FANS Interoperability Team Meeting (FIT/19)

Nadi, Fiji, 28-29 February 2012

Agenda Item 5: System Performance Review

CPDLC and ADS-C Data Link Performance Monitoring for the Brisbane FIR

Presented by Airservices Australia

SUMMARY

This paper provides observed performance measures as specified in the Global Operational Data Link Document (GOLD) from the operational data collected in the Brisbane FIR. This analysis includes performance of the Controller Pilot Data Link Communication (CPDLC) and Automatic Dependent Surveillance – Contract (ADS-C).

1. INTRODUCTION

1.1 This paper provides observed performance measures from the operational data link system in the Brisbane FIR. The purpose of this paper is to present the most recent observed performance of the data link system.

1.2 The performance data observed from the Controller Pilot Data Link Communications (CPDLC) and Automatic Dependent Surveillance - Contract (ADS-C) systems are measured against the appropriate Required Communication Performance (RCP) and Required Surveillance Performance (RSP) specification to demonstrate that safety objectives which rely on the communications infrastructure can be met by the aircraft and ground systems.

1.3 This paper presents the data link performance by media type and by operator.

2. DISCUSSION

2.1 The Global Operational Data Link Document (GOLD) provides the guidance material describing the required data points from the FANS 1/A aircraft communications addressing and reporting system (ACARS) messages. The GOLD also describes the calculation process for the actual communication performance (ACP), actual communication technical performance (ACTP), pilot operational response time (PORT), and surveillance latency.

2.2 Observed Data Link Performance by Media Type

2.2.2 Figure 1 presents the ACP measurement for the messages sent within the Brisbane FIR by media type (Satellite, VHF, and HF) during the collection period of January 2011 to December 2011. The numbers of CPDLC messages included in the analysis are shown

in the legend of Figure 1, there were 82428 satellite, 52088 VHF, and 272 HF messages. The ACP for CPDLC messages sent via Satellite and VHF messages meet the 95 percent criteria but fall just below the 99.9 percent criteria.

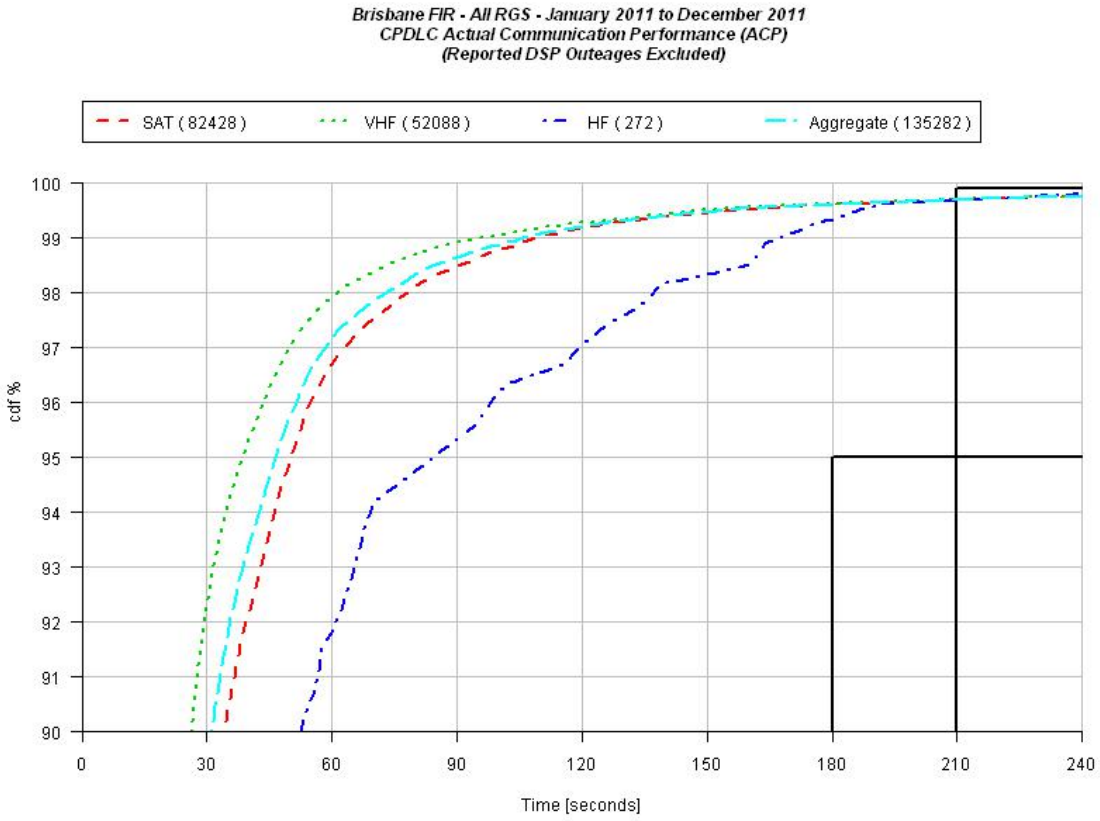

Figure 1. ACP – Brisbane FIR by Data Link Media Type

Note. The “aggregate” includes entries for which classification into VHF, HF or Satellite was unknown."

2.2.3 Figures 2 and 3 presents the ACTP and ADS-C measurements, respectively, for messages sent within the Brisbane FIR by media type (Satellite, VHF, and HF) during the time period January 2011 to December 2011. Again, the numbers of CPDLC and ADS-C messages used for each measurement are shown in the legend key of the figure. Figure 2 shows that data link messages sent via VHF and satellite meet the 95 percent ACTP criteria.

