Twenty Fourth Meeting of the
Informal South Pacific ATS Co-ordinating Group (ISPACG/24)

Brisbane, Australia, 11-12 March 2010

Agenda Item 4: Review Open Action Items

OCEANIC TAILORED ARRIVALS

Presented by the Federal Aviation Administration

SUMMARY

This information paper provides information on the use of Oceanic Tailored Arrivals in California.

1. INTRODUCTION

1.1 The FAA began their initial Oceanic Tailored Arrival (OTA) trial to the San Francisco International Airport (KSFO) in November 2006. The OTA is a descent profile clearance which is uplinked via Controller Pilot Data Link Communications (CPDLC) to participating aircraft. The pilot can then use the aircraft's Flight Management System to fly the most efficient descent to the arrival airport.

1.2 The FAA expanded operational trials utilizing an OTA to the Miami and Los Angeles International airports.

2. DISCUSSION

2.1 The OTA provides the following savings:

a) Reduced fuel burn and carbon dioxide ($CO_{2)}$ emissions by having the aircraft fly an optimized descent profile.

b) Reduced noise pollution since the aircraft is flying a reduced power descent.

c) Reduced engine wear.

2.2 The initial OTA trial ran for a three month period. The trial was limited to very early morning and late night United Airlines KSFO arrivals, when there was very little airport demand. In December 2007, the KSFO OTA trial resumed and has been expanded to include more aircraft and additional airlines.

2.3 A complete OTA is projected to save each flight between 590 (B777) and 1000 kilograms (kg) (B744) of fuel over the standard arrival profile into KSFO. Due to airport demand it is not always possible for an aircraft to fly the full OTA to the runway

threshold. When the arrival demand for the airport increases, aircraft flying the OTA may need to be vectored for arrival spacing, causing the OTA to be terminated. There are, however, still savings to be gained for the aircraft flying partial OTAs. A partial OTA has been calculated to save between 181 and 590 kg of fuel burn.

2.4 When developing an OTA, several considerations must be included. The goal is to create a profile that allows the aircraft to fly an engine idle descent to the runway. If the OTA profile contains restrictions that require the aircraft to level off, the aircraft must add power to maintain altitude and the overall fuel savings is reduced. Ideally, the descent profile, when viewed from the side, is a wedge of airspace that keeps the aircraft on a continuous descent. Different factors affect the optimum altitudes at which the aircraft cross waypoints on the OTA profile. These factors include such items as initial altitude, aircraft descent speed, aircraft type, and winds.

2.5 When building the KSFO OTA vertical profile, the first factors that were considered were air traffic control (ATC) required altitude crossing restrictions. The routing and those vertical crossing restrictions were given to Boeing to fly in their simulators for the B744 and B777 aircrafts. Boeing flew the OTA several different times, under different flight conditions, and then provided the FAA with minimum and maximum altitudes for each waypoint on the OTA routing.

2.6 The minimum and maximum altitudes were used to develop altitude crossing restrictions for the points on the OTA route that did not over-restrict the aircraft. These crossing restrictions were developed into a CPDLC uplink message 83 clearance to uplink to the aircraft.

2.7 The following procedures are used to establish an OTA scenario:

a) *Participating aircraft will request the "Pacific 1 TA" into KSFO at least 45 minutes prior to exiting oceanic airspace. The Oceanic controller formulates an OTA clearance which includes a routing with altitude and speed restrictions or advise the flight unable.*

b) *The controller composes the following message:*

1) *"Free Text Element" - "PACIFIC 1 TA" (This is a unique name that provides a reference to the uplinked OTA Clearance)*

2) *Route – Uplink message 83Clearance – At (pos), Cleared (rte clr)*

- *Insert filed Oceanic Boundary as "pos" (CREAN, ALLBE, CEPAS or DACEM)*

3) *Route Clearance Instructions*

- *Arrival Airport – KSFO*
- *Arrival Runway – 28L*
- *Approach Procedure – ILS28L MENLO*
- *Route – appropriate routes listed below:*

