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Agenda Item 4: Review Open Action Items (AI 25-1)

LOST FUEL SAVINGS DUE TO LACK OF RNP 4 & FANS-1A EQUIPAGE

(Presented by Federal Aviation Administration)

SUMMARY

This paper identifies denied aircraft requests for climb to optimum altitudes and places a value on the increased fuel burn due to lack of Future Air Navigation System (FANS) equipment and RNP 4 certification.

1. INTRODUCTION

1.1. When aircraft are FANS equipped and RNP 4 certified, Oakland Oceanic controllers can apply Automatic Dependent Surveillance-Contract (ADS-C) separation rules between pairs of properly equipped aircraft. Smaller separation standards allow aircraft to operate at more efficient routes and altitudes. This paper focuses on extra fuel burn due to denied requests because of lack of aircraft FANS and RNP 4 equipage.

2. DISCUSSION

2.1. FANS equipped aircraft are able to qualify for RNP 4 certification. Since the fuel burn savings metrics in this paper were first developed, there has been a significant closure in the gap between the percentages of RNP 4 and FANS-1A equipped aircraft in the Oakland Oceanic Control Area (CTA). In May 2012, 55 percent of aircraft in the Oakland CTA were FANS-1A equipped, but only 30 percent of aircraft flight planned RNP 4 equipage. That was a gap of 25 percent of aircraft capable of being certified as RNP 4 but were not flight planning the equipage. Currently, about 60 percent of flights in the Oakland Oceanic FIR are FANS equipped and 50 percent flight plan RNP 4. There is still a gap of about 10 percent of flights that are capable of RNP 4 but that do not flight plan with RNP 4 equipage. Over the last 18 months, the gap has closed 14 to15 percent between RNP 4 and FANS-1A equipped aircraft.

2.2. Some operators do not flight plan RNP 4 because of the extra cost associated with more frequent ADS-C reports. A FANS, RNP 4 flight planned aircraft in the Oakland Oceanic FIR receives an ADS-C reporting rate of 832 seconds (13 minutes 52 seconds). A FANS, RNP 10 aircraft receives an ADS-C reporting rate of 1600 seconds (26 minutes 40 seconds). So it is true that a FANS, RNP 4 aircraft will have more ADS-C reports operating on the same routes in the Oakland FIR. However, when you examine the overall costs, it is more efficient to flight plan with RNP 4 equipage. Over an 8 hour flight, an RNP 4 aircraft will send 35 ADS-C periodic reports. Over the same 8 hour flight, an RNP 10 aircraft will send 18 ADS-C periodic reports. The difference is 17 extra ADS-C reports for an RNP 4 aircraft. Assuming an average cost for an ADS-C periodic position report of 0.25 US dollars ($0.25), the extra cost in ADS-C reports adds up to $4.25. Consider that a gallon of fuel weighs 6.65 pounds (lbs) and costs a conservative $3.25 a gallon. A B744, held 1000 feet below its optimum altitude, burns approximately 288 pounds per hour of fuel more than at their optimum altitude. That means that the B744 will burn up that $4.25 in fuel in only 1.81 minutes by operating only 1000 feet below its optimum altitude. RNP 4 and FANS will greatly increase the likelihood that the aircraft will be able to operate at its optimum altitude.

2.3. States need to work with their operators to help them certify their aircraft as RNP 4 capable. RNP 4, FANS equipped aircraft operate at more fuel efficient altitudes and reduce carbon dioxide (CO_2) emissions. Reductions in CO_2 emissions lessen the impact of global aviation on the environment.

2.4. Oakland Air Route Traffic Control Center (ARTCC) conducted a study to place a value on the extra fuel burn that is caused by aircraft operating at altitudes below their optimum altitude due to lack of RNP 4 and FANS equipment. The FAA felt this analysis would help operators recognize the potential savings with RNP 4 and FANS equipage. The following are the details on how the extra fuel burn is calculated:

a) To calculate the extra fuel burn, the FAA worked with the operators and International Air Transport Association (IATA) to develop a table of how much extra fuel each aircraft type burns when it is in thousand feet increments below the aircraft’s optimum altitude. This table is provided as an attachment to this paper.

b) To determine when an aircraft is below its optimum altitude, the program tracks when an aircraft makes a request for a climb clearance and the climb is denied by air traffic control (ATC). The requested altitude is tracked as the aircraft’s optimum altitude. The program examines the blocking traffic and looks to see if the conflict is same direction traffic and the distance to the traffic is 16 nautical miles (NM) or more (ADS-C Climb Descend Procedure[CDP]). If these conditions are met, the program will track the time the aircraft is below their optimum altitude.

