dynamic Airborne Reroute Procedure.

#### 1. Introduction

- 1.1. The ability to re-optimise the route of a flight once airborne, Dynamic Airborne Reroute Procedure (DARP), based on latest winds and accurate zero-fuel-weight has the capability to reduce fuel burn.
- 1.2. One of the consistent issues experienced by airlines implementing DARP is the Flight Planning/Despatch workload involved in identifying DARP opportunities and carrying out the flight planning processes to achieve a successful DARP.
- 1.3. Boeing and Air New Zealand have been conducting research and development on an automation system called OCEANS to reduce airline workload associated with a number of these processes and to encourage the adoption of DARP.
- 1.4. This paper presents the operational concept and preliminary results of such an automation system Optimal Conflict-Evasive Airborne Reroute Notification System (OCEANS).
- 1.5. Air New Zealand and Boeing will continue development and more information can be obtained from Boeing.

#### 2. Discussion

- 2.1. DARP has proven to reduce airline operational costs via fuel saving.
- 2.2. A growing number of ANSPs in the Asia Pacific region offer DARP in their airspace to operators of suitably equipped aircraft.



- 2.3. A significant impediment to a widespread implementation of DARP is the airline dispatcher/flight planner workload associated with the identification and execution of post-departure optimal rerouting.
- 2.4. OCEANS automates and enhances the DARP process for an airline, without changing the existing procedure from the ANSP perspective.
- 2.5. OCEANS interfaces with the airline and aircraft, using currently available data and messaging, to automatically monitor flights with an oceanic, remote, or polar segment.
- 2.6. OCEANS interfaces with ANSP and NOAA to automatically monitor airspace for changes in winds, temperature, severe weather, and airspace constraints.
- 2.7. OCEANS proactively identifies fuel saving reroute opportunities and computes dynamic, in-flight, and (where possible) conflict-free reroutes.
- 2.8. The OCEANS graphical user interface advises dispatchers of optimal reroutes and associated fuel savings which, if deemed acceptable, are uploaded automatically into an airline's flight planning system utilizing a standard TDM format message. The rest of the process stays the same as the existing DARP.
- 2.9. Currently, Boeing and Air New Zealand are performing trials to validate reroutes and associated fuel benefits of OCEANS. So far, the OCEANS generated reroute advisories have not been sent directly to the flight crew to execute a DARP. The plan is to achieve live flight trials in 2015.
- 2.10.Preliminary results have validated that OCEANS can provide multiple fuel saving reroute opportunities during a 12-hour flight at a significantly faster rate than is possible with a manual process. The OCEANS graphical interface allows an airline dispatcher to review, analyze, and accept (or reject) an OCEANS computed reroute advisory with the click of a few buttons.
- 2.11.Figure 1 shows the potential fuel benefits predicted by OCEANS for a set of Air New Zealand flights between New Zealand and North America



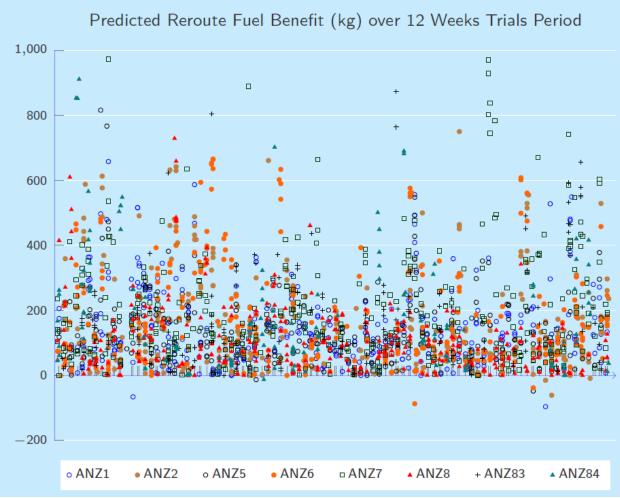


Figure 1 OCEANS predicted fuel benefits for a set of Air New Zealand flights between New Zealand and North America.

2.12.Further flight trials are due to start in March 2015 to validate reroute benefits, to exercise end to end testing of OCEANS with flight planner and flight crew in the loop. During this time Air New Zealand will be using OCEANS as its DARP tool, replacing its current manual procedures to create routes.

ANZ	8 <mark>3</mark>	🖋 Requ	est Re	eroute	🖋 Accept Re	route	🗙 Reje	ect Reroute	📕 Revie	w Preferen	ces   😯 R	eview Alert	ts 📔 🏰 Review Resu	lts
light	Flight Infor									Reroute Advisory				
	PID		rom	То	Departure		Arrival OFF Estimated		A/C	Reason	Benefit	Expires	Status	
	FIL	FID FID		10	Scheduled 1	OUT			AC		Denem			
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7	2Q071		SFO	NZAA	26FEB15 0345	0347	0408	26FEB15 1601	око	Request	109 KG	0:40:33	NEW	
1	2Q070		LAX	NZAA	26FEB15 0500	0505	0531	26FEB15 1724	OKM				IDLE	
15	2Q070		SFO	NZAA	26FEB15 0500	0457	0523	26FEB15 1734	OKD				BUSY	
5	20071		AX	N7AA	26EEB15.0600	A	сç.	26FEB15 1756	OKO			/	-	
C	urrent Ro	ute		Propos	ed Reroute							1	Map Satellite	FPCFP32 Entries
		FL340		538 FOM		esia								Free Text Message to Flight Crew:
		FL340		715 20N		Ba	nda Sea Aratu	Papua New Guinea						EXPECT DARP REROUTE FROM 20N48 AT 0715Z.
		FL340		756 15N							X			Departure Point / Orig: FOMAS
		FL360	08								17			Departure Time / ETD: 0638
		FL360 FL360	09	021 05N			NT		al Sea		/			Zero Fuel Weight / ZFW, KG: 182154
		FL360		05 00M		WA	Austra						South	Departure Fuel / DEPART, KG: 68378
		FL360		138 10W			SA			- #			Pacific Ocean	Enroute Alternates: YVR,PDX,SFO,HNL,APW,NAN
		FL360		25 15W			Great	NSW						Destination Alternates:
		FL360		313 20W			Bight	VIC		1				FN Uplink:
c	GELA	FL360	13	359 25W	79 FL380	-		TAS	Tasman Sea	New Zealand				FPN/RI:DA:CYVR:AA:NZAA:F:FOMASN20000W148000
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# 2.13.Screenshot of OCEANS UI



2.14.Demonstration of the User Interface by Boeing.

# 3. ACTION BY THE MEETING

3.1. The meeting is invited to note the information provided.