2.2.4 The HF data link performance is included in Figures 1 through 3 for comparison purposes only. The RCP240 and RSP240 criteria shown in Figures 1 through 3 are used to measure the performance of VHF and satellite data link only. The RCP400 and RSP400 criteria are used to measure the performance of HF data link.

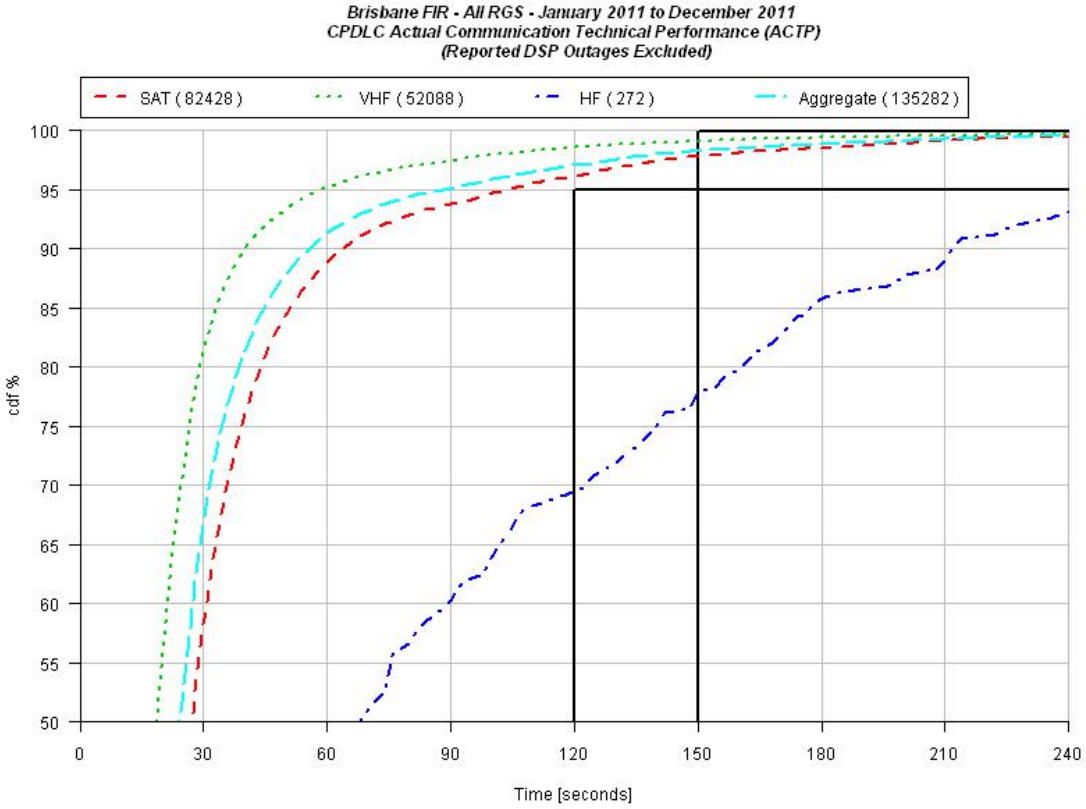

Figure 2. ACTP – Brisbane FIR by Data Link Media Type

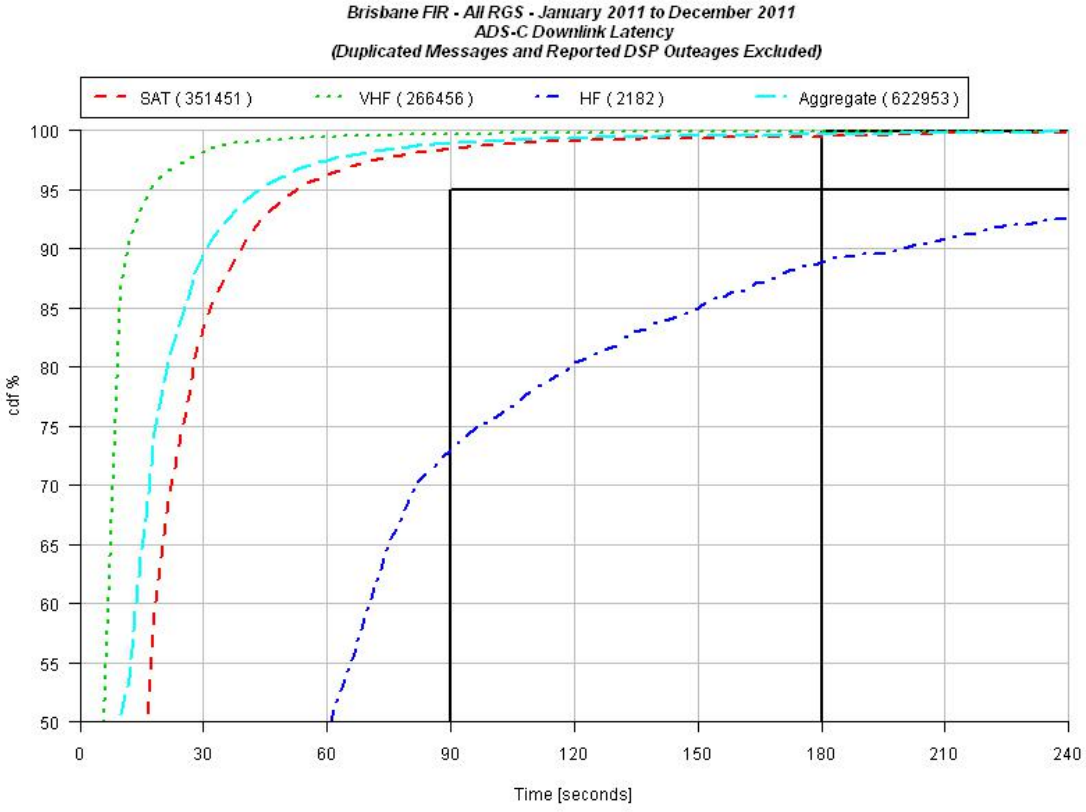

Figure 3: ADS-C Downlink Latency – Brisbane FIR by Data Link Media Type

2.2.5 Figures 4 through 6 present the ACP, ACTP and ADS-C performance by month for the January 2011 through December 2011 time period. Figures 