The Twenty-First Meeting of the Informal South Pacific ATS Coordinating Group (ISPACG/21)

Auckland, New Zealand, 5-9 March 2007

Agenda Item 4: Review progress on open action items
AI 16-8

A Summary of Airspace Characteristics Related to the Operational Trial of 30 NM Lateral / 30 NM Longitudinal Separation Standards (30/30) in the Oakland Oceanic Flight Information Region (FIR)

(Presented by the Federal Aviation Administration)

SUMMARY

This information paper presents a summary of airspace characteristics related to the operational trial of 30 NM lateral /30 NM longitudinal separation standards (30/30) in the Oakland Flight Information Region. The information presented in this paper was prepared for the Oceanic Separation Reduction Working Group (OSRWG) Scrutiny Group, which was formed to evaluate performance of the various components of the system supporting the reduced separation minima. Included in this paper are analyses detailing the number of flights per day conducted by operators participating in the operational trial. It also presents descriptive information on all of Oakland Oceanic airspace, which includes the proportion of flights that are FANS-1/A equipped.

1. Introduction

1.1. On 22 December 2005, the Federal Aviation Administration (FAA) implemented 30 NM lateral / 30 NM longitudinal separation standards (30/30) on an operational trial basis in a portion of the Oakland Oceanic Flight Information Region (FIR). The operational trial permits FAA to evaluate the relevant performance of aircraft with suitable State approval for participation in the trial, as well as operation of the new Ocean21 oceanic automation system introduced into full-time operation at the Oakland Air Route Traffic Control Center (ZOA) on 17 October 2005. The implementation followed all guidelines in outlined in Annex 11 of the Convention on International Civil Aviation and the International Civil Aviation Organization (ICAO) Doc 4444.

1.2. As part of the operational trial, FAA has formed a group of experts to evaluate performance of the various components of the system supporting the reduced separation minima. This group has been termed the "OSRWG Scrutiny Group," more simply known as the scrutiny group. The scrutiny group is chaired by FAA Flight Standards Services and has representatives from various groups within the FAA, such as ZOA and Anchorage ARTCC, Flight Standards Services, Aircraft Certification Service, Oceanic Standards, FAA Technical Center (TC) and support contractors.

1.3. The scrutiny group has met four (4) times since the start of the operational trial, agreeing on terms of reference shown in Attachment A. The group has reviewed pertinent data from a number of sources. The purpose of this information paper is to provide a summary of airspace characteristics related to the operational trial of 30/30 in the Oakland Oceanic FIR.

2. Background

2.1. The FAA TC has assembled data from a number of sources:

- Ocean21 data reduction archives;
- Enhanced Traffic Management System (ETMS);
- TC archives of ZOA en route radar data;
- FAA accident and incident databases; and
- NASA Aviation Safety Reporting System.

2.2. The frequencies with which these data arrive at the FAA TC are variable. For example, Ocean21 data reduction archives which cover all of ZOA oceanic operations arrives in 15 day intervals, with each delivery covering all Ocean21 operations for the time period between that of the last delivery and that of the current. As a consequence, while the operational trial is being conducted only in ZOA Oceanic Sector 3 (OC3), data pertinent to the performance of key systems are available for all of ZOA-controlled international airspace.

2.3. Because the bulk of data presented to the scrutiny group has been derived from Ocean21 data reduction archives sources, only airspace characteristics available from processing the automated systems data reduction archives will be presented in this paper.

3. Discussion

3.1. The operational trial is being conducted in OC3. Data presented to the scrutiny group covers the period from 22 December 2005 through 31 January 2007. Figure 1 shows the Oakland Oceanic FIR, including OC3.

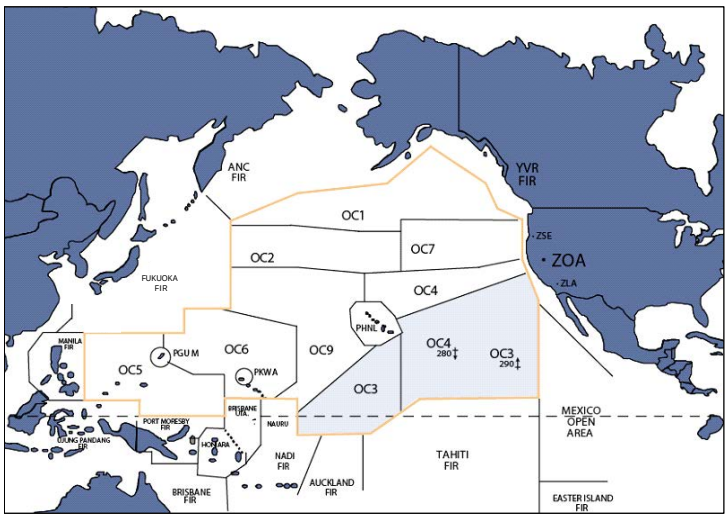

Figure 1. Oakland Oceanic Airspace

3.2. The following operators are participating in the operational trial: Air New Zealand Limited (ANZ), Qantas Airways Limited (QFA) and United Airlines Incorporated (UAL). In addition, it has been noted that three (3) additional operators are filing flight plans indicating approval to participate in airspace where 30/30 is applied, although they do not currently conduct operations within OC3 airspace. Those operators include: Cathay Pacific Airways Limited (CPA), Singapore Airlines Limited (SIA), and Singapore Airlines Cargo PTE Limited (SQC).

3.3. Figure 2 presents the number of OC3 operations conducted per day by the three (3) operators participating in the operational trial: ANZ, QFA, and UAL. The principle city pairs for these operators in OC3 include: Los Angeles/San Francisco (KLAX/KSFO) to/from Sydney (YSSY)/Brisbane (YBBN)/Melbourne (YMML) and KLAX/KSFO to/from Auckland (NZAA)/Christchurch (NZCH). The average number of flights per day conducted in OC3 by these operators is 23.

