International Civil Aviation Organization

FIFTEENTH MEETING OF THE COMMUNICATIONS/NAVIGATION/SURVEILLANCE AND METEOROLOGY SUB-GROUP (CNS/MET SG/15) OF APANPIRG

Bangkok, Thailand, 25 – 29 July 2011

Agenda Item 4: Aeronautical Mobile Service (AMS)

DATALINK PERFORMANCE MONITORING RESULTS

(Presented by New Zealand)

SUMMARY

This paper reviews some results of data-link performance monitoring within the Auckland Oceanic FIR.
This paper relates to –

Strategic Objectives:
A: Safety - *Enhance global civil aviation safety*
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-17 Data link applications

1 Introduction

1.1 Data-link communications have been used for CPDLC and ADS-C for many years, and data-link performance requirements have been established. Specific requirements are now published in the Global Operational Data-link Document (GOLD), and reflect those contained in Doc 9869, Manual on Required Communication Performance.

1.2 Within the Asia Pacific Region the monitoring of data-link performance is undertaken by the Central Reporting Agencies (CRAs). This paper reviews monitoring results from the Auckland Oceanic FIR.

2 Discussion

2.1 The CRA of the Informal South Pacific ATS Coordinating Group, the ISPACG CRA, has for some time published a collection of data-link monitoring data on its website at http://www.ispacg-cra.com/performance.asp.

2.2 These data include:

- CPDLC performance
- Actual communications technical performance (ACTP)
- Actual communications performance (ACP)
- Flight crew response
- ADS-C performance
- System availability

2.3 The de-identified information is presented by aircraft type and by operator, and provides a useful overview of data-link performance in the South Pacific. The data refers to the Auckland Oceanic FIR and is presented on a monthly basis.

2.4 This paper reworks some of these data to reflect performance trends rather than monthly performance.

2.5 Figure 1 below shows the duration of monthly network outages and of the cumulative annual outage. The number in each bar shows the number of outages in each month. The GOLD requires an availability of 99.9% for safety, but adds the more stringent availability of 99.99% for traffic efficiency for ANSPs operating reduced separations in areas of high traffic density. In terms of outages, the safety target is a maximum of 520 min total outage in a 12 month period, and the efficiency target is a maximum of 52 min total outage with no more than 4 outages of greater than 10 min in a 12 month period.