4 through 6 include message performance from by satellite only (VHF and HF were excluded). The numbers of messages observed during each month are shown in the legend key of each figure.

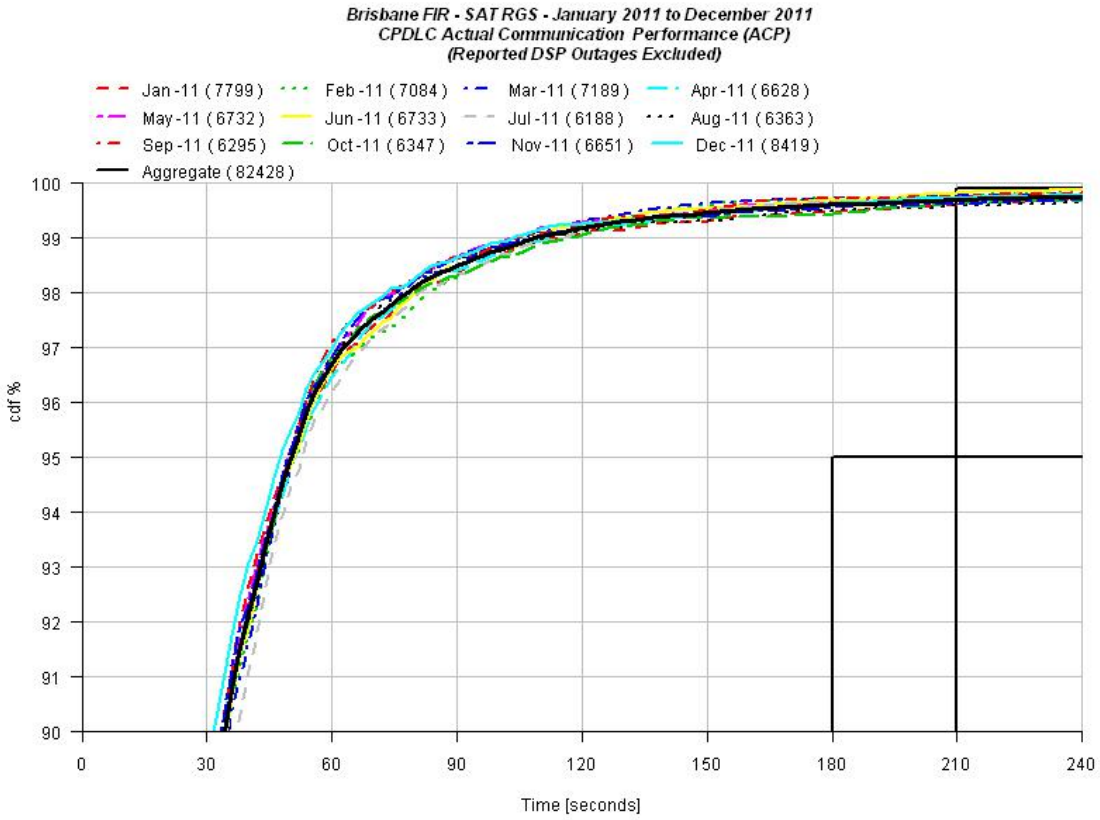

Figure 4: ACP – Brisbane FIR by Month (Sat' remote Ground Station (RGS) Only)

2.2.6 Figures 7 through 9 present the ACP, ACTP and ADS-C HF data link performance by month for the January 2011 through December 2011 time period. The RCP 400 and RSP 400 criteria are used in Figures 7 through 9 for the HF data link performance targets. The numbers of messages observed during each month are shown in the legend key of each figure.