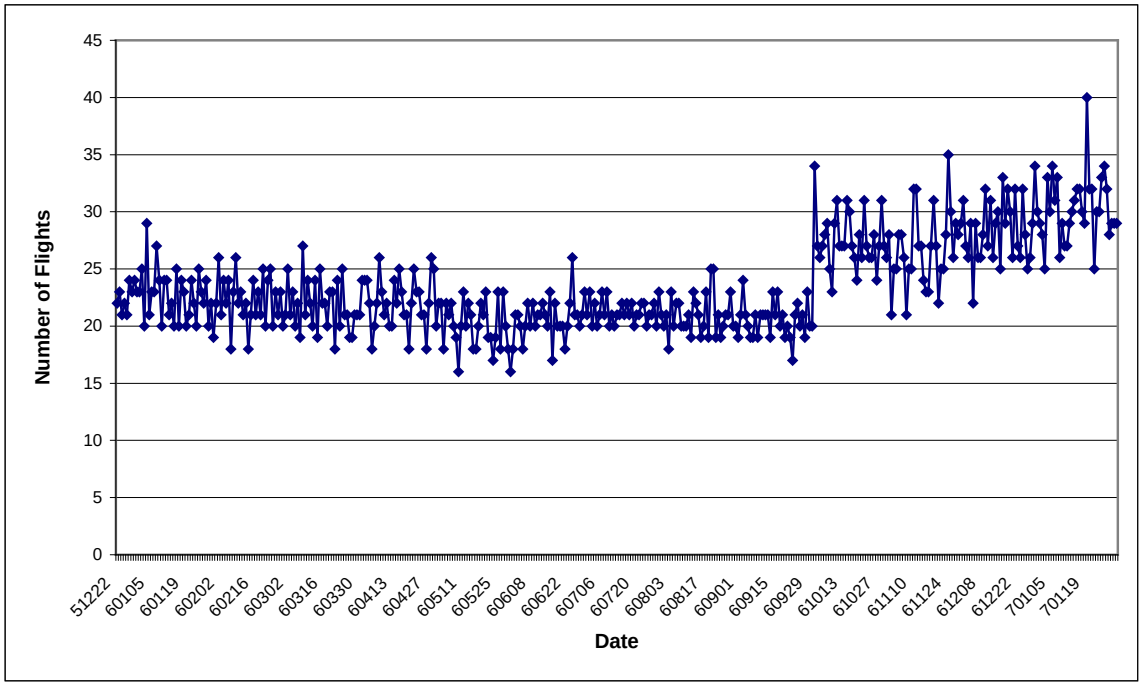

Figure 2. Daily OC3 Operations Conducted by Operators Participating in the Operational Trial

3.4 Figure 3 presents the number of pertinent OC3 operations conducted per day in January 2007. As can be seen in Figure 3, amongst the three (3) operators participating in the operational trial, QFA has the largest number of daily operations in OC3 airspace.

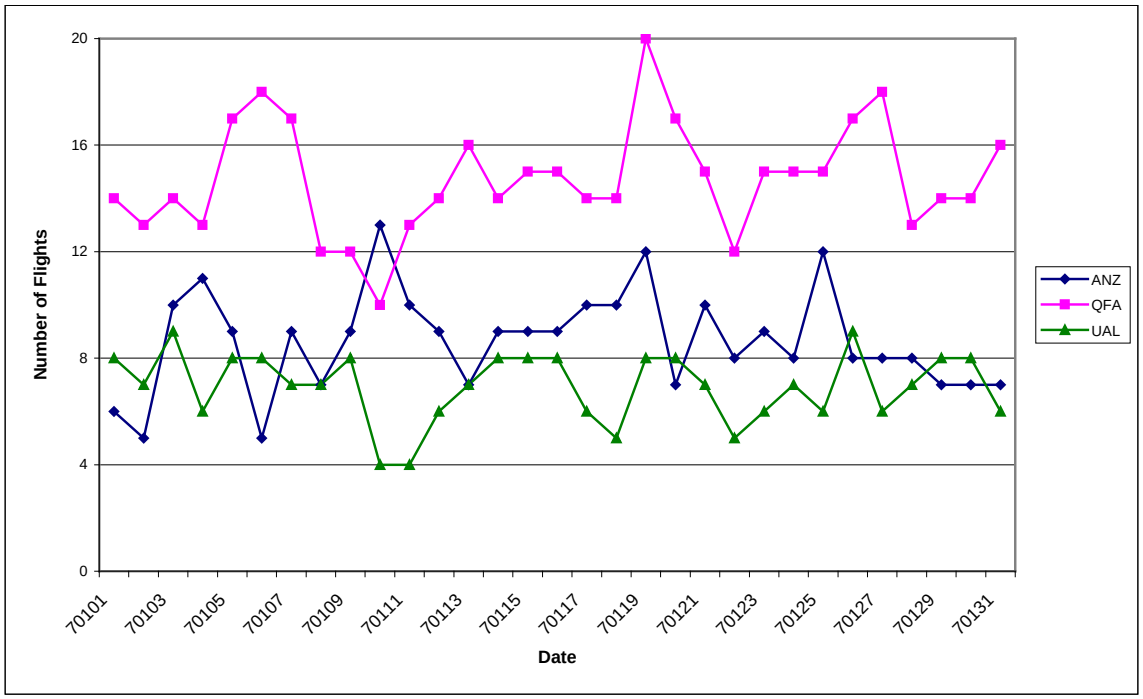

Figure 3. January 2007 OC3 Operations by Day & Operator
(Operators Participating in Operational Trial)

3.5. The average number of flights per day in all of ZOA oceanic airspace is 660. Of these flights approximately 33.8 percent are FANS-1/A equipped. Figure 4 presents the percentage of flights operating in ZOA oceanic airspace submitting position reports with Automatic Dependent Surveillance-Contract (ADS-C) from 22 December 2005 through 31 January 2007.

