



International Civil Aviation Organization

**The Sixteenth Meeting of the Regional Airspace Safety Monitoring
Advisory Group (RASMAG/16)**

Bangkok, Thailand, 20 – 24 February 2012

**Agenda Item 5: Airspace Safety Monitoring Activities/Requirements in the Asia/Pacific
Region**

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 One of the tasks of the RASMAG is “to review the safety monitoring programmes in the Asia and Pacific Regions for implementation and operation of aircraft separation applications using data link”.
- 1.2 The monitoring work is undertaken by the Central Reporting Agencies (CRAs) of the Asia Pacific Region. However, very little reporting has been made available to the RASMAG.

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 both as monthly performance data and as long-term performance trends (the latter based on earlier work by RASMAG).

2.4 This paper presents the performance trends rather than monthly performance.

3 Inmarsat Performance

3.1 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 minutes total outage in a 12 month period, and the efficiency target is a maximum of 52 minutes total outage with no more than 4 outages of greater than 10 minutes in a 12 month period.

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

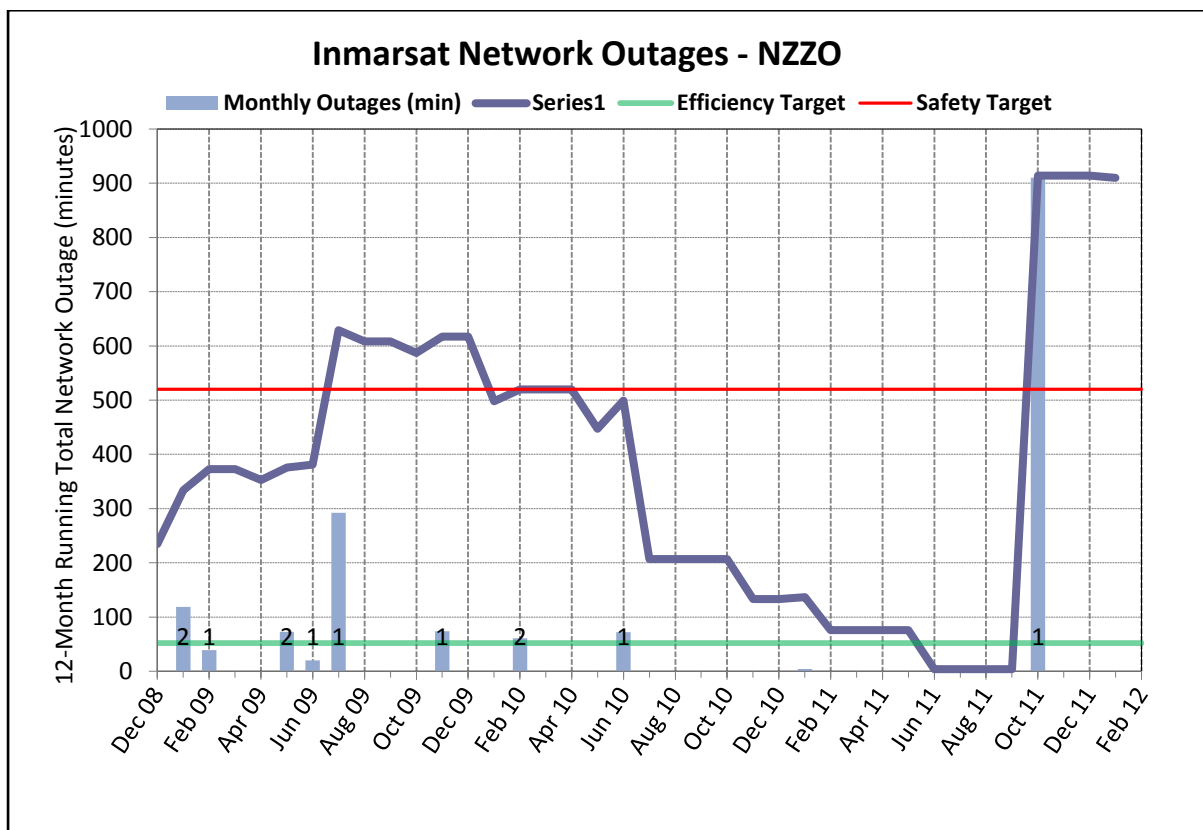


Figure 1 Inmarsat Network Outages

- 3.3 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). Inmarsat and the communication service providers are analyzing the event to improve the contingency processes.

