International Civil Aviation Organization

The First Meeting of the APANPIRG ATM Sub-Group (ATM /SG/1)

Bangkok, Thailand, 20 – 24 May 2013

Agenda Item 9: Any other business (including Election of Officers)

IFSET EXAMPLE TO DEMONSTRATE POTENTIAL ENVIRONMENTAL BENEFITS

(Presented by the Secretariat)

SUMMARY

This paper presents an example of how using the IFSET tool to provide potential environmental benefits.

This paper relates to –

Strategic Objectives:

C: ***Environmental Protection and Sustainable Development of Air Transport*** – *Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment*

Global Plan Initiatives:

GPI-21 Navigation systems

1. INTRODUCTION

1.1 ICAO has been stressing the importance of operational measurements to demonstrate the positive work conducted within the aviation sector to reduce its effect in the environment. Aside from the improvement in aircraft technologies and market-based measures, one of the key areas of focus is ATM as an instrument available to States to improve fuel efficiency and reduce CO2 emissions. The ICAO Fuel Savings Estimation Tool (IFSET) has been developed by ICAO with support from States and international organizations to estimate fuel savings in a manner consistent with the Global Air Navigation Plan.

1.2 The IFSET is not intended to replace the use of detailed measurement or modeling of fuel savings, where those capabilities exist. Rather, it is provided to assist those States without such facilities to estimate the benefits from operational improvements in a harmonized way. The tool is available at http://www.icao.int/environmental-protection/Pages/Tools.aspx.

1.3 The Silk Road initiative was a proof-of-concept ATS route study. The initiative had been presented to the Regional ATM Contingency Plan Task Force (RACP/TF) as a possible future contingency system north of the Himalayas for traffic previously operating on Major Traffic Flow (MTF) AR-4 via South Asian airspace between Europe and Southeast Asia. The Silk Road concept is a pair of ATS routes spaced at least 20NM apart, utilising RNP 2, RNAV 2 or RNAV 5 Performance-based Navigation (PBN) navigation specifications.

2. DISCUSSION

2.1 To date, the input by Asia/Pacific States of IFSET data has been poor. Given the increasing traffic of the Asia/Pacific Region towards being the busiest in the world, there is an urgent need for the Asia/Pacific to demonstrate its contribution and commitment to environmental improvements.

2.2 In developing the possibilities and rationale of the Silk Road concept, early consideration was made of the environmental effect of any contingency operation utilising a Silk Road. While the potential route directions of the Silk Road routes had not been determined with any certainty, one possibility is the application of these 'PBN Highways' between Kunming, China and Frankfurt, Germany as close as possible to the great circle.

2.3 A comparison of an example flight from Bangkok, Thailand to Frankfurt, Germany that would normally operate south of the Himalayas through Indian, Pakistan and Afghanistan airspace on MTF AR-4 routes and the Silk Road concept via Kunming yielded some surprising results. The Silk Road 'contingency' route system at 4,999NM was determined to be approximately **139NM** or 18 minutes shorter than the traditional route system at 4,860NM (**Figure 1**).