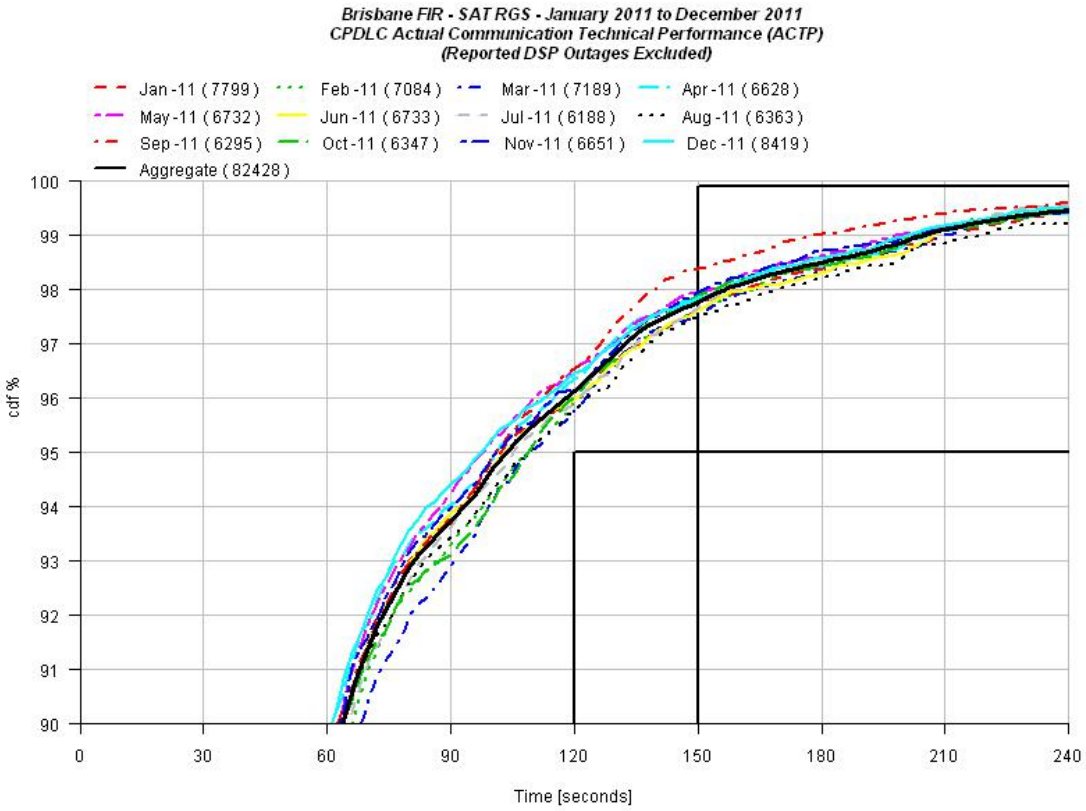

Figure 5: ACTP – Brisbane FIR by Month (Satellite RGS Only)

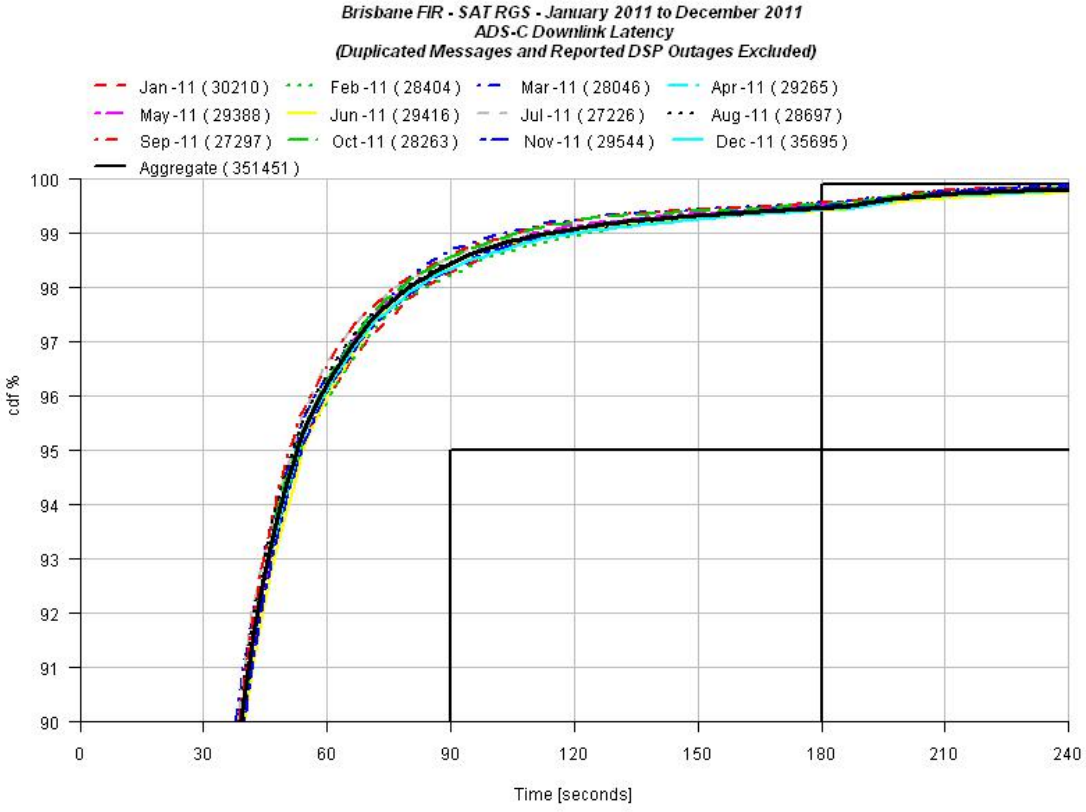

Figure 6: ADS-C Downlink Tendency – Brisbane FIR by Month (Sat' RGS Only)