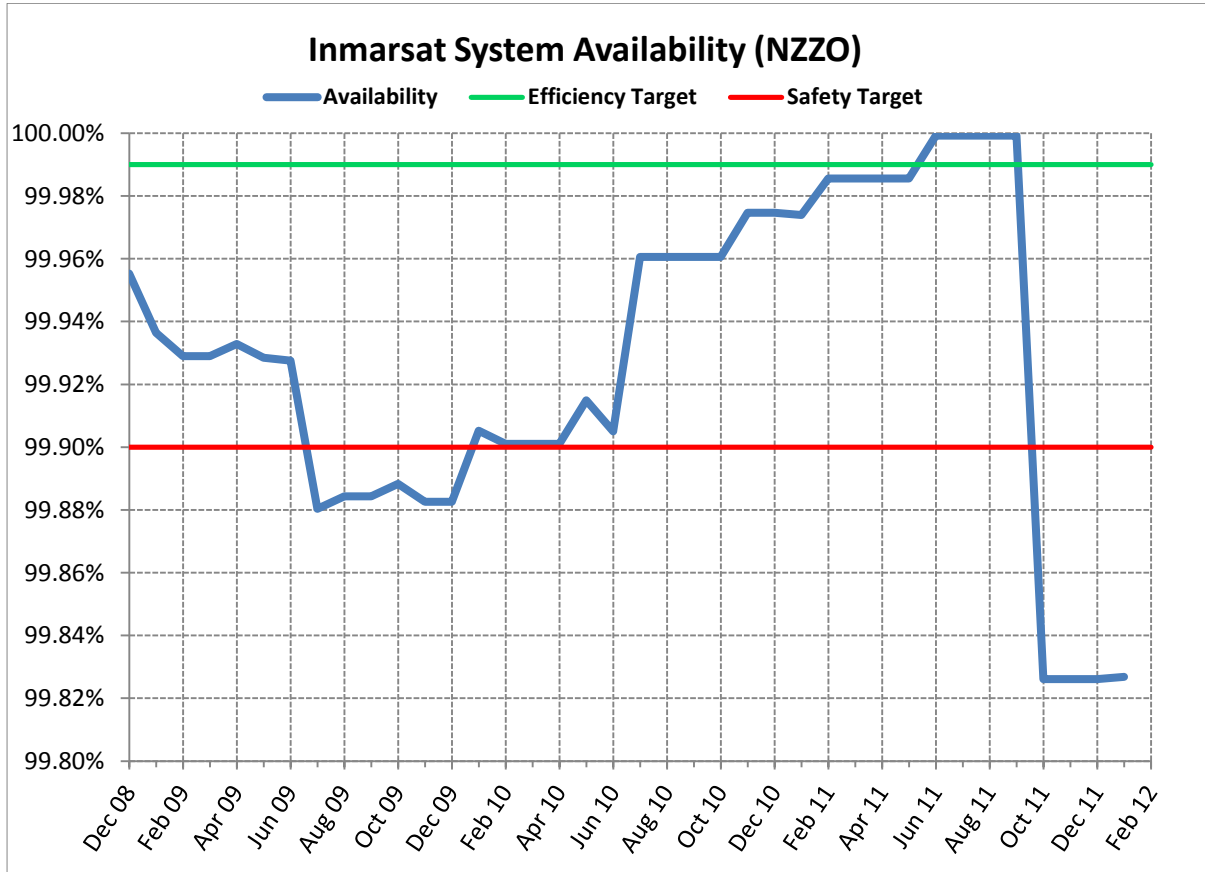


Figure 2 System Availability

- 3.4 It should be noted that 99.999% availability was achieved in June 2011 and maintained for 4 months before this single outage. This outage was the first since June 2010.
- 3.5 Figure 3 compares the CPDLC ACP with the continuity requirements for RCP 400 and RCP 240. 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.
- 3.6 It should be noted that the ACP includes the pilot operational response time for which 60 seconds is allowed. Figure 4 shows the same parameters for the actual technical communications performance (ATCP), which does not include the pilot response time. In practice, achievement of the 60 second pilot response time is about 97%.
- 3.7 Continuity for both ACP and ATCP using all RGS are well above the target for TT 95%, but only the ATCP ET for RCP 400 currently meets the 99.9% target.