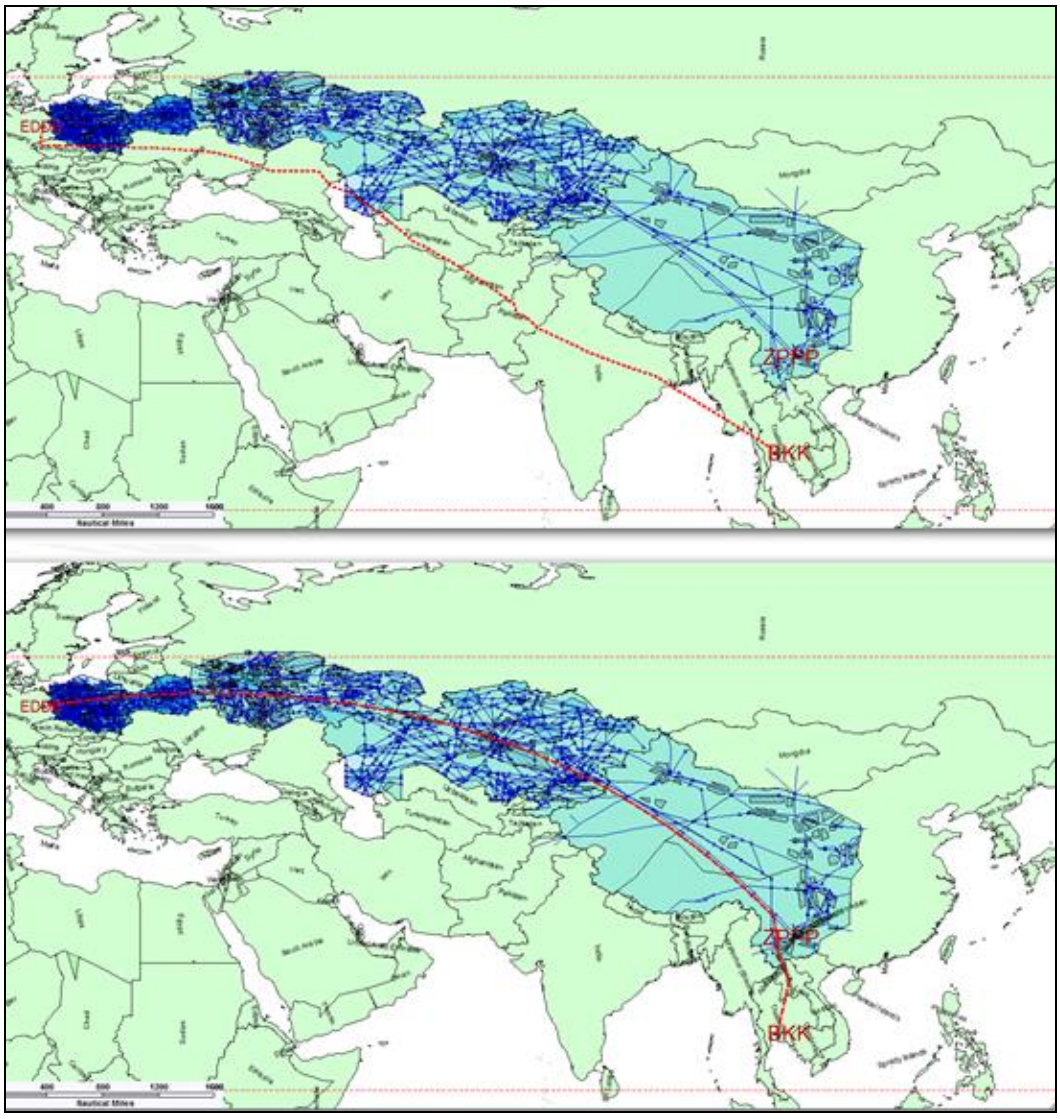

Figure 1: MTF AR-4 route compared with a possible Silk Road route north of the Himalayas

2.4 In utilising the IFSET tool for a contingency scenario with the Kabul FIR being unavailable, an assumption of 200 aircraft westbound was applied. Also, an assumption was made that the average aircraft would achieve a flight level of FL360 compared to FL340, due to the application of a more efficient longitudinal spacing (assumed 25NM versus 50NM), allowing aircraft to operate closer to their optimal level.

2.5 In making these assumptions, it is recognised that flights from Indo-China, Southern China, The Philippines, and Indonesia may achieve much greater savings than the Bangkok-Frankfurt example, while there may be a marginal difference from Malaysia and Singapore. The results are indicated in **Figure 2**.

Estimated Fuel Changes Report

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Scenario	Old Fuel Consumption (Kg)	New Fuel Consumption (Kg)	Savings (Kg)	Savings (%)
Silk Road	7933300	7596800	-336500	-4.2

Note - Results are rounded to the nearest 100 Kg.

Figure 2: IFSET Scenario Estimate

2.6 The greater savings from Southern China are demonstrated in a comparison of route length of a flight from Kunming to Frankfurt using the traditional route L888 (4,455NM) versus the Silk Road concept (4,210NM), the latter being shorter by 245NM (**Figure 3**).