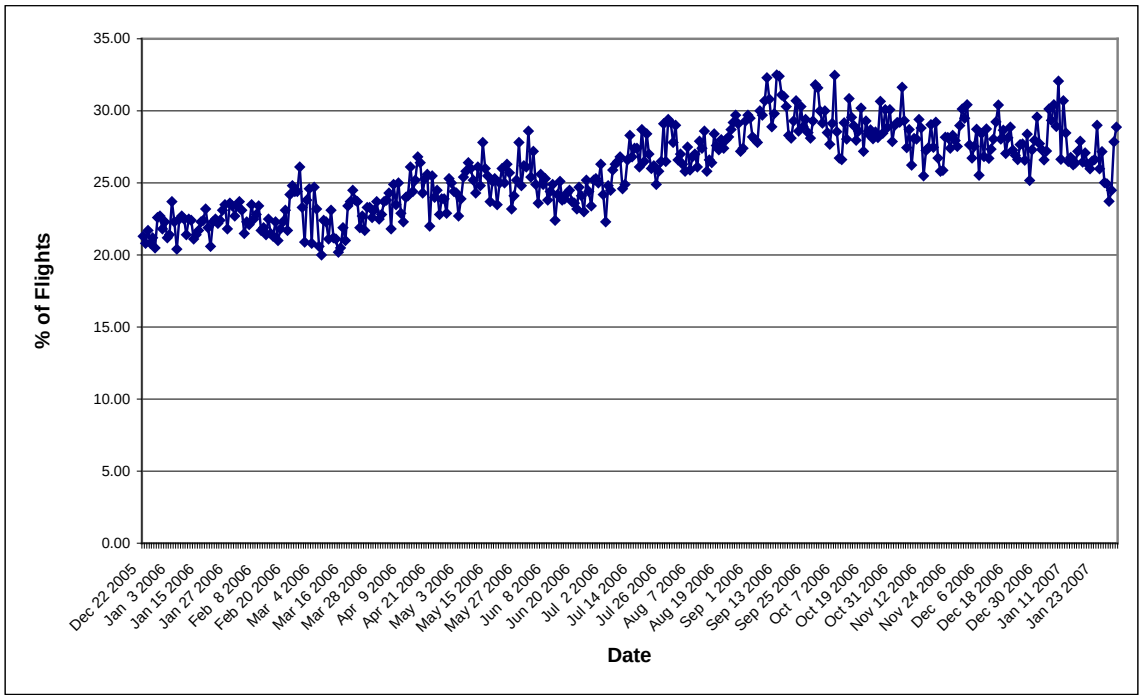

Figure 4. Percent of Flights Operating in Oakland Oceanic Airspace Using ADS-C

3.6. The FAA TC developed groupings of the traffic data in ZOA oceanic airspace by origin/destination pairings as a means of further categorizing the data. Table 1 presents information descriptive of these flows by geographic sub-regions of the Pacific.

Flow Designator	Flow Name	Description of Flow
CEP	Central East Pacific	Hawaii to/from North American mainland
CEPN	Northern Central East Pacific	Hawaii to/from Northwest US/Canada/Alaska
CNPAC	Central Pacific	North American mainland to/from Japan/Korea/other Asian origins
HGUAM	Hawaii to Guam Area	Hawaii to/from Guam/Saipan/other proximate destinations
HSOPA	Hawaii to South Pacific	Hawaii to/from South Pacific
JAUST	Japan to South Pacific	Japan to/from South Pacific
JGUAM	Japan to Guam area	Japan to/from Guam/Saipan/other proximate destinations
JH	Japan to Hawaii	Japan to/from Hawaii
KGUAM	North America/Hawaii to Guam Area	North American mainland to/from Guam/Saipan/other proximate destinations
KSOPA	North America to South Pacific	North American mainland to/from South Pacific

Table 1. ZOA Oceanic Airspace Traffic Flows

3.7. Figure 5 presents the locations of each flow described in Table 1. The percentage of datalink-equipped traffic observed in each flow is also presented in Figure 5 and repeated in Figure 6. Figure 6 shows the percentages of aircraft filing ADS/datalink-equipped within each traffic flow. For example, the flow contained within the operational trial airspace is designated KSOPA. The traffic observed in this flow represents 4.7 percent of all traffic in ZOA Oceanic airspace. Of the traffic within the KSOPA flow, 91.4 percent are filing ADS-C equipped in their flight plans. Another interesting example is the CEP traffic flow. The traffic observed within the CEP flow represents 32.3 percent of all traffic in ZOA Oceanic airspace, but only 5.6 percent of CEP traffic are filing ADS-C equipped.

3.8. The average proportion of flights submitting position reports using High Frequency (HF) Radio, Controller-Pilot Datalink Communications (CPDLC), and ADS-C is presented in Figure 7 for March 2006 to January 2007. As can be seen in Figure 7, most flights operating in ZOA Oceanic airspace submit position reports via HF Radio. In ZOA oceanic airspace, the average number of flights per day submitting position reports using only CPDLC and only HF is 9 and 442 flights, respectively, while the average number of flights submitting at least one ADS position report is 211 flights.