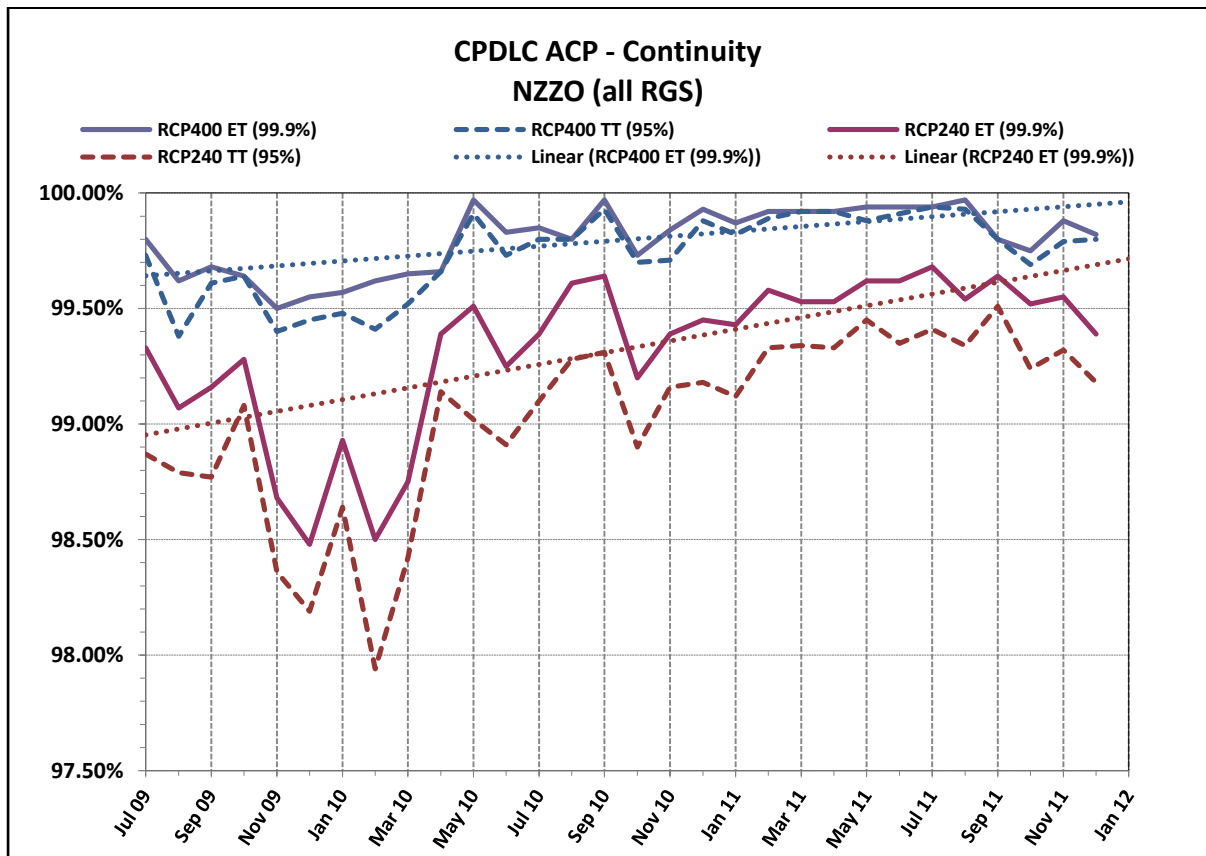


Figure 3 CPDLC Continuity Performance – ACP

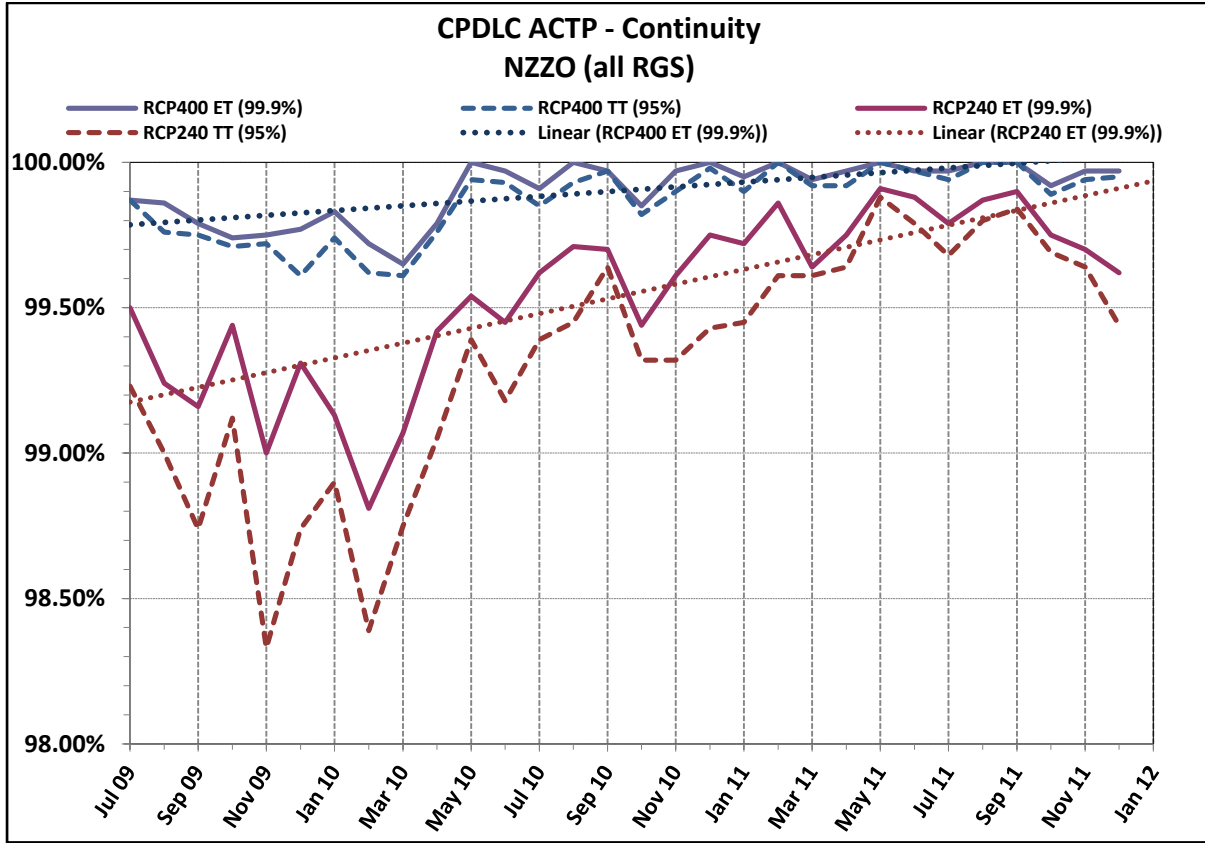


Figure 4 CPDLC Continuity Performance – ATPC (all RGS)

3.8 Figure 5 compares the ADS-C downlink performance with the continuity standards for surveillance Types 400 and 180. Continuity is the required probability that surveillance data can be delivered within the surveillance delivery time parameter, either overdue time (OT) or delivery time (DT), given that the service was available at the start of delivery. The delivery time is that within which 95% of surveillance data is to be delivered, and the overdue time is the maximum time for the successful delivery of surveillance data.