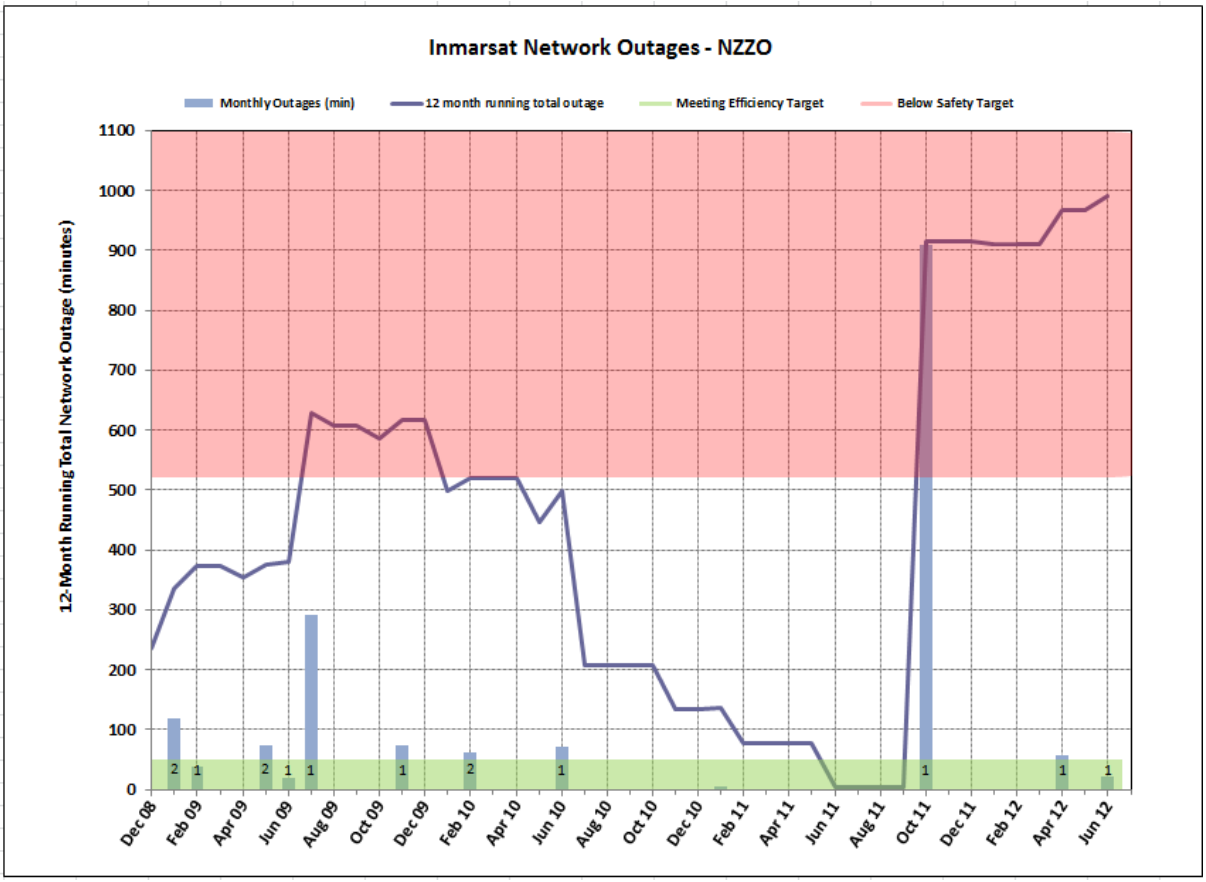

Figure 1 Network Outages

2.6 The very large step is due to a single outage of over 15 hours (910 minutes) on 22 October 2011. This was caused by a Single Event Upset on the Inmarsat 3F3 satellite that caused a total payload outage. The recovery was slow because of a lack of telemetry on the satellite and included temporarily switching some services to two I2 satellites (which required physical realignment of the ground earth station antennas). This event was discussed in detail at the SOCM/2 meeting in February 2102. Two further outages, of 58 minutes and 22 minutes, have contributed to the cumulative 12-month total.

2.7 Figure 2 compares the system availability from December 2008 as a running annual total with the safety target and the efficiency target.

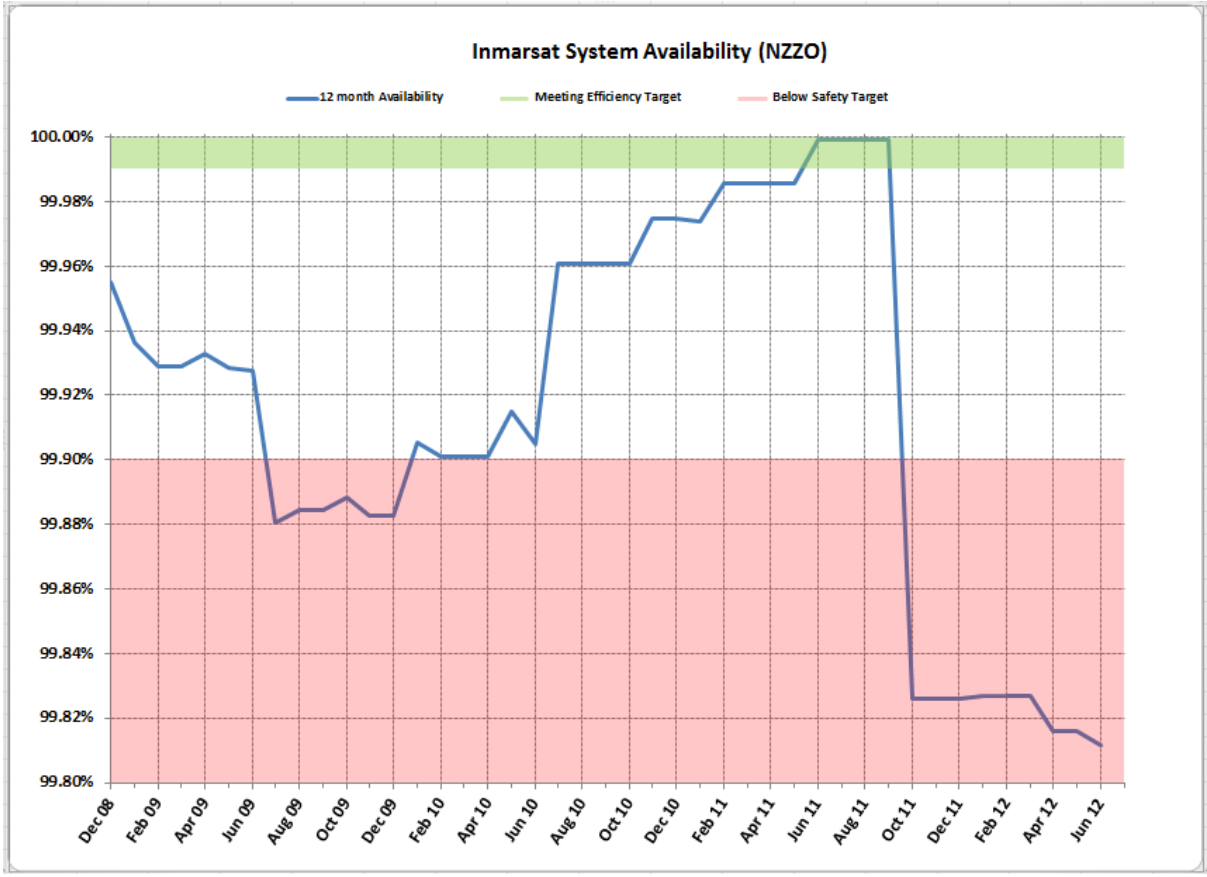

Figure 2 System Availability

2.8 There has been insufficient Iridium traffic in the Auckland FIR to provide useful performance data. However, two degradations of the Iridium network have been reported in 2012. The first was for 307 minutes in May and the second for 29 minutes in June; both were attributed to weather conditions.

2.9 Figures 3 and 4 compare the CPDLC ACTP with the continuity requirements for RCP 240 and RCP 400 respectively. Continuity is the required probability that an operational communication transaction can be completed within the communication transaction time, either expiration time (ET) or nominal time (TT 95%), given that the service was available at the start of the transaction. The 95% figure in each case represents the TT within which 95% of all transactions must

be completed; the 99.9% figure is the ET, which is the maximum time for the completion of the operational communication transaction, after which the initiator is required to revert to an alternative procedure.