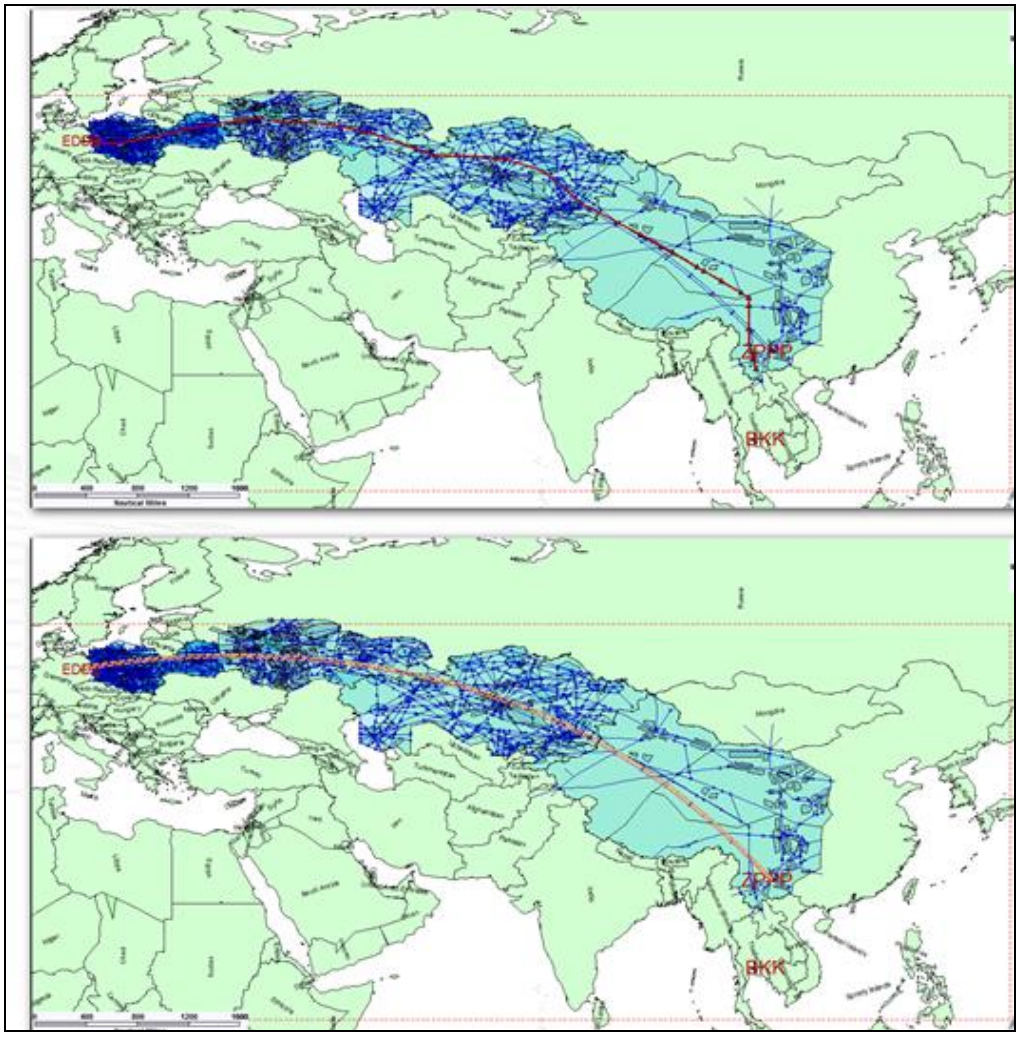

Figure 3: Kunming to Frankfurt comparison using L888 versus Silk Road

2.7 The IFSET results indicated a savings of approximately 1,682kg per aircraft, or 336,500kg per day. Given that eastbound aircraft can also benefit to the same degree, the total daily savings for 400 aircraft would be 673 tonnes of fuel, or 245,645 tonnes per annum.

2.8 Although the IFSET tool does not yet calculate the savings in terms of Carbon Dioxide (CO_2) or monetary values, these can be estimated manually.

2.9 For the CO2 savings, this would be equivalent to 776,238 tonnes per annum using an approximate multiplier of 3.16 from the fuel value.

2.10 Regarding the monetary savings in this scenario, if it is assumed that a barrel equivalent of kerosene (approximately 140kg) was USD125, then each aircraft would save 1,682 ÷ 140 = 12 barrels x 125 = USD1,500. The total daily and annual savings if we consider the whole operations of 400 aircraft/day would be USD600,000 and USD219 million respectively in this assumed scenario.

2.11 The IFSET calculations provide a powerful result for decision-makers in considering the relative costs and benefits of the Silk Road concept, and other ATM projects. In addition, the calculation from ATM improvement projects that become reality provide important indications of the work the aviation community is conducting to reduce the overall effect of aviation on the environment. This would inevitably assist in reducing pressure from external agencies for political solutions imposed unilaterally to reduce emissions.

IATA Peer Review

2.12 A peer review of the basic analysis provided in this paper was conducted by IATA, using the known assumptions provided by ICAO:

- distance saving (139NM);
- Total number of flights 200 in each direction, total 400 daily flights (eastbound + westbound).