c) The time the aircraft is below its optimum altitude is multiplied by the data in the extra fuel burn table. This allows us to calculate the extra fuel burned because an aircraft is operating below optimum altitude. The program also tracks interim step climbs and updates in requested altitude and figures this data in the calculation.

d) Over the past 18 months, four 15 day time periods were examined. The results from the first 3 data collections were very similar. 1-16 April 2012 showed a lost savings of 27,331 kg for the 15 days. 10-24 September 2012 showed a lost savings of 28,829 kg for those 15 days. 6-21 January 2013 showed a lost savings of 28,858 kg for those 15 days.

e) For the calculations in this forth analysis, 15 days of data (September 1-16, 2013) were examined in the Oakland Oceanic FIR. The results show that an extra fuel burn of 21,310 kilograms (kg) (46,882 lbs) was experienced due to lack of RNP 4 and FANS equipment. If the data are extrapolated over a 1 year time period, an annual extra burn of 518,543 kg (1,140,795 lbs) of fuel and an extra 1.6 million kg of CO_2 emissions would be realized.

f) The latest extra fuel burn analysis indicated a smaller potential fuel burn savings, but the savings are still significant. One possible reason for the smaller fuel burn savings found during this data collection may be explained by the increase in RNP4 aircraft since April 2012 when the first extra fuel burn due to the lack of RNP4 data analysis occurred. In April 2012, in the Oakland Oceanic FIR, the percentage of RNP4 aircraft was at 30 percent. The percentage of RNP4 aircraft has now risen to 50 percent. With more RNP4, FANS 1A equipped aircraft can realize more frequently, altitude assignments that are closer to their optimum operating altitude. It is too early to tell if this trend will continue, but we will continue to monitor the data.

g) As part of this ongoing analysis we have reported in the past that there is an extra fuel burn associated with RNP4/FANS1A aircraft that were denied altitude changes because the conflicting traffic was not flight planned with RNP4 capability. For this paper we were able to calculate a fuel burn loss for these RNP4 aircraft. From 1-16 of September 2013, RNP4 aircraft experienced an extra fuel burn of 13,534 kg (29,744lbs) due to other Non-RNP4 aircraft. That means the total extra fuel burn due to lack of RNP4 and FANS1A equipment was 34,844kg (76,656lbs) for September 1-16, 2013. If the data is extrapolated over a 1 year time period, an annual extra burn of 847,870 kg (1,865,315 lbs) of fuel and an extra 2.67 million kg of CO_2 emissions is being realized.

2.5. While this data is based on every aircraft being RNP 4 and FANS equipped, it does not capture all of the benefits that can be realized by this equipage:

a) This paper does not capture the benefits related to the application of 30 NM lateral separation for pairs of RNP 4 aircraft. It would be much more difficult to make this calculation.

b) This paper does not capture the benefits associated with the application of 30 NM longitudinal separation for opposite direction pairs of RNP 4 aircraft after the aircraft have passed. It would be much more difficult to make this calculation.

c) This paper does not capture the benefits that are lost when an aircraft is denied a request for climb due to traffic, and the aircraft does not make subsequent requests for higher optimum altitudes because of the traffic.

d) ATS Route Structures and Pacific Organized Track System (PACOTS) are developed based on a 50 NM lateral separation standard. Extra savings could be realized if route structures could be revised based on a 30 NM lateral separation standard.

e) Most of all, this paper only captures the lost savings in the Oakland FIR. It does not capture the lost savings in other FIRs.

2.6. One last thing to consider when analyzing the benefits of RNP4 and FANS1A equipment is traffic growth in the Pacific. In July 2009, traffic levels in the Oakland FIR hit a low of 500 flights per day on average. Four years later in 2013, traffic levels have rebounded to levels above the downturn in traffic in 2008. In August of 2013, the Oakland Oceanic FIR experienced an average of 690 flights per day. That is a traffic increase of almost 38 percent since July 2009. With more aircraft in the Pacific airspace, there is more competition for optimum altitude assignments. The data clearly shows that RNP4 and FANS1A equipped aircraft have a higher likelihood of operating at their optimum altitude.

3. ACTION BY THE MEETING

3.1. Significant fuel burn savings can be realized by aircraft with RNP4 and FAN-1A equipment.

3.2. Operators should recognize the benefits of RNP 4 and FANS equipment. They should:

a) Consider certifying FANS equipped aircraft as RNP 4; and

b) Consider equipping aircraft with satellite FANS and RNP 4 certification.