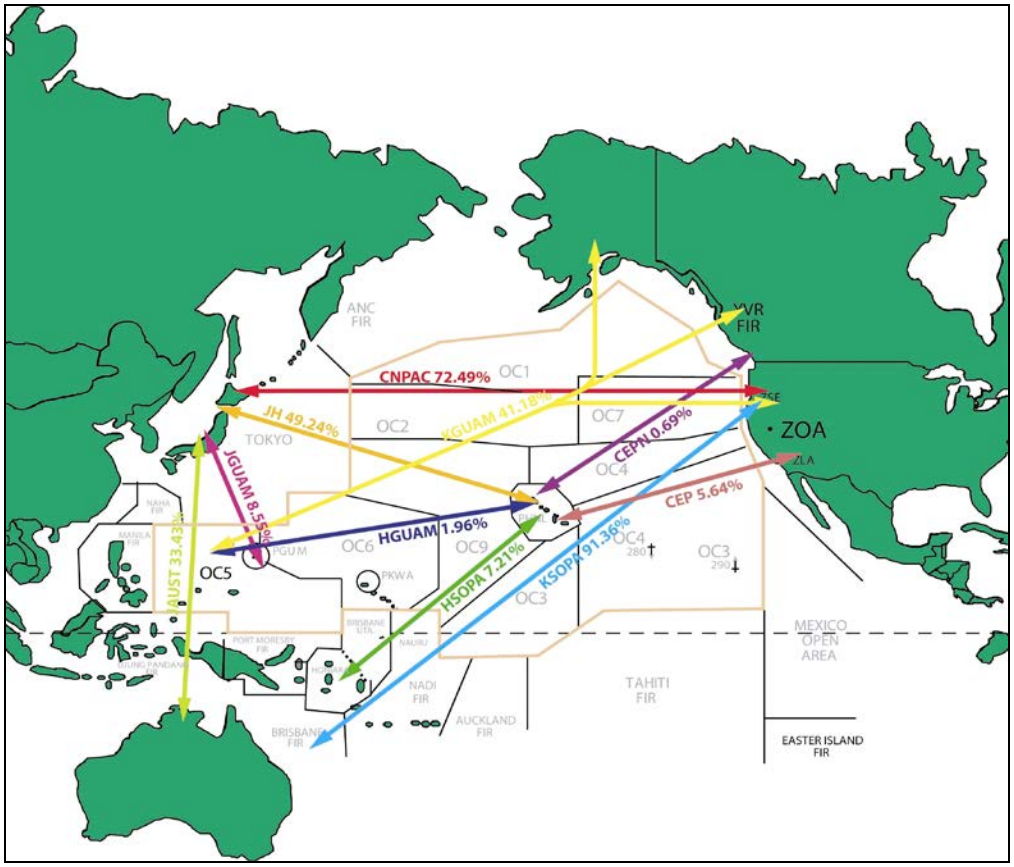

Figure 5. Location of Oakland Oceanic Airspace Traffic Flows

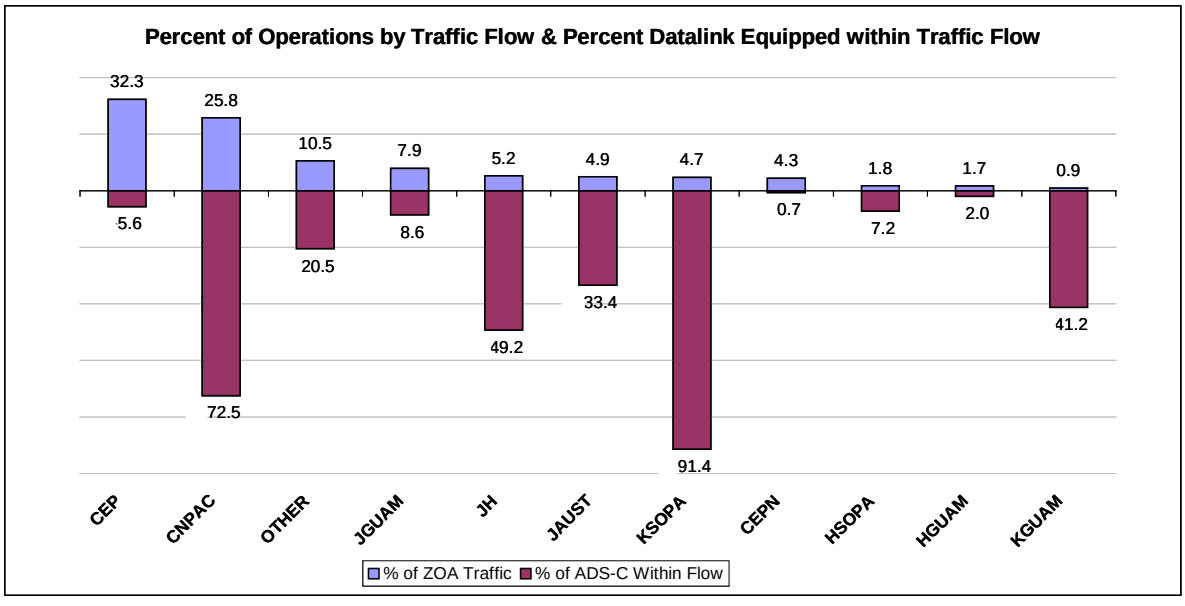

Figure 6. Percent of Operations in Each Traffic Flow & Corresponding Percent of Aircraft Filing Datalink/ADS Equipped within Each Flow