2.13 The crosscheck using the IATA Infra Calculator resulted in the following (**Figure 4**):

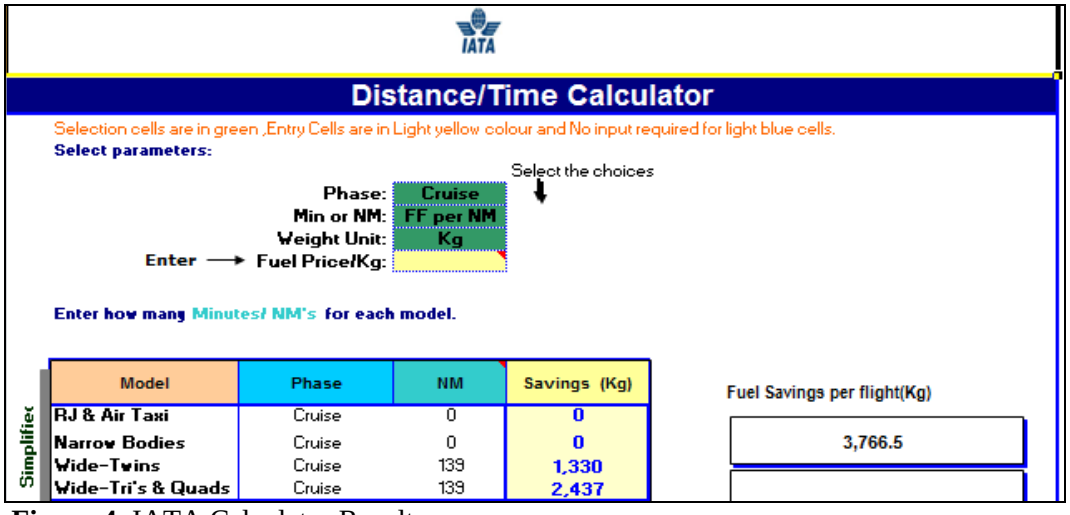

Figure 4: IATA Calculator Results

2.14 Assumption: Based on our observation, these are long haul flights and two thirds of the operations will be by Wide Twins, while one third will be by Wide Quads. Therefore, average fuel Savings with 139NM distance reduced = ((1330*(66%))+ (2437*(33%))= 1,682Kg.

2.15 The results indicated a savings of approximately 1,682kg (agreed) per aircraft, or 336,500kg per day (1682*200 = 336400 Kg, perhaps figure rounded to next thus 336,500Kg). Given that eastbound aircraft can also benefit to the same degree, the total daily savings for 400 aircraft would be 673 tonnes of fuel (1682*400 = 672, 800Kg, here also figures seems rounded up thus 673 Tones) or 245,645 tonnes per annum.

2.16 For the CO2 savings, this would be equivalent to 776,238 tonnes per annum using an approximate multiplier of 3.16 from the fuel value.

2.17 For ATF the conversion factor is 3.15 and not 3.16; estimated CO2 emissions savings = 245,645*3.15= 773,782 tonnes per annum.

2.18 Regarding the fuel price analysis contained within this paper, and noting the current analysis at (http://www.iata.org/publications/economics/fuel-monitor/Pages/price-analysis.aspx, the first row shows Jet Fuel price as 897.2 USD/MT, resulting in annual savings of 245,645 tonnes @ 897.2 = 220 Million USD.

IATA Conclusions

2.19 The following are IATA's conclusions for this scenario.

1. Based on the 139NM Distance Saving, IATA Infra Calculator estimates on An average 1,682Kg Fuel savings per flight.

2. Fuel Saving estimates based on 200 flights in each direction (Tot 400 daily flights) – I cannot get data for these flights at this point of time, but a rough estimate like from Key airports in Europe (LHR, FRA, CDG, AMS, MUC, MAN, Berlin, GVA, Say 10 European airports, and BKK, SIN, ZPPP, Philippines, Noibai, JKT, etc so say 10 airports in South Asia, means estimate of 400 daily flights.

3. These flights operates on "Wind analysis - Route Search flight planning". As per my experience, Probability of Westbound flights choosing North of Himalayas routes are more than that of South of Himalayas and vice versa for eastbound flights. Anyway, its wind component and detailed analysis is required to be carried out.

4. To begin with, there is possibility of 200 + flights daily may choose operating North of Himalayas, while the figure of 400 daily flights and 220 Mil USD Savings per year confirms potential of these routes and this potential cannot be denied.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) discuss the Silk Road example and any further uses of the IFSET tool; and

c) discuss any relevant matters as appropriate.

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