International Civil Aviation Organization

The Combined Meeting of the South Asia Indian Ocean Co-ordination Group SAIOACG/4 and South East Asia Co-ordination Group SEACG/21

Hong Kong, China, 24 – 28 February 2014

Agenda Item 5: ATS Route Development

PBN TRACK SHORTENING EFFICIENCY CASE STUDY

(Presented by ICAO)

SUMMARY

Based on the use of IFSET, this paper presents an example of a case study conducted by the ICAO APAC Regional Sub-Office (RSO) to estimate the benefits of a direct track utilizing PBN and draws to attention the need for collaboration among States to achieve such an outcome. It is in line with the holistic outcomes ICAO has envisioned that a safe, secure, efficient and environmentally sustainable air navigation system is available at global, regional and State levels. The meeting is also invited to review the structure of the case study and provide comments as appropriate and to encourage regional cooperation in this area of en-route PBN implementation.

1. INTRODUCTION

1.1 The phenomenal growth of air traffic in the Asia and Pacific Region and expansions in low cost carriers and other aviation related activities has been universally acknowledged. This in turn drives the need to not only increase capacity of the airspace, but also to improve economic efficiencies of air transportation while protecting the environment.

1.2 ICAO has made available the ICAO Fuel Saving and Estimation Tool (IFSET) to be used to estimate fuel and carbon savings. This tool can be applied to quantify the benefit of ATM enhancement initiatives, such as introduction of more direct PBN routes and implementation of CDO/CCO procedures.

2. DISCUSSION

Background information on the Case Study: Hanoi and Ho Chi Minh City Pair

2.1 The expanding traffic between the domestic city pair between Hanoi and Ho Chi Minh City drew to attention the benefits of providing a more efficient route through utilizing a technology, such as PBN, as compared to currently available conventional routes.

2.2 It became an interesting case study due to the geography of Vietnam, which in effect is like an arc. To keep the route within Vietnam meant that the route had to follow the general geography of the country. While keeping the route structure purely domestic reduced the need for international collaboration and coordination, however, the resulting route would not be the most efficient. To implement a more-efficient direct track between the city pair, international coordination and collaboration are required as the direct track will form an international route passing through two additional neighboring FIRs, namely Vientiane and Phnom Penh. (See **Figure 1**).

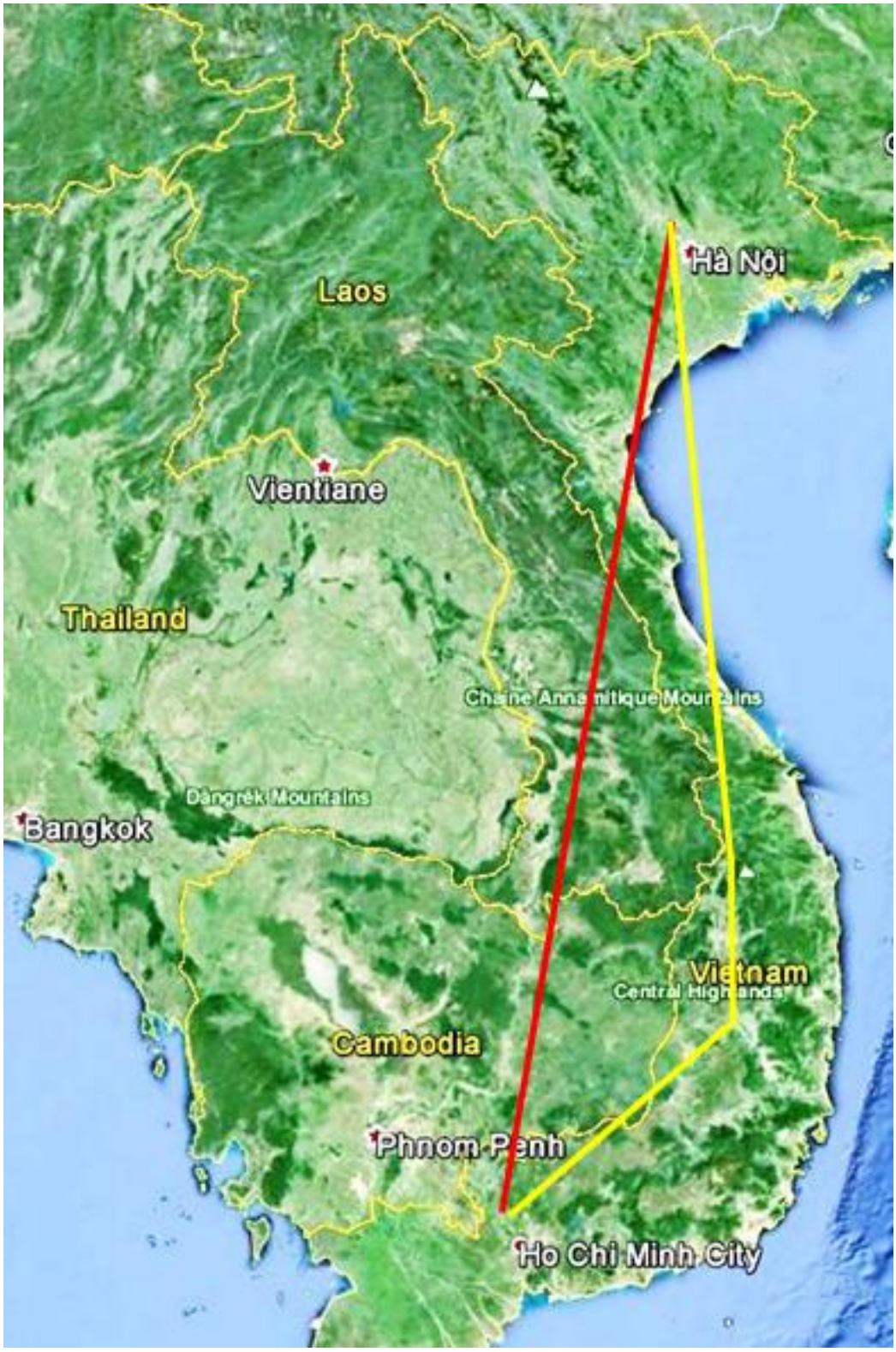
Hà Nội
Laos
Vientiane
Thailand
Dangrek Mountains
Bangkok
Vietnam
Central Highlands
Cambodia
Phnom Penh
Ho Chi Minh City