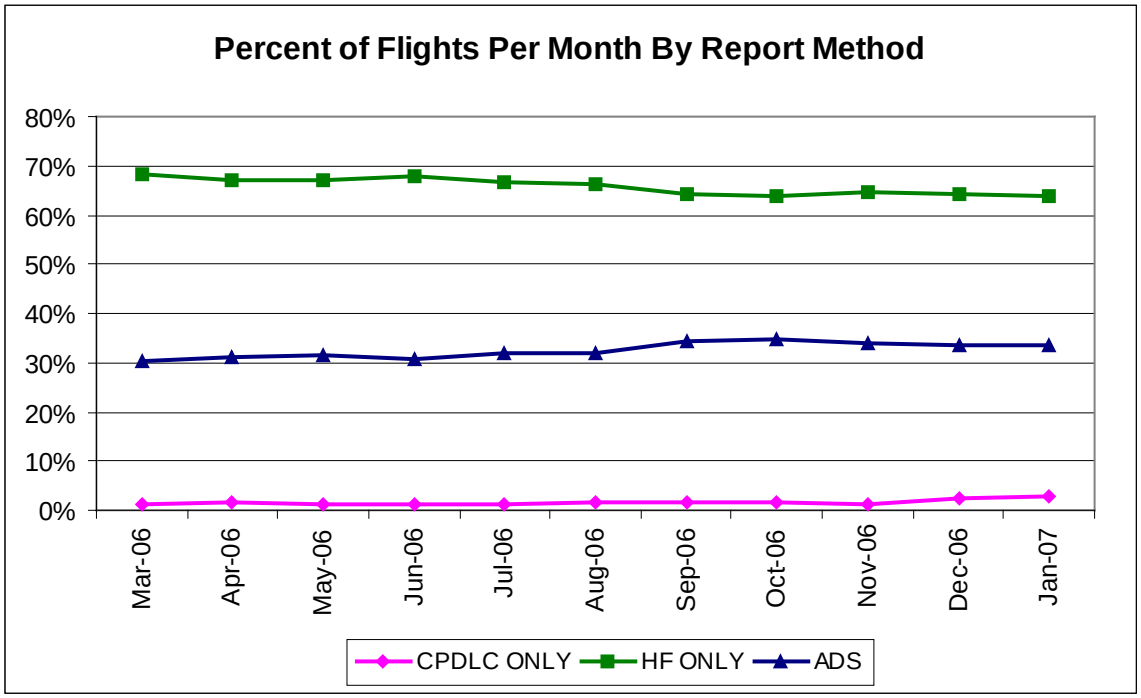

Figure 7. Percent of Monthly Operations Submitting Position Reports Through HF Radio, CPDLC, & ADS-C

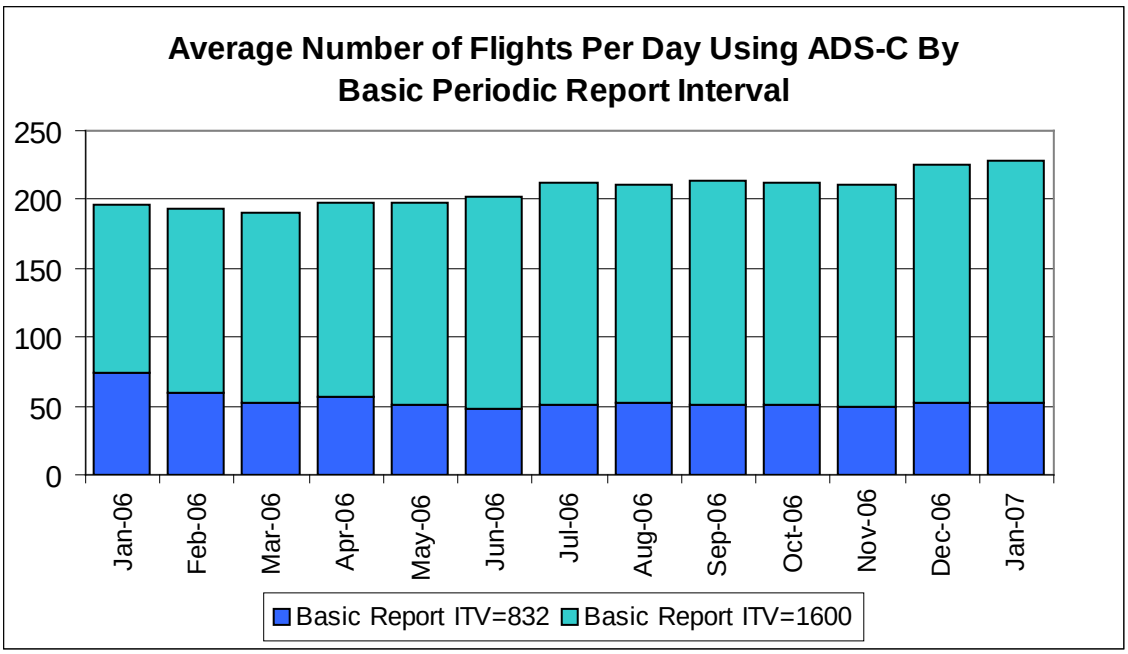

Figure 8. Average Number of Flights Utilizing ADS-C in Oakland Airspace by Basic Periodic Report Interval for January 2006 – January 2007

3.9. Figure 8 presents the average number of flights per day submitting position reports through ADS-C from January 2006 through January 2007. In addition Figure 8 illustrates the proportion of flights submitting ADS-C basic periodic with report intervals of 832 and 1600 seconds, or roughly 14 and 27 minutes, respectively. The number of flights with basic periodic report intervals equal to 832 seconds represents the flights filing RNP4 in the

airspace. These RNP4 flights include all those operations conducted by the operators mentioned in paragraph 3.2.

3.10. The proportion of downlink and uplink ADS-C messages handled by the relevant ZOA Oceanic communication providers are presented in Figures 9 and 10, respectively. This information was extracted from a new, recently provided set of Ocean21 data, which contains the service provider and ground earth station associated with each Ocean21 message.