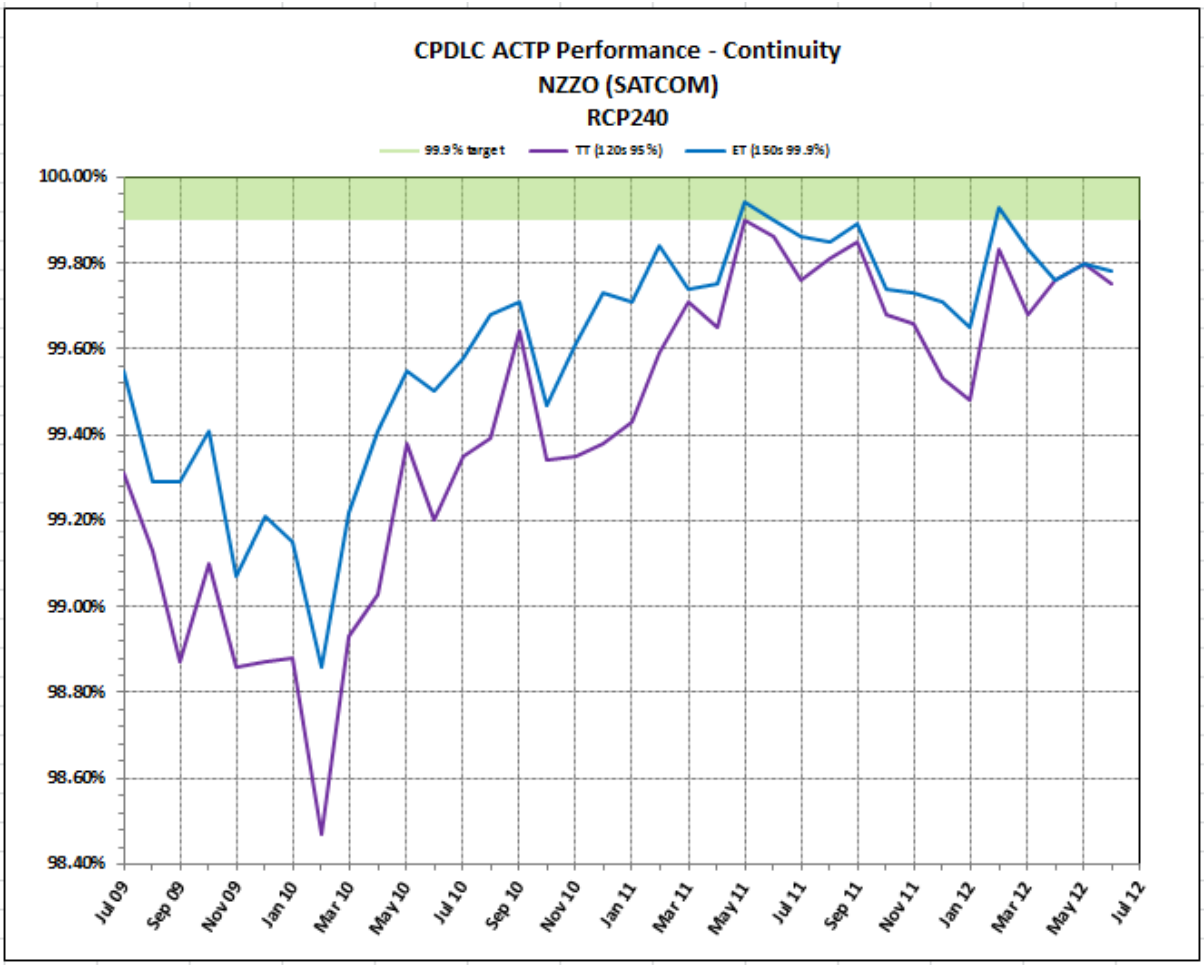

Figure 3 CPDLC ACTP for RCP 240

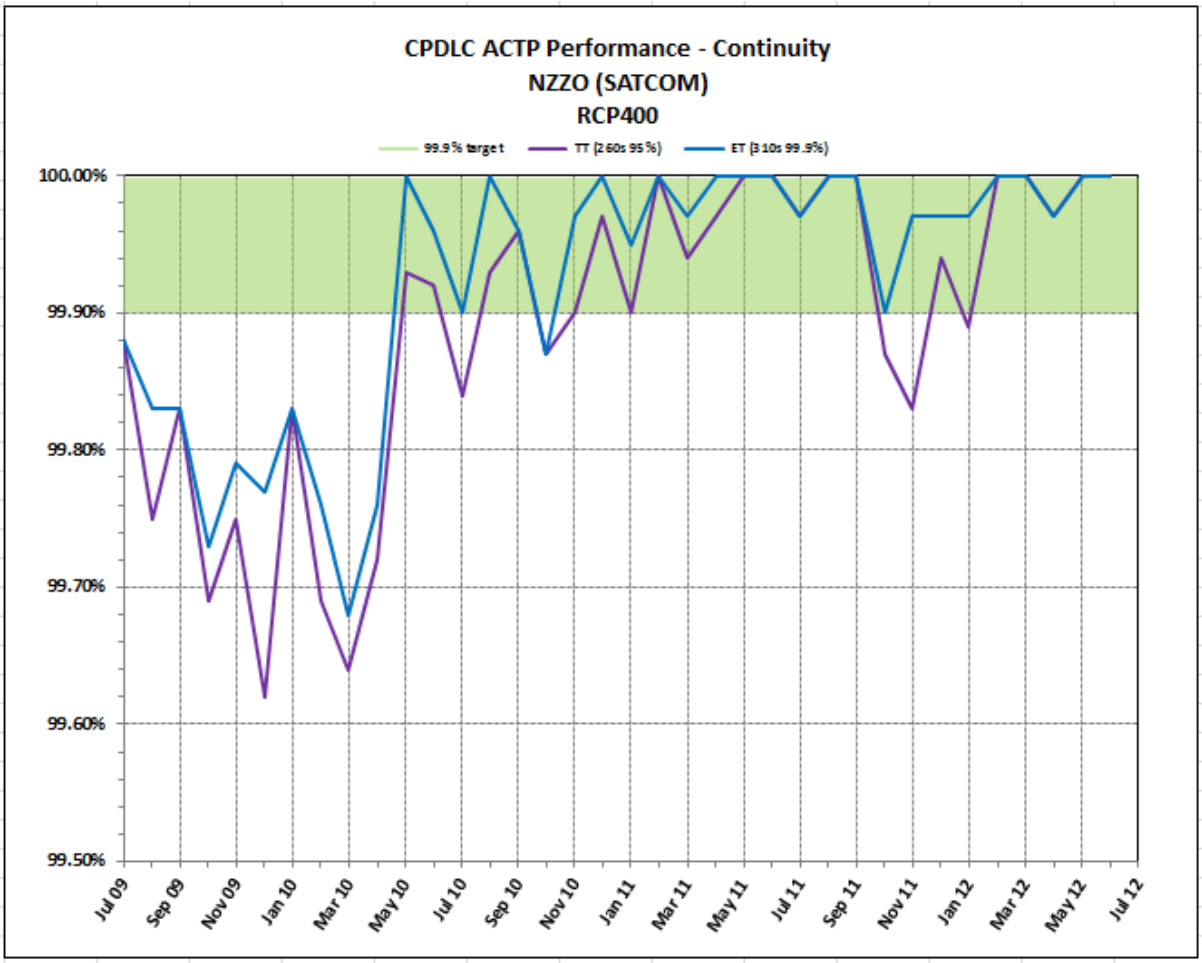

Figure 4 CPDLC RACTP for RCP 400

2.10 Figures 5 and 6 compare the ACTP TT and ET performance respectively for the 2 RCPs.

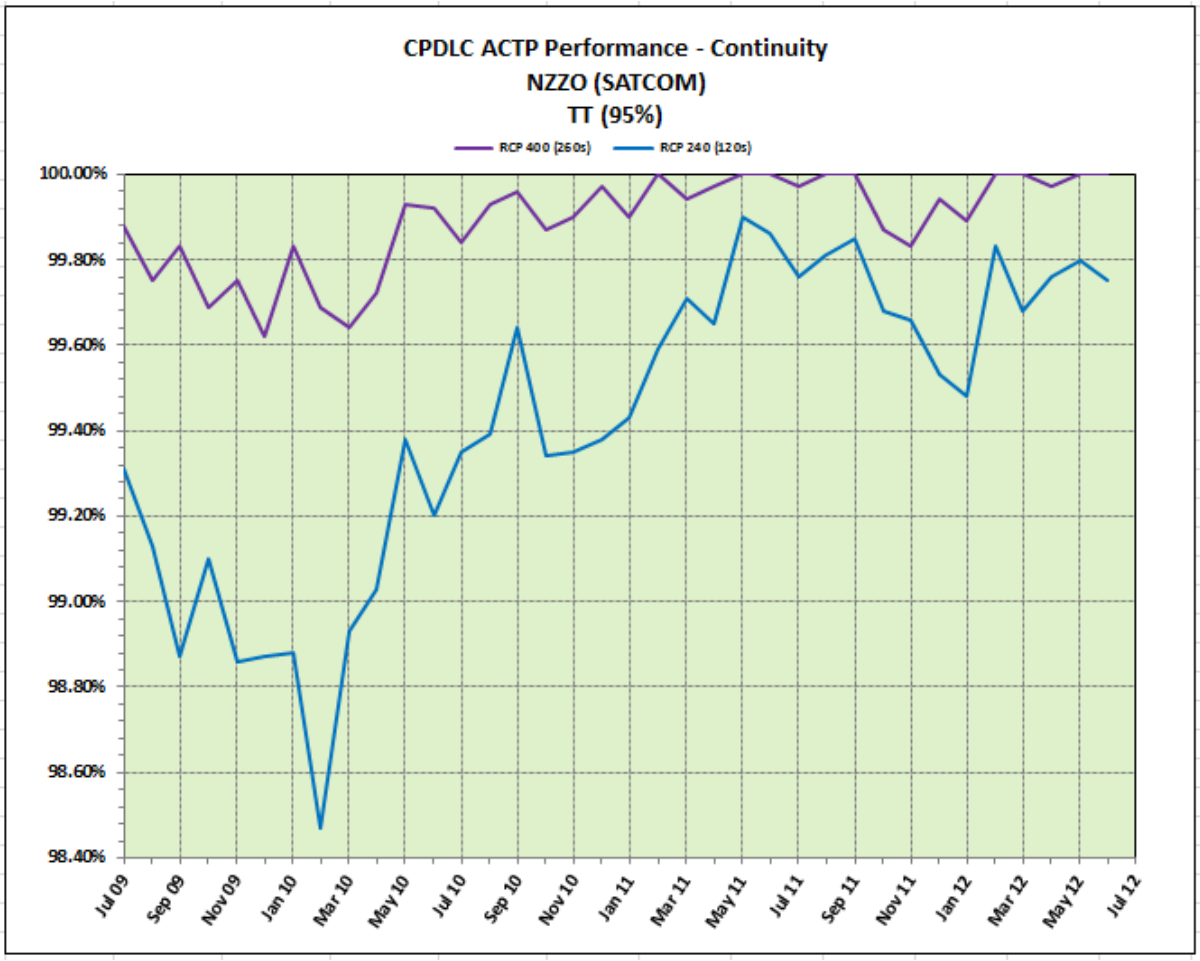

Figure 5 CPDLC ACTP Performance - TT

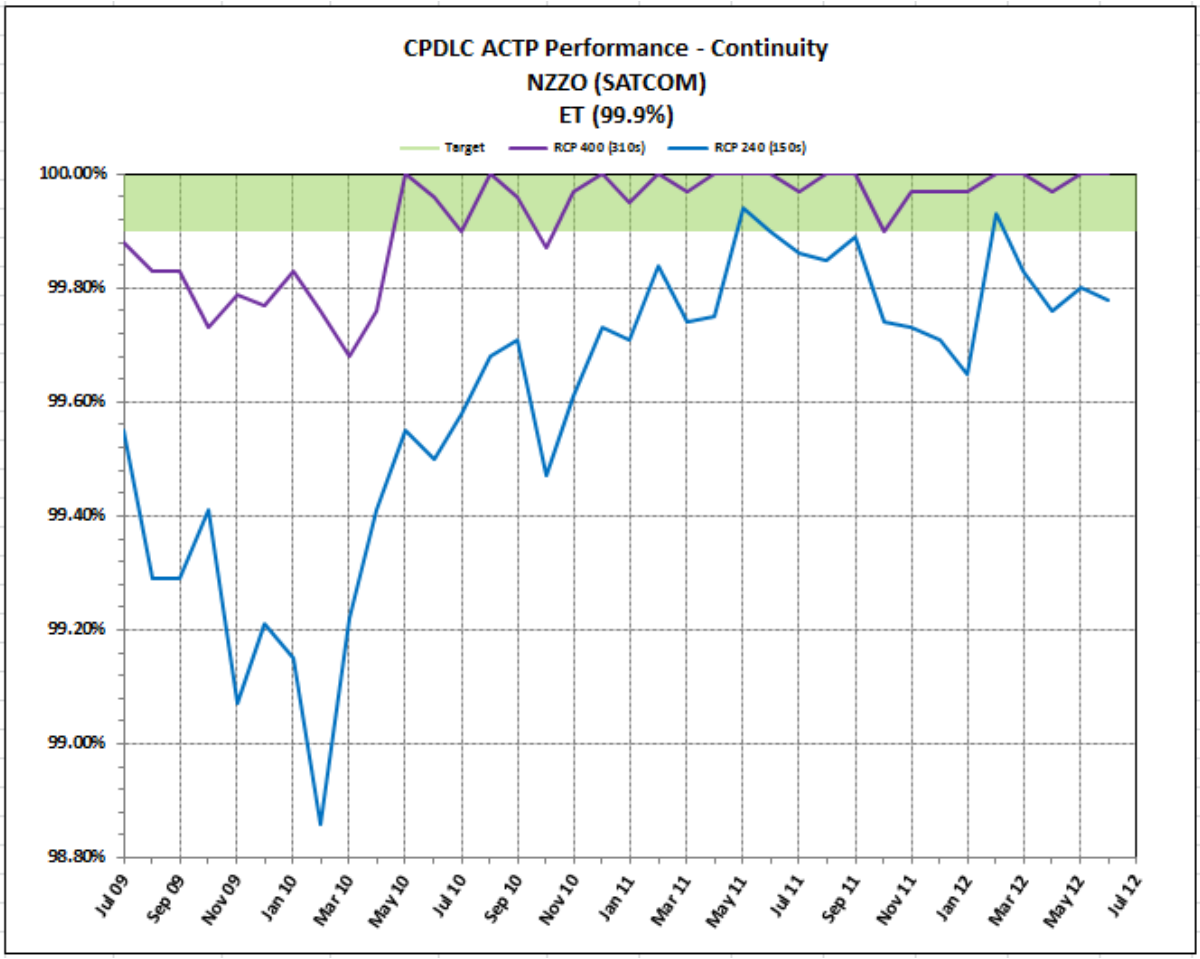

Figure 6 CPDLC ACTP Performance - ET

2.11 Continuity for both ACP and ATCP using all RGS are well above the target for TT 95%, but only the ET for ACTP 400 consistently reaches the target 99.9%.

2.12 Figures 7 and 8 compare the ADS-C downlink performance for surveillance Types 180 and 400 respectively. Continuity is the required probability that surveillance data can be delivered within the surveillance delivery time parameter, either overdue time (OT) or delivery time 95% (DT), given that the service was available at the start of delivery. The 95% figure represents the delivery time within which 95% of surveillance data is to be delivered, and the 99.9% figure represents the overdue time, which is the maximum time for the successful delivery of surveillance data.

