THE FORTIETH MEETING OF THE  
IFORMAL PACIFIC ATC CO-ORDINATING GROUP  
(IPACG/40)

THE TWENTY-SEVENTY MEETING OF THE  
FANS INTEROPERABILITY TEAM (FIT/27)

(Washington DC, USA, 11 September 2014)

Agenda Item 3: Reports on the relevant activities

# PBCS Monitoring in Oakland and Anchorage Flight Information Regions

(Presented by the Federal Aviation Administration)

SUMMARY

This paper provides observed performance of the data link operations conducted in Oakland and Anchorage oceanic flight information regions (FIRs). This analysis includes performance of the Controller Pilot Data Link Communication (CPDLC) and Automatic Dependent Surveillance – Contract (ADS-C) systems. The performance is measured against the criteria specified in the Performance Based Communication and Surveillance (PBCS) Manual, International Civil Aviation Organization (ICAO) Document 9869.

# Introduction

## This paper provides observed performance for the data link operations conducted in Oakland and Anchorage oceanic flight information regions (FIRs). The performance data observed from the Controller Pilot Data Link Communication (CPDLC) and Automatic Dependent Surveillance - Contract (ADS-C) systems are measured against the appropriate Required Communication Performance (RCP) and Required Surveillance Performance (RSP) specifications detailed in the Performance Based Communication and Surveillance (PBCS) Manual, International Civil Aviation Organization (ICAO) Document 9869.

## This paper presents a summary of the data link performance by media type, by station identifier, and by operator observed for the recent six-month period from January to June 2014 in Oakland and Anchorage FIRs. The purpose is to demonstrate that safety objectives which rely on the surveillance and communications infrastructure can be met by the aircraft and ground systems in the respective airspace.

## The corresponding power point presentation (Attachment A) contains the information shown within this paper with additional charts assessing data link system availability and the data link performance for FANS over Iridium (FOI) and FANS over Classic Aero (Inmarsat I-4).

# Discussion

## The PBCS Manual provides the guidance material for the analysis to assess the data link performance against the appropriate RSP and RCP requirements. The guidance material describes the data points in the FANS 1/A aircraft communications addressing and reporting system (ACARS) messages that are necessary to complete the post-implementation monitoring analysis and describes the calculation process for the actual communication performance (ACP), actual communication technical performance (ACTP), pilot operational response time (PORT), and actual surveillance performance (ASP).

## According to the guidance in the PBCS Manual, the ACP, ACTP and PORT for applicable CPDLC transactions are required to meet RCP240 criteria when sent via satellite and VHF, and are required to meet RCP400 criteria when sent via HF. Similarly, the ASP for ADS-C is required to meet RSP180 criteria for ADS-C downlink messages sent via satellite and VHF, and is required to meet RSP400 criteria when sent via HF.

*Observed Data Link Performance by Media Type*

### 1 and2 present a summary of the observed performance by media type for the ADS-C downlink messages and applicable CPDLC transactions within the Oakland and Anchorage FIRs, respectively during the aggregate period from January to June 2014. There were approximately **72,194** flights observed using data link in the Oakland FIR and approximately **30,066** flights observed using data link in the Anchorage FIR during this six-month period

### The percentage contribution of the messages for each media type is shown in parentheses under the respective message count. Only the CPDLC transactions in which the same media type was used for both the uplink and downlink portion of the transaction are included in these counts. The observed performance for messages sent via HF media are not shown as only 51 CPDLC transactions in Oakland FIR and 14 in Anchorage FIR occurred using pure HF media.

## The cells colored in green highlight where the performance measures are met for observed performance in Oakland FIR during the aggregate period from January to June 2014. Likewise, cells **colored in red** highlight where the performance is not meeting the criteria, and the cells **colored in yellow** highlight where the 99.9% performance is nearly met at the “rule-of-thumb” between 99.0% and 99.9%.