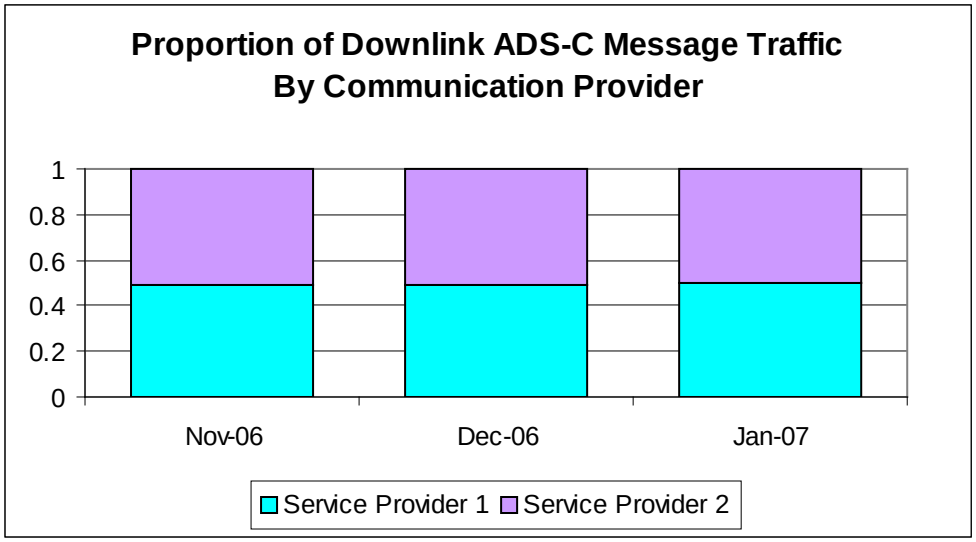

Figure 9. Proportion of ADS-C Downlink Messages by Communication Provider

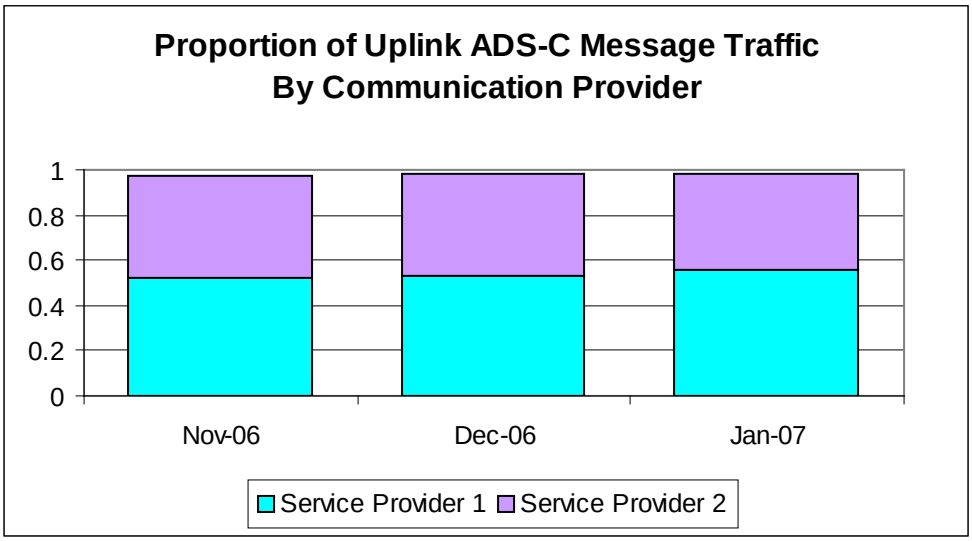

Figure 10. Proportion of ADS-C Uplink Messages by Communication Provider

3.11. The monthly counts of flights submitting ADS-C position reports in ZOA oceanic airspace for the months of January 2006 and January 2007 are presented in Figures 11 and 12, respectively. In addition, both Figures 11 and 12 illustrate the breakdown of flights using basic periodic reporting intervals equal to 832 and 1600 seconds (or 14 minutes and 27 minutes) for each operator. It is interesting to note the change in the numbers of ADS-C flights with basic periodic reporting rates equal to 832 seconds for a few operators from January 2006 to January 2007.

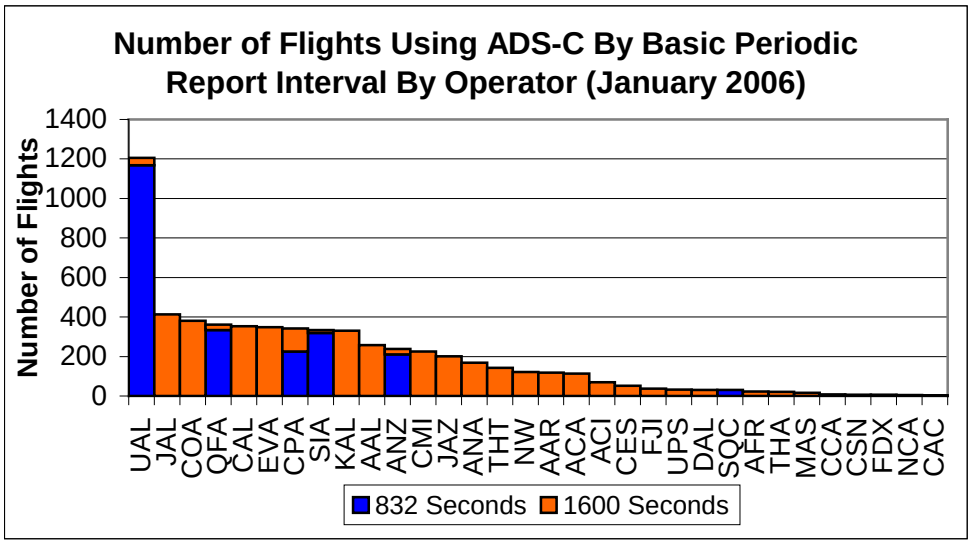

Figure 11. Number of ADS-C Flights by Operator & Basic Periodic Reporting Rates – January 2006

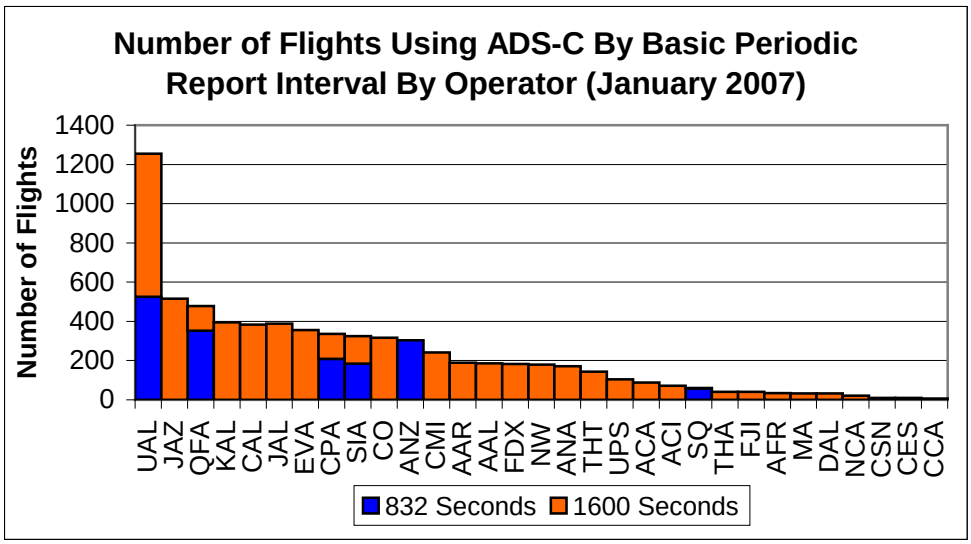

Figure 12. Number of ADS-C Flights by Operator & Basic Periodic Reporting Rates – January 2007