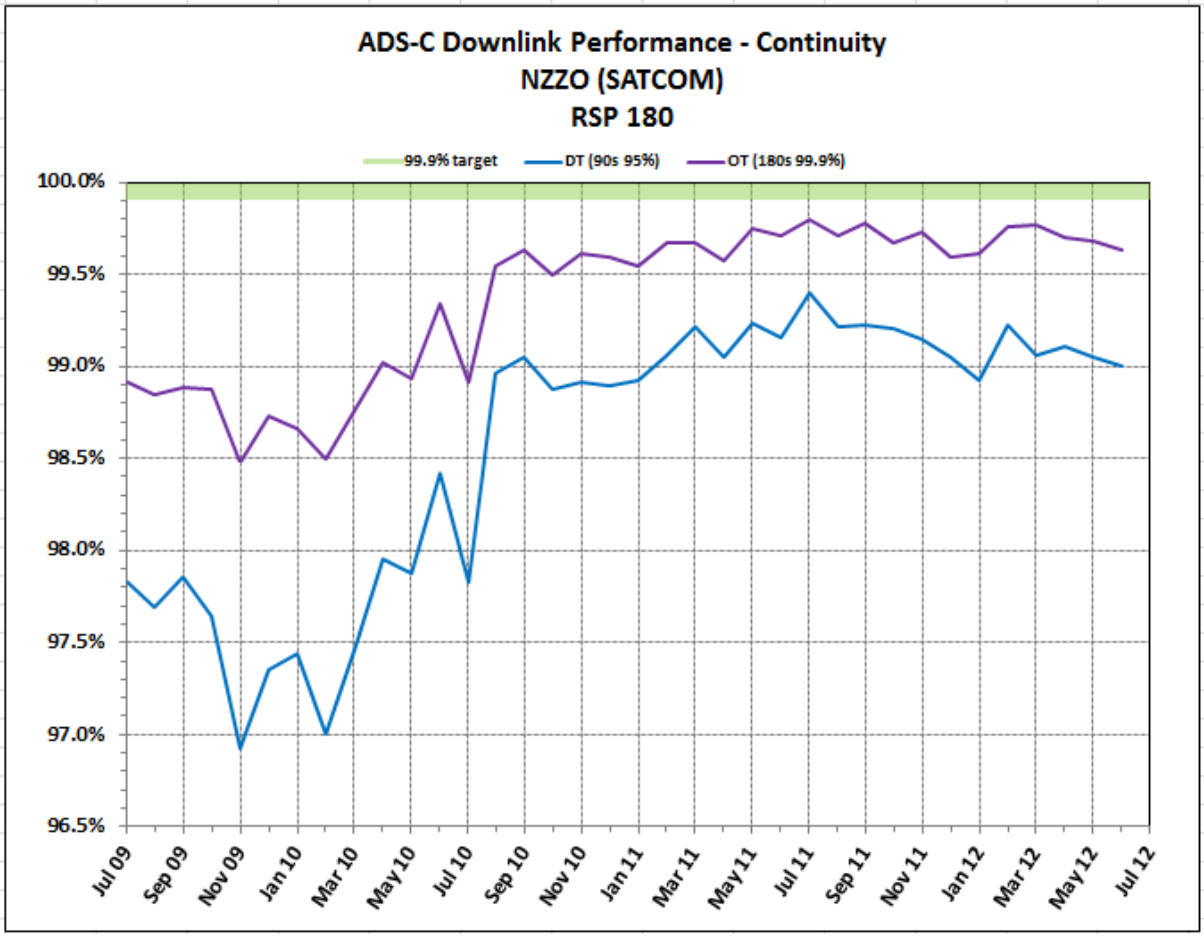

Figure 7 ADS-C Continuity Performance Surveillance Type 180

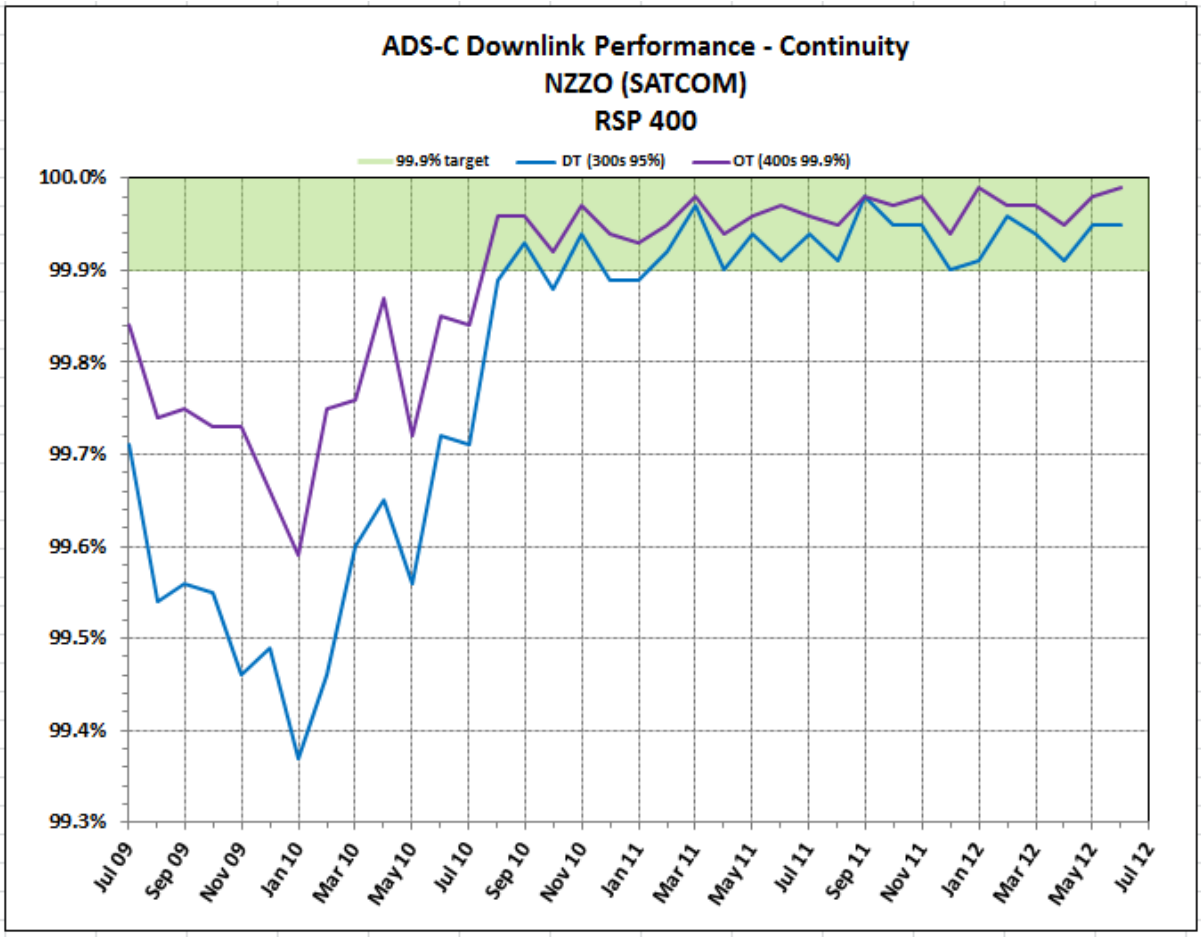

Figure 8 ADS-C Continuity Performance Surveillance Type 400

2.13 Figures 9 and 10 compare the DT and OT performance respectively for the two surveillance types.

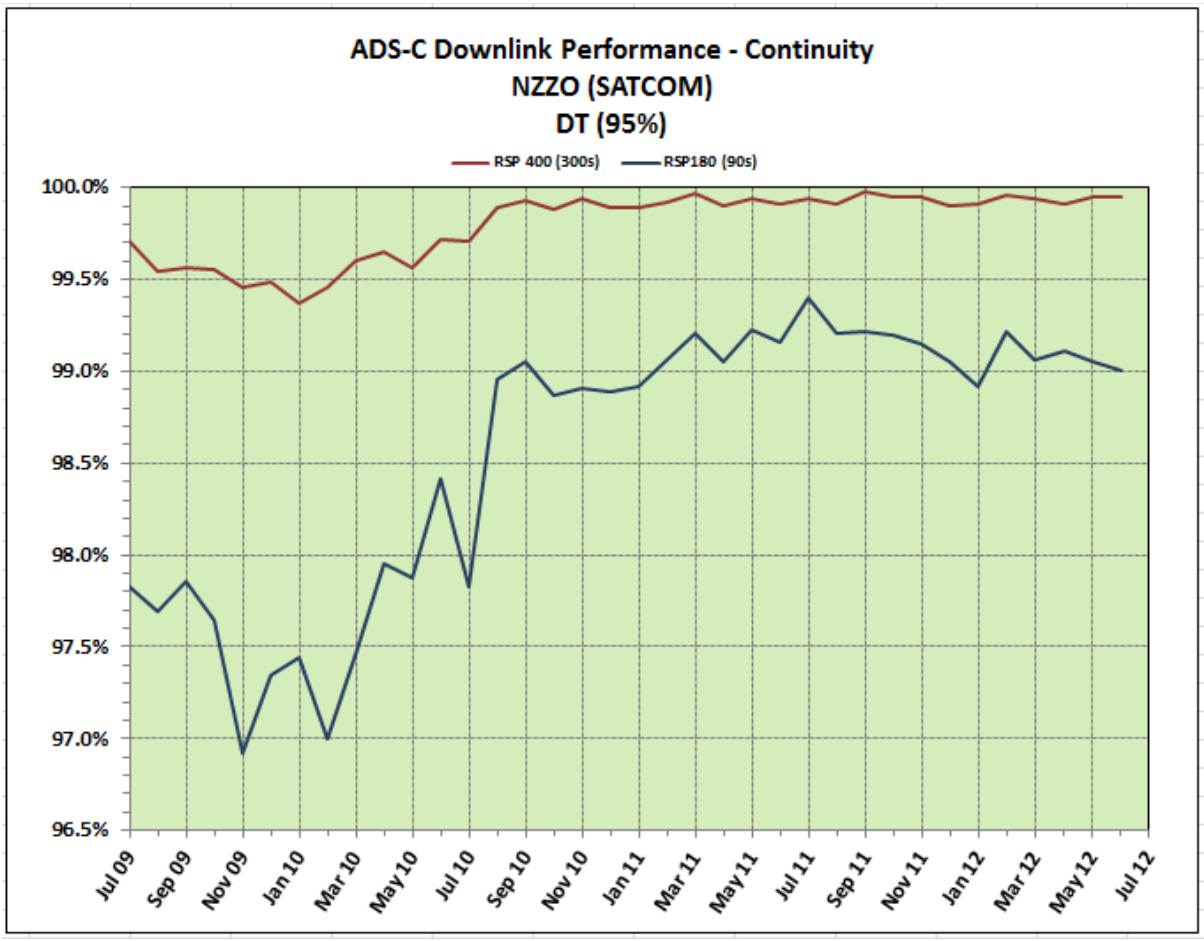

Figure 8 ADS-C Continuity Performance - DT

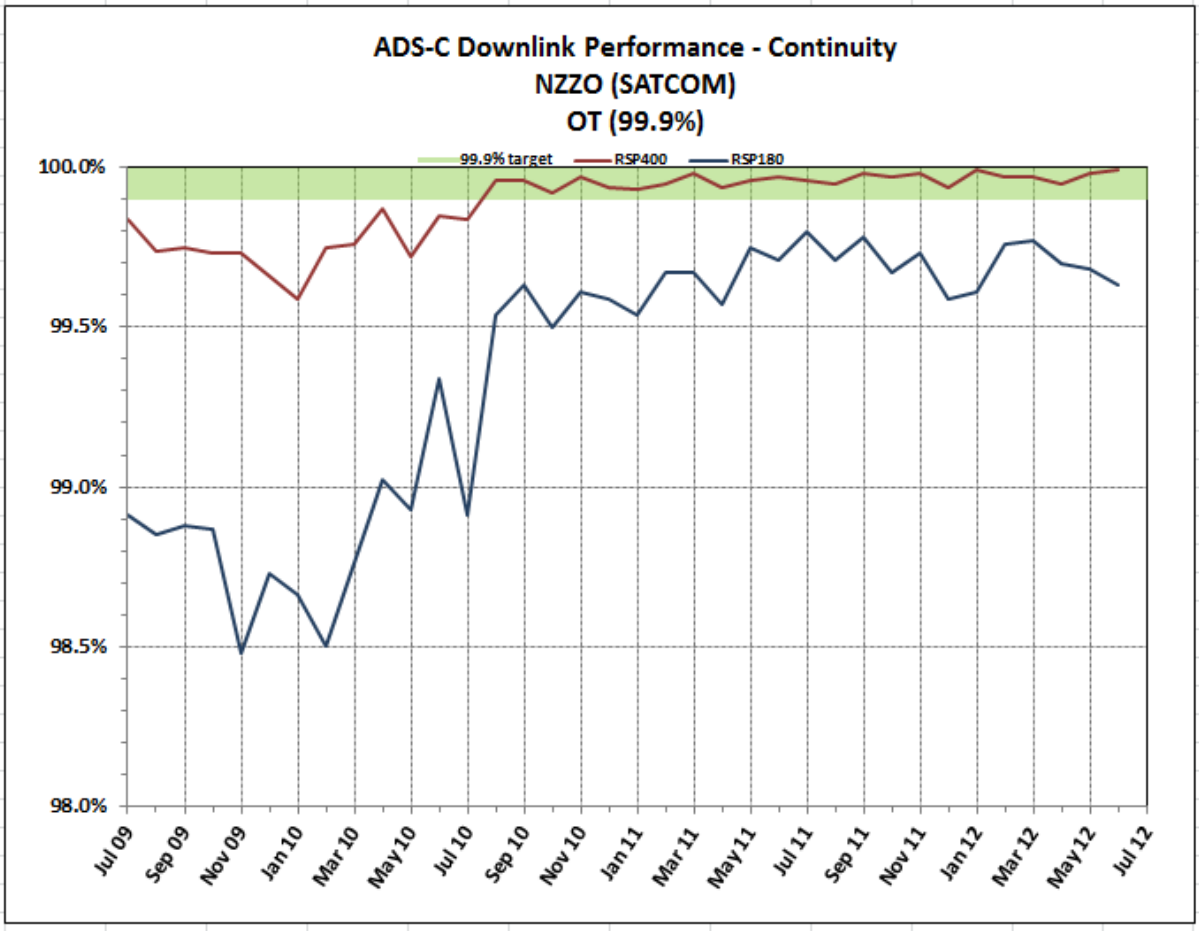

Figure 8 ADS-C Continuity Performance - OT

2.14 As with CPDLC, the continuity easily meets the target for DT 95%; however, while it almost meets the target for RSP400 OT, the RSP180 OT is hovering just below 99.8%.

2.15 The data available do not enable the outages and service delays to be attributed to specific elements of the data-link path (i.e. ANSP, CSP, VHF/HF/satellite, aircraft system).

3 Conclusion

3.1 While the safety targets for network availability are being achieved at present, it is clear that considerable improvement is necessary if the efficiency target is to be met. The efficiency target supports operational efficiency and orderly flow of air traffic.

3.2 The nominal times for CPDLC and ADS-C continuity are being achieved, but some improvement is necessary to reach the target for expiration time for CPDLC and delivery time for ADS-C.

3.3 While this paper relates to the Auckland Oceanic FIR, anecdotal evidence suggests that similar results apply across the region.

4 Recommendation

4.1 The meeting is invited to note the contents of this paper.

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