- *CINNY 3657N12223W/F270B RAINS/F210B PIRAT/N0250A150B BRINY/N0250A120B 3721N12228W/A060A OSI MENLO/N0210A040A*
- *ALCOA SUPER/F210A PIRAT/N0250A150B BRINY/N0250A120B 3721N12228W/A060A OSI MENLO/N0210A040A*
- *PAINT SUPER/F210A PIRAT/N0250A150B BRINY/N0250A120B 3721N12228W/A060A OSI MENLO/N0210A040A*
  - ◊ *SUPER/F210A = SUPER at or above FL210*
  - ◊ *PIRAT/N0250A150B = PIRAT at or below 15000 at 250 kts*
  - ◊ *BRINY/N0250A120B = BRINY at or below 12000 at 250 kts*
  - ◊ *3721N12228W/A060A = at or above 6000*
  - ◊ *MENLO/N0210A040A = MENLO At or Above 4000 at 210 kts*

Note: *The TA Clearance elements are available to controllers via a clearance shortcut botton.*

4) *"Vertical" -MOPS19 clearance– Maintain FXXX (Current Altitude).*

5) *Probe the clearance for conflicts and uplink it to the aircraft.*

c) *Aircraft will "WILCO" the clearance or send "Unable."*

1) *The flight crews have been advised to send an Unable if there is a Logic Reject by their navigation computer.*

2) *If the controller receives an Unable, they check the clearance for formatting errors.*

d) *When the pilot establishes initial contact with the controller, he will advise that the aircraft is on Pacific 1 TA.*

e) *The radar controller will issue "Maintain flight level xxx (current altitude)."*

f) *The phraseology for the descent clearance is "(Call sign), cleared to descend via Pacific One TA, SFO. Altimeter xxxx."*

2.8 The pilot or controller may terminate the OTA at any time. If the OTA is terminated, the controller will issue the appropriate arrival and vertical clearances; i.e., *"UAL76, tailored arrival is cancelled, cleared to the San Francisco airport via PIRAT OSI direct, cross PIRAT at and maintain 10,000."*

2.9 Based on the success of the San Francisco "Pacific One Tailored Arrival", work has begun on developing a "Catalina 1 Tailored Arrival" into Los Angeles International Airport (KLAX). The Catalina 1 OTA is providing a more efficient alternative to the LEENA Arrival. It is a product of the collaboration of the FAA, Boeing, NASA and the operators. Daily trials of a KLAX temporary procedure began in November 2009.

The Catalina 1 OTA is only available to data-link equipped aircraft bound for KLAX and routed over waypoint FICKY. Because of the extensive military use of offshore airspace in the vicinity of Los Angeles, the OTA must traverse a narrow corridor between warning areas. This corridor is used for departing aircraft as well as arrivals and therefore, it was necessary to construct a less than optimum descent profile with a route segment where the aircraft must actually remain level at 12,000 feet. Coordination is underway to develop an alternate departure routing that will hopefully improve the GOATZ crossing restriction.

a) The Catalina 1 TA begins at FICKY and the routing is as follows:

1) ROSIN
2) MALIT
3) GOATZ (crossing restriction of 12,000')
4) SXC (crossing restriction of 12,000')
5) 3325N11808W (crossing restriction at 12,000' and 250 kts)
6) 3331N11803W (crossing restriction of at or above 10,000')
7) 3335N11800W
8) DIXNN (crossing restriction of at or below 8,000')
9) SLI (crossing restriction at 7,000' and 210 kts)
10) ILS25L Approach, SLI transition
11) Runway 25L

2.10 Overall, the OTA has worked well. About 34 percent of the aircraft that are cleared on the KSFO OTA are able to complete the full arrival to touchdown. The remaining 66 percent of the aircraft are able to experience the benefits that a partial OTA affords.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) Note the information in this paper.