3.12. The average number of ADS-C downlink messages received by ZOA each day is presented in Figure 13. This information is presented as a breakdown of the average number of the top 4 occurring ADS-C downlink message types observed in the data and their contribution to the average number of total downlink messages per day. These ADS-C downlink message types are the following: BAS (basic periodic reports), WPC (waypoint change reports), ACK (acknowledgement messages) and LDC (lateral deviation reports). The overall average number of ADS-C downlink messages received daily by ZOA is 5,582 messages. The average percent of BAS, WPC, ACK, and LDC messages received from the total ADS-C downlink messages are 54.8 percent, 30.6 percent, 0.8 percent, and 13.8 percent, respectively.

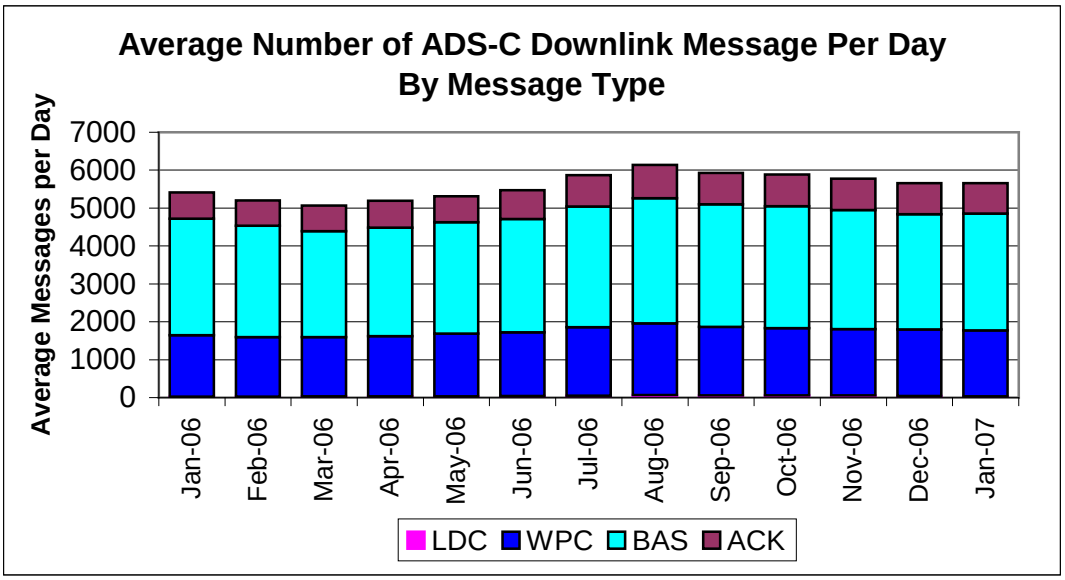

Figure 13. Average Number of ADS-C Downlink Messages Received at ZOA by Message Type – January 2006 to January 2007

3.13. The average number of ADS-C uplink messages sent daily by ZOA is presented in Figure 14. This information is presented as a breakdown of the average number of the top 3 occurring ADS-C uplink message types observed in the data and their contribution to the average number of total uplink messages per day. The ADS-C uplink message types in Figure 14 are the following: PER (the uplink message that establishes the periodic contracts), EVT (the uplink message that establishes the event contract, usually consisting of waypoint change and lateral deviation event contracts) and CTC (the uplink message that cancels all ADS-C contracts and terminates connection). The overall average number of ADS-C uplink messages sent daily by ZOA is 1,058 messages. The average percent of PER, EVT, and CTC messages sent from the total ADS-C uplink messages are 38.2 percent, 38.7 percent, and 23.1 percent, respectively.

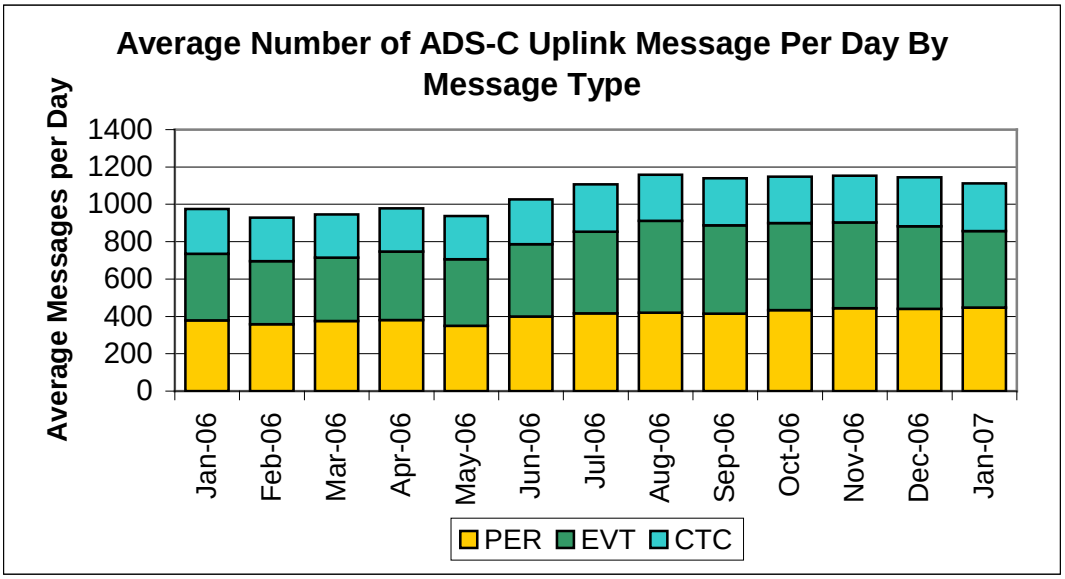

Figure 14. Average Number of ADS-C Uplink Messages Sent from ZOA by Message Type – January 2006 to January 2007

3.14. The location of the ADS-C downlink messages from 15 September 2006 containing position reports are plotted in Figure 15. The data presented in Figure 15 contains all positions reported in the Ocean21 data; it is noted that several positions appear outside of the Oakland Oceanic FIR Boundary. Further processing removes the positions not contained within the Oakland Oceanic FIR for scrutiny group analyses.