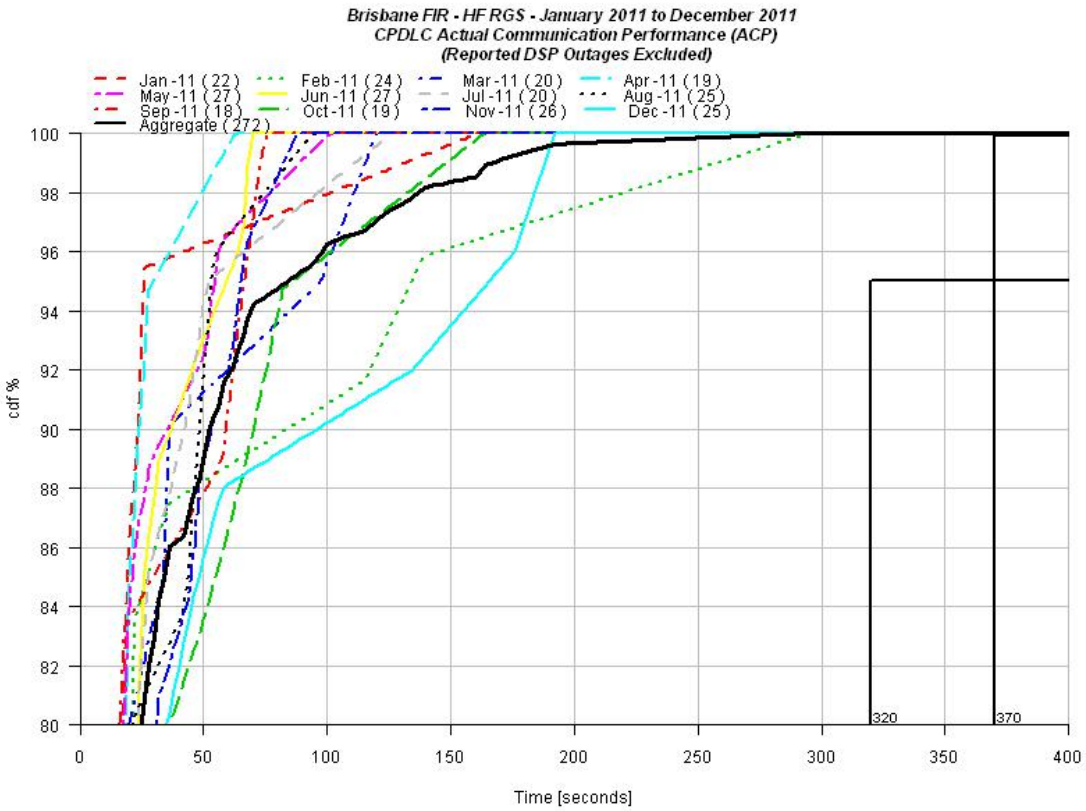

Figure 7: ACP – Brisbane FIR by Month (HF RGS Only)

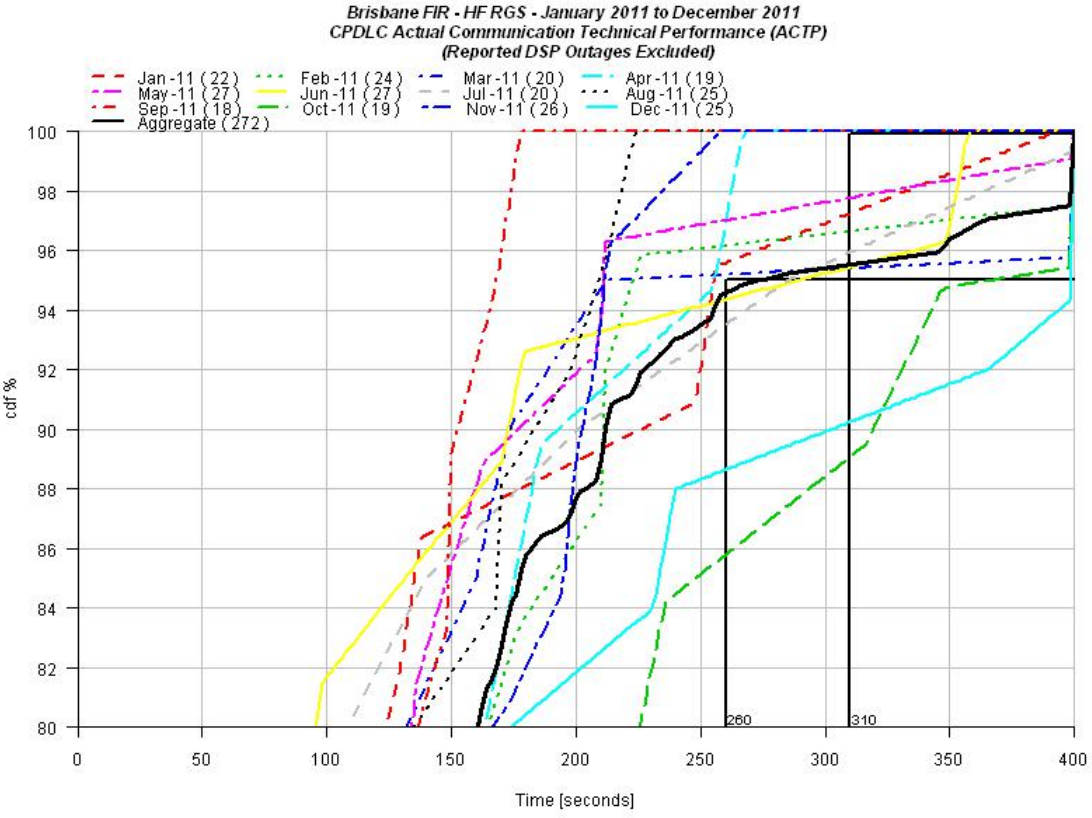

Figure 8: ACTP – Brisbane FIR by Month (HF RGS Only)