Figure 1

Case Study Structure and Analysis Result

2.3 Using the ICAO IFSET, ICAO APAC RSO analyses potential fuel and carbon savings from implementing a direct route between Hanoi and Ho Chi Minh City Pair. As shown in **Attachment A** the direct track will save airlines 200 kg of fuel and 630 kg of carbon emission per flight on a single aisle jet and can yield approximately 196.4 USD in monetary savings from the fuel cost.

2.4 In addition, this case study estimates other savings in airline operating expenses, such as flight crew and maintenance costs, using three different operating cost schedules comprising a low-cost business model carrier, a full-service business model carrier and the cost delay for quantified by Eurocontrol in 2013 for analyzing cost-benefit. As shown in **Attachment B**, the result of the study indicates potential reduction of airline operating cost between USD 260.79 to USD 346.26 per flight on a single aisle jet.

2.5 However, another major cost component, air navigation charges have not been factored into the analysis, as this case study is only meant to highlight fuel and other operating costs savings through the implementation of PBN.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) review the structure of the case study, and

i) comment on use of the study as a template for future studies;

ii) consider providing a list of routes to be evaluated based on the existing route catalogue and/or other regional / sub-regional initiatives;

iii) discuss the values used to derive costing in Table 2, including the use of values from "Standard Inputs for EUROCONTROL Cost Benefit Analyses", and

c) promote regional and sub-regional coordination and collaboration which are required for implementation of more direct routes.

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TABLE 1

Table 1: IFSET Savings Estimation							
Aircraft Category	**Example**	**Baseline Fuel (kg)**	**Direct Route Fuel (kg)**	**Carbon Emission Savings (kg)***	**Fuel Savings (kg)**	**Fuel Savings (%)**	**Monetary Savings (USD)****
Sing Aisle Jet	Airbus 320 / Boeing 737	2,900	2,700	630	-200	-6.9	196
Twin Aisle Jet	Airbus 330	7,300	6,900	1,260	-400	-5.5	393
Large Twin Aisle Jet	Boeing 777	8,800	8,300	1,575	-500	-5.7	491
Three Plus Engine Twin Aisle Jet	Boeing 747	12,400	11,600	2,520	-800	-6.5	786
Large Quad Engine Twin Aisle Jet	Airbus 380	16,700	15,700	3,150	-1,000	-6.0	982

Notes:

* Carbon Emission Savings calcuation is based on savings on fuel consumption, which derived from factor of 3.15 grams per gram of fuel.

** Menetary Savings calculation is based on IATA's Fuel Price Average for 2013 which is 0.982 USD per kg.

Table 2: Estaimated Saving for Airlines' Operating Cost

Case Study : Direct Route Vs Current Baseline Route (Hanoi - Ho Chi Min City)

	Costs (USD)											
	A320 - LCC				B738 - FULL SERVICE				EUROCONTROL COST OF DELAY VALUES			
	Cost per minute	Baseline Route	Direct Route	Savings per flight	Cost per minute	Baseline Route	Direct Route	Savings per flight	Cost per minute	Baseline Route	Direct Route	Savings per flight
Fuel Saving Cost												
Fuel Saving in kg		2900.00	2700.00	200.00		2900.00	2700.00	200.00		2900.00	2700.00	200.00
Fuel Saving in USD (see note ii)		2847.80	2651.40	196.40		2847.80	2651.40	196.40		2847.80	2651.40	196.40
Other Operating Costs												
Distance (Nm)		607	570	37		607	570	37		607	570	37
Flight Time (474 NM/hr)		76.80	72.00	4.80		76.80	72.00	4.80		76.80	72.00	4.80
Flight Crew Cost (USD)	11.69	897.58	841.48	56.10	23.28	1787.90	1676.16	111.74	19.72	1514.50	1419.84	94.66
Maintenance Cost (USD)	1.73	132.60	124.31	8.29					11.50	883.20	828.00	55.20
Total Saving in Operating Costs (USD)				260.79				308.14				346.26

Note:

i) This is a basic case study to merely highlight the potential for new intitiaties at the sub-regional/bilateral levels, therefore the values are only indicative rather than authorative.

ii) Fuel Savings calculated using ICAO IFSET, Sinble Aisle Aircraft

iii) Maintenance and Flight Crew Costings for LCC and Full Service Carriers are based of figures provided by particular airlines in South East Asia, and therefore are not industry averages.

iv) Maintenance and crew costs for Eurocontrol are based on "Standard Inputs for EUROCONTROL Cost Benefit Analyses" Edition Number: 6.0 Edition Date: September 2013. Values for strategic airborne delay used in the analysis above. (Definition of "Cost of Delay" - The average cost per minute to the airline of ground or airborne delay of a passenger air transport aircraft.)

v) Monetary values of carbon emission savings were not factored into the analysis as there was currently no carbon tax in the countries used in the case study.

vi) Another major cost component, air navigation charges have not been factored into analysis, as this case study is only meant to highlight fuels and other operating costs savings through implementation of PBN.