Table 1. Observed performance by data link media type – Oakland FIR

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Media Type | Count of ADS-C Downlink Msgs | ADS-C 95% | ADS-C 99.9% | Count of CPDLC Transactions | ACTP 95% | ACTP 99.9% | ACP 95% | ACP 99.9% | PORT 95% |
| **Performance Criteria** | | **RSP 180** | |  | **RCP 240** | | | | |
| ***Aggregate*** | 2,098,467 | 98.6% | 99.4% | 83,633 | 99.6% | 99.7% | 99.3% | 99.6% | 98.1% |
| SAT | 1,847,590 | 98.6% | 99.4% | 81,639 | 99.7% | 99.7% | 99.4% | 99.6% | 98.1% |
| VHF | 242,890 | 99.3% | 99.6% | 1,686 | 100.0% | 100.0% | 99.6% | 99.7% | 98.0% |
| **Performance Criteria** | | **RSP 400** | |  | **RCP 400** | | | | |
| HF | 7,981 | 92.4% | 94.6% | 51 | -- | -- | -- | -- | -- |

### **1** shows that the 95 percent criteria for RSP180 ASP and RCP240 ACTP, ACP and PORT are met for satellite, VHF and all media types combined. In addition, the performance at the levels specified by the 99.9 % criteria is 99.0% or better for all performance measures for the aggregate, SAT and VHF. The 95 percent criterion for RSP400 ADS-C is not met for HF.

Table 2. Observed performance by data link media type – Anchorage FIR

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Media Type | Count of ADS-C Downlink Msgs | ASP  95% | ASP 99.9% | Count of CPDLC Transactions | ACTP 95% | ACTP 99.9% | ACP 95% | ACP 99.9% | PORT 95% |
| **Performance Criteria** | | **RSP 180** | |  | **RCP 240** | | | | |
| ***Aggregate*** | 855,689 | 98.1% | 99.3% | 19,120 | 99.6% | 99.7% | 99.3% | 99.6% | 97.1% |
| SAT | 549,918 | 97.6% | 99.2% | 12,353 | 99.5% | 99.7% | 99.1% | 99.5% | 96.6% |
| VHF | 300,081 | 99.6% | 99.7% | 6,512 | 100.0% | 100.0% | 99.8% | 99.8% | 98.3% |
| **Performance Criteria** | | **RSP 400** | |  | **RCP 400** | | | | |
| HF | 5,687 | 90.7% | 94.1% | 14 | -- | -- | -- | -- | -- |

### **2** shows that the 95 percent criteria for RSP180 ASP and RCP240 ACTP, ACP and PORT are met for satellite, VHF and all media types combined. In addition, the performance at the levels specified by the 99.9 % criteria is 99.0% or better for all performance measures for the aggregate, SAT and VHF. The 95 percent criterion for RSP400 ASP is not met for HF.

## *Observed Data Link Performance by Station Identifier*

### It is useful to observe the satellite data link performance by station identifier because of the various “paths” being used for satellite communications. The station identifiers help to distinguish what “path” was used to deliver the messages between the aircraft and air traffic control (ATC). lists the currently available “paths,” which vary between the four constellations of satellites as well as between the two data link service providers.

Table 3. Satellite station identifiers

### 

### and show the ASP by station/gateway identifier for all satellite operations observed during the period of July 2014 in the Oakland and Anchorage FIRs, respectively.

### The number of ADS-C downlink messages associated with each station identifier is shown in the legends of and . The majority of the ADS-C downlink messages observed in both the Oakland and Anchorage FIRs travel via the “paths” designated by XXP and POR1, which both correspond to the Inmarsat I-3 Pacific Ocean Region (POR) satellite. The observed ASP for the messages traveling through these “paths” in both Oakland and Anchorage FIRs meets the 95% criterion, with better performance for XXP and POR1 observed in Oakland than in Anchorage.