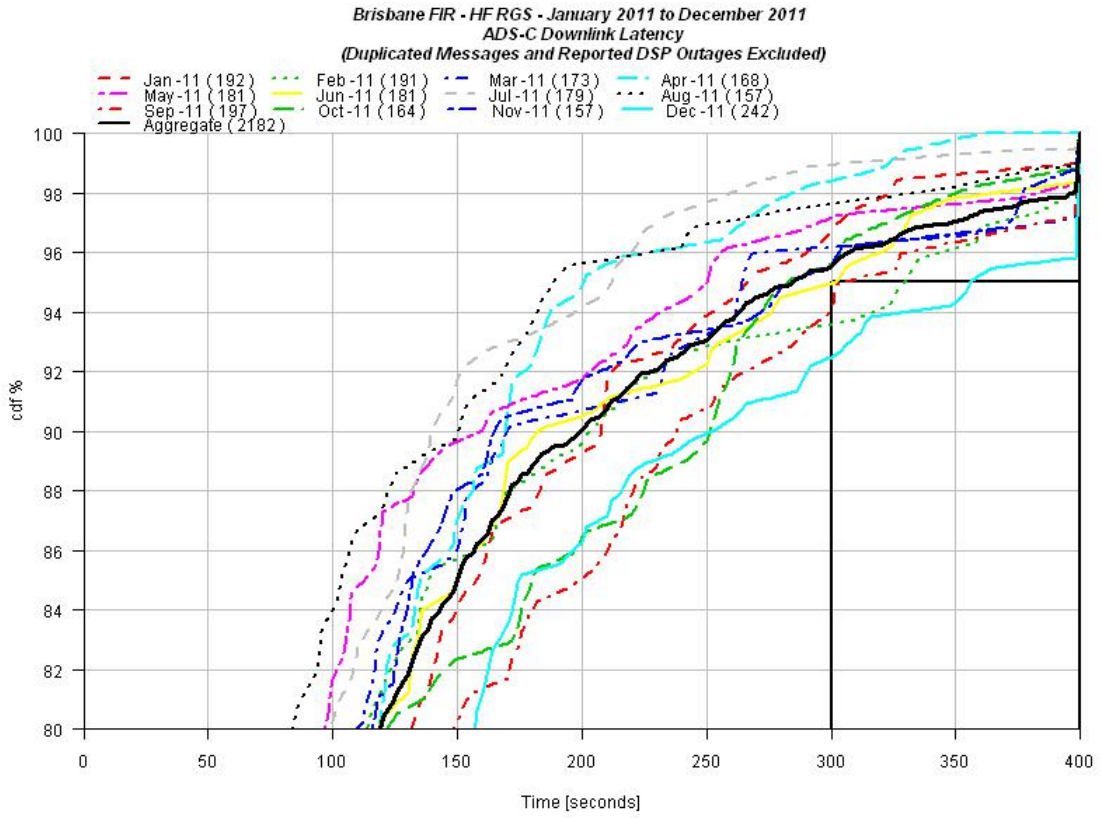

Figure 9: ADS-C Downlink Latency – Brisbane FIR by Month (HF RGS Only)

2.2.7 Figures 1 through 6 show that the observed satellite and VHF data link performance for ACP, ACTP and ADS-C (Type 180) meet the 95 percent criteria for RCP240. In addition, the observed HF data link performance for ACP, ACTP, and ADS-C does not meet the 95 percent criteria for RCP400 in some of the months shown in Figures 7 through 9.

2.3 Observed Data Link Performance by Operator

2.3.1 Figures 10 through 13 show the ACP, ACTP, PORT and ADS-C downlink latency charts by operator for the time period January 2011 through December 2011. Figures 10 through 13 include only satellite data link communications and represented observed performance in the Brisbane FIR. Again, the numbers of messages observed during each month by operator are shown in the legend key of each figure. The top 18 operators contributing the 87 percent in terms of message counts were chosen for the charts. The identifying information for the operators is desensitized in the figures.