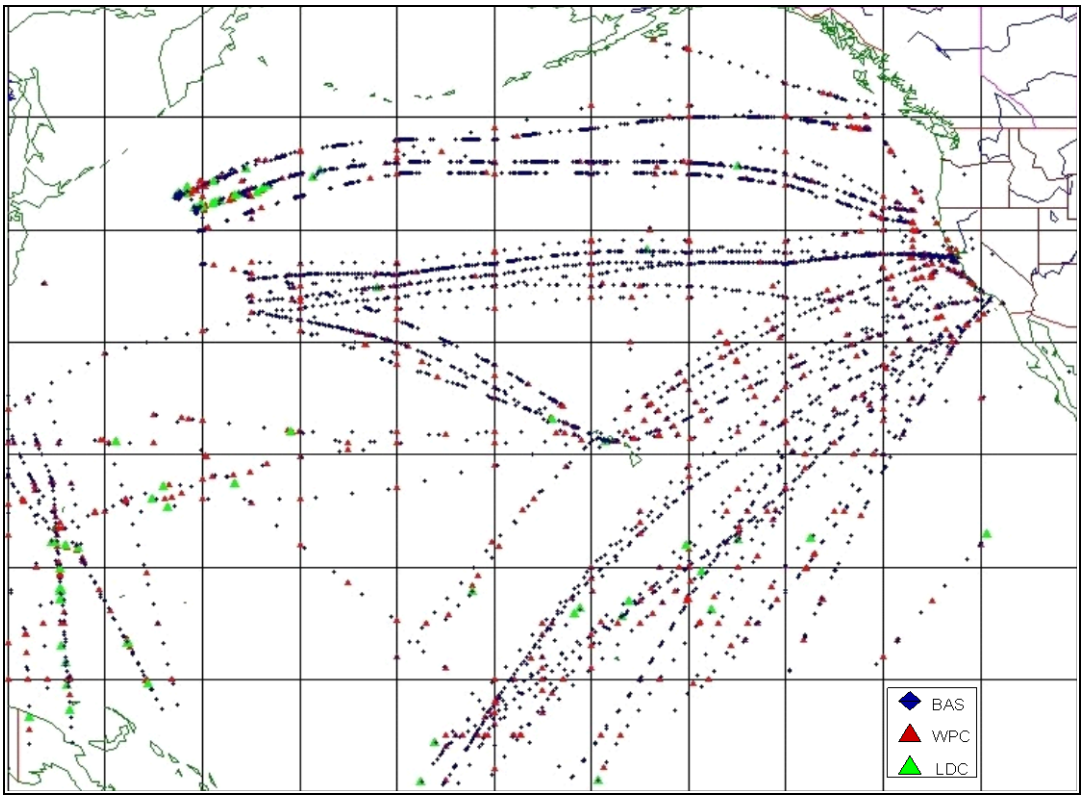

Figure 15. Location of Basic Periodic Reports, Waypoint Change Reports, & Lateral Deviation Change Reports for 15 September 2006

4. Conclusions

4.1. This information paper has presented a summary of airspace characteristics related to the operational trial of 30/30 in the Oakland Oceanic FIR. These data were prepared for the scrutiny group, which consists of a group of experts who evaluate performance of the various components of the system supporting the reduced separation minima. The scrutiny group has met four (4) times since the start of the operational trial, and has agreed on terms of reference.

4.2. This paper has presented descriptive data detailing the number of flights per day conducted by the operators participating in the operational trial. It also has presented descriptive information on all of ZOA Oceanic airspace, which includes an account of the proportion of flights that are FANS-1/A equipped.

4.3. Further information was provided for flights utilizing ADS-C in ZOA Oceanic airspace. The proportion of flights submitting basic periodic reports every 14 minutes versus

27 minutes was provided. It was noted that the flights submitting basic periodic reports every 14 minutes are those filing RNP4 in their flight plans.

4.4. The average number of ADS-C downlink messages received daily by ZOA is 5,582 messages. The average percent of BAS, WPC, ACK, and LDC messages received from the total ADS-C downlink messages are 54.8 percent, 30.6 percent, 0.8 percent, and 13.8 percent, respectively.

4.5. The average number of ADS-C uplink messages sent daily by ZOA is 1,058 messages. The average percent of PER, EVT, and CTC messages sent from the total ADS-C uplink messages are 38.2 percent, 38.7 percent, and 23.1 percent, respectively.

5. Recommendations

5.1. The Meeting is invited to note the information presented in this paper.

- END -

ATTACHMENT A

Terms of Reference of the Oceanic Separation Reduction Working Group (OSRWG) Scrutiny Group (OSRWG/SG)

a) To assemble subject matter experts, as needed, including those experienced in: air traffic control; aircraft operations and airworthiness; regulation and certification; data analysis and risk modeling and communications, navigation and surveillance

b) To coordinate collection of relevant data, such as traffic flow data, communication logs, and equipment availability

c) To analyze and evaluate reports of deviations and anomalies in oceanic airspace where data link services are relied upon to support reduced lateral and longitudinal separation

d) To quantify the magnitude and duration of deviations from cleared route of flight

e) To identify any new hazards associated with application of reduced separation minima

f) To produce estimates of the likelihood or rate of occurrence, and of the severity of the new hazards inferred from the deviations and anomalies observed in operational data acquired from the system in use

g) To identify adverse trends in performance and recommend remedial actions to improve safety and reduce risk; to identify beneficial trends in system performance and promote practices that ensure continued safe operations

h) To accomplish other tasks as might be required for safe implementation of reduced horizontal separation minima in oceanic airspace

i) To report results to the OSRWG to assist in determining the safety of implementation of oceanic separation reduction