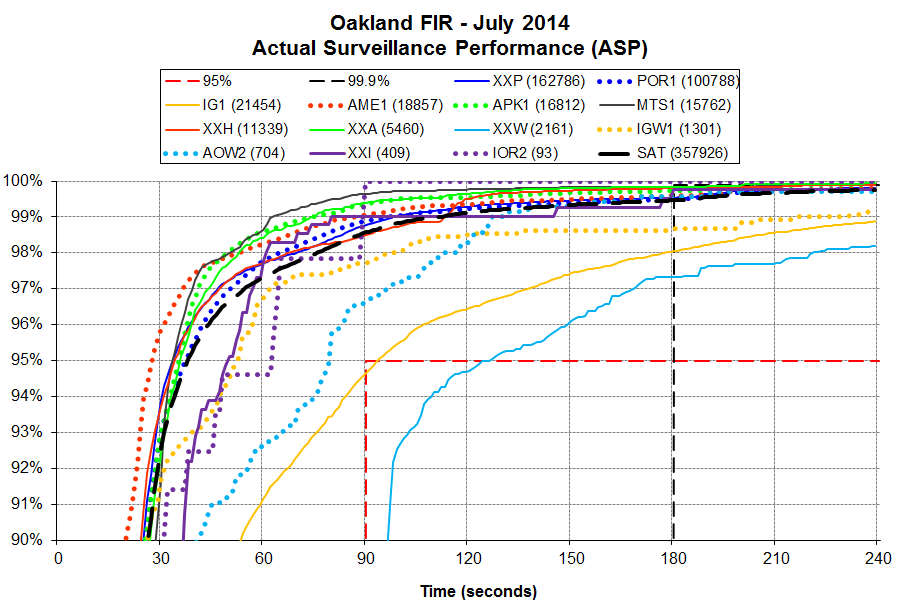


Figure 1. ADS-C (RSP 180) – Data link performance by station id – Oakland FIR

### shows that all paths that are observed to be used in the Oakland FIR meet the 95% criterion for RSP180 ASP, except for the path corresponding to the Iridium satellite service associated with ARINC and the path corresponding to the Inmarsat I-3 Atlantic Ocean Region – west (AOR-W) satellite associated with ARINC. While the AOR-W satellite coverage does extend over part of the Oakland FIR, it is typically observed with significantly lower data link performance.

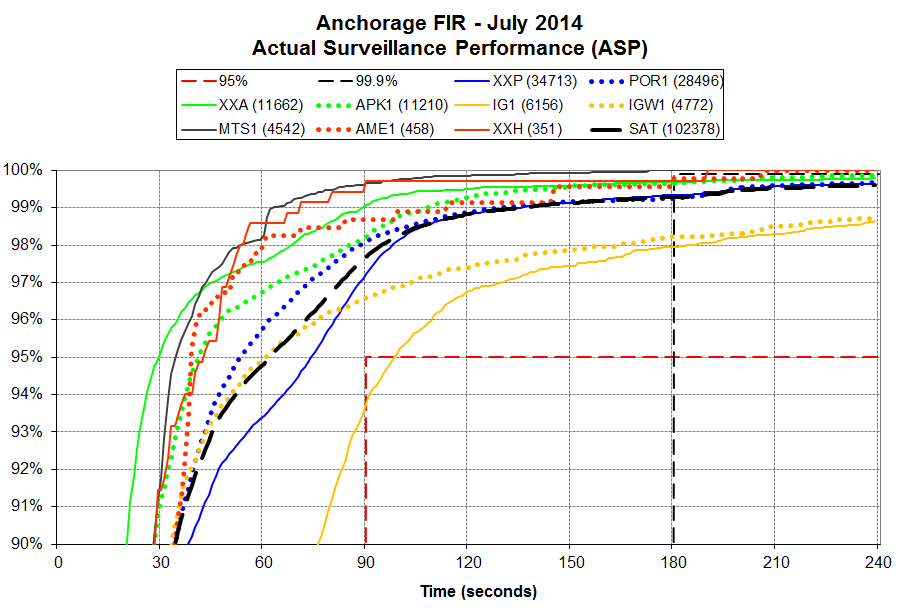


Figure 2. ADS-C (RSP 180) – Data link performance by station identifier – Anchorage FIR

### shows that all paths that are observed to be used in the Anchorage FIR meet the 95% criterion for RSP180 ASP, except for the path corresponding to the Iridium satellite service associated with ARINC.

*Observed Data Link Performance by Operator*

### In Oakland FIR, there were **53** operators that were observed with at least 100 ADS-C downlink reports during the six-month period from January to June 2014, which contributed approximately 99.96% of the ADS-C downlink reports. Table 4 provides a summary of how many of these operators met the criteria for the PBCS performance measures.

Table 4. Summary of data link performance by operator in Oakland FIR (out of 53 operators)

### 

### In Anchorage FIR, there are **38** operators that were observed with at least 100 ADS-C downlink reports during the six-month period from January to June 2014, which contributed approximately 99.94% of the ADS-C downlink reports. Table 5 provides a summary of how many of these operators met the criteria for the PBCS performance measures.

Table 5. Summary of data link performance by operator in Anchorage FIR (out of 38 operators)

### 

# Conclusion

## The meeting is invited to:

1. Note the information in the paper and the accompanying power point presentation; and
2. Review and comment on the observed performance.

Attachment A PBCS Monitoring in Oakland and Anchorage Flight Information Regions

[Provided as a separate Powerpoint file]

# -END-