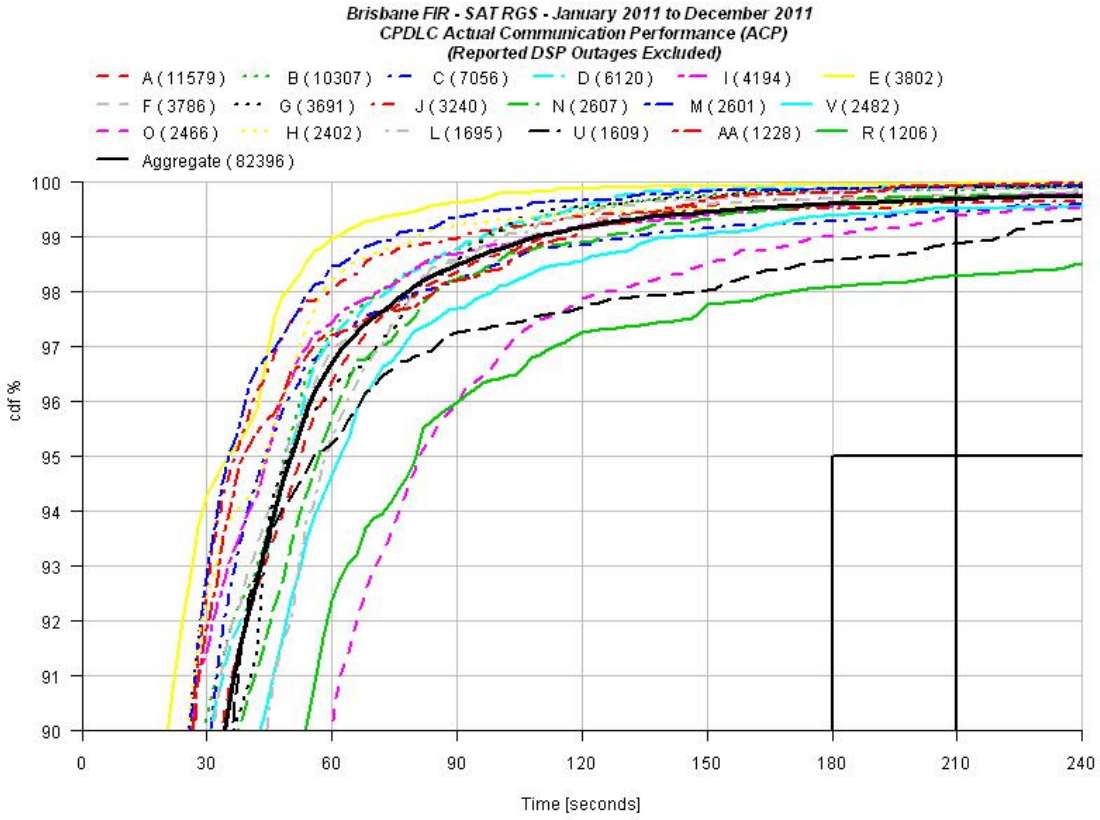

Figure 10: ACP – Brisbane FIR by Operator (SAT RGS Only)

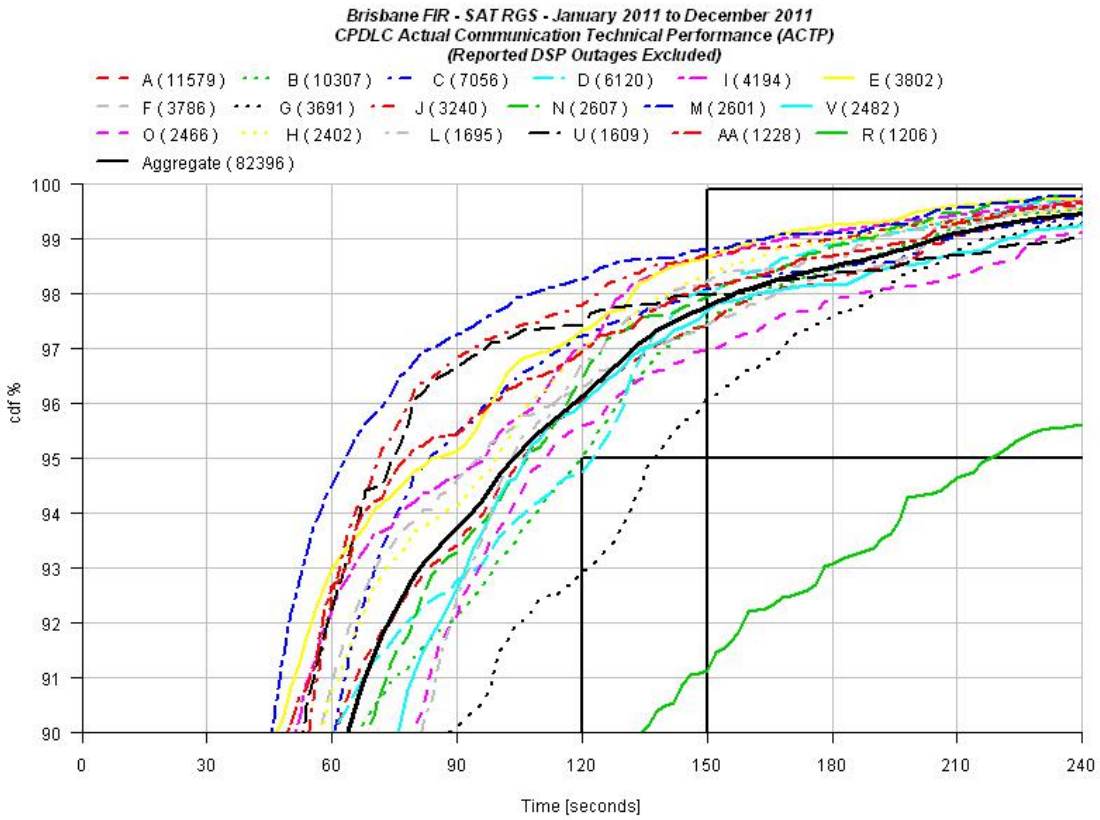

Figure 11: ACTP – Brisbane FIR by Operator (SAT RGS Only)

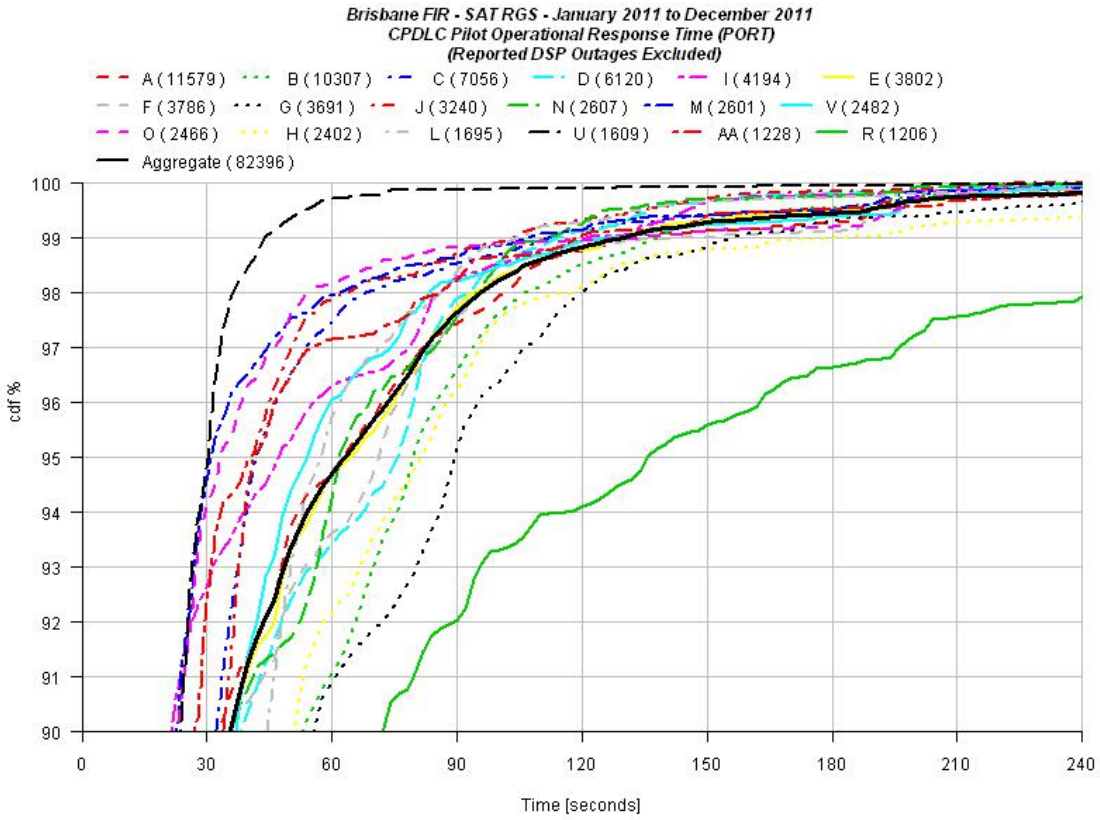

Figure 12: PORT – Brisbane FIR by Operator (SAT RGS Only)

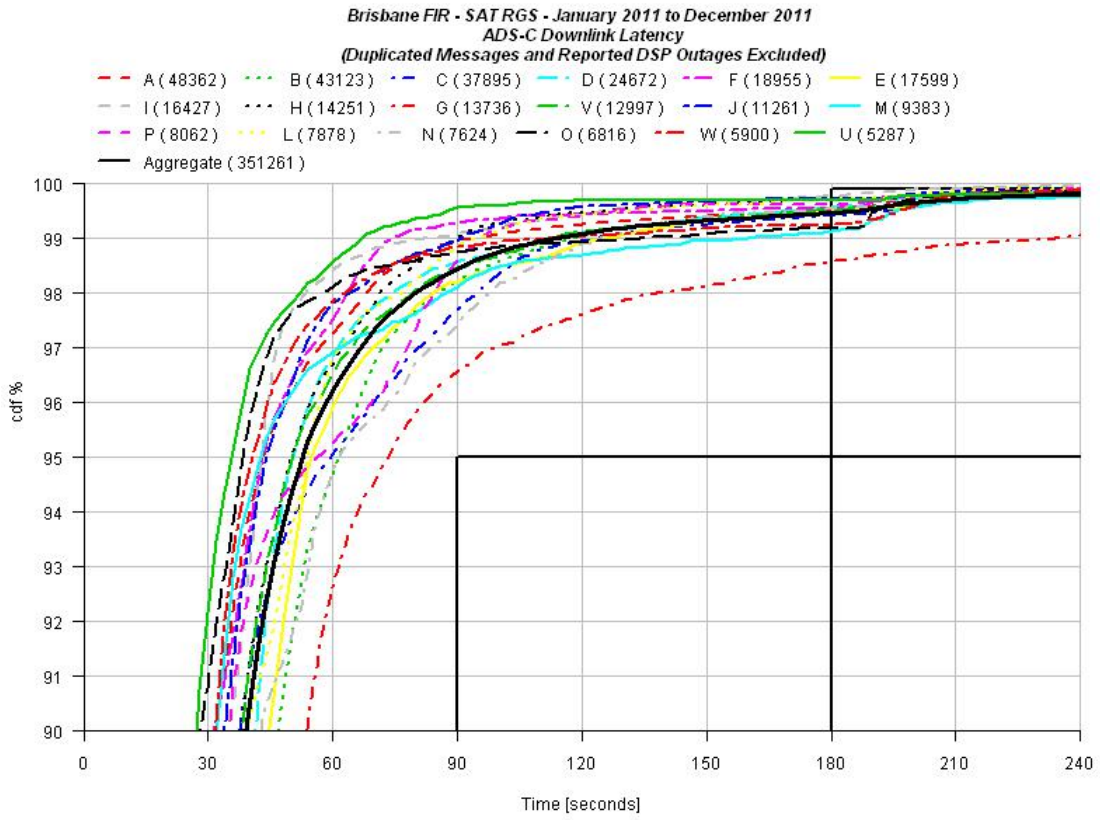

Figure 13: ADS-C Downlink Latency – Brisbane FIR by Operator (SAT RGS Only)

2.3.2 Figures 10 through 13 show that the ACP and ACTP for the data link messages from the operators presented in the charts meet the 95 percent RCP240 criteria in all but three operators (Fig.10).

3 Acknowledgement WP-04 from ISPACG/25/FIT/18 (22 March 2011) was used as a template for this working paper. Data analysis was done by Geoffrey Aldis, Andrew Jason-Jones, Sau-Kuk Tsang, Adam Watkin and Steven Barry using a mixture of Perl and R.

4. ACTION BY THE MEETING

4.1 The meeting is invited to note the information contained within this paper