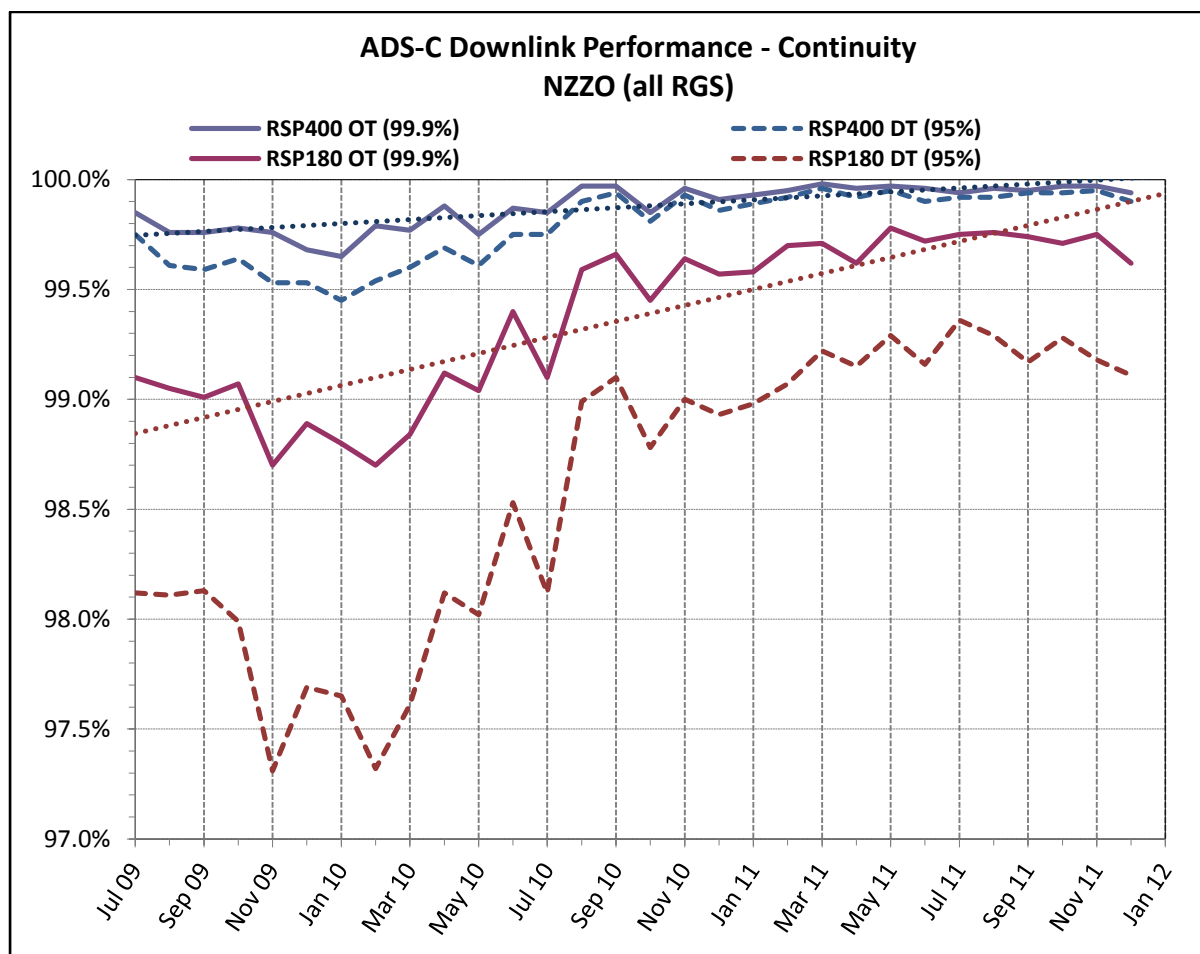


Figure 5 ADS-C Continuity Performance (all RGS)

- 3.9 As with CPDLC, the continuity easily meets the target for DT 95%; however, while it meets the target for RSP400 OT (achieving 99.94%), only 99.62% is achieved against the RSP180 OT.
- 3.10 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).
- 3.11 The graphs above indicate that continuity performance for both CPDLC and ADS-C has remained fairly constant for the last 12 months.

4 Iridium Performance

- 4.1 There has been some use of the Iridium network within the Auckland FIR, and monitoring of performance has begun. Since July 2011, 484 minutes of weather related outages at the Tempe GES have been notified; there were 6 outages, ranging from 1 minute to 304 minutes. The 99.9% safety target requires total outage of no more than 520 minutes in any 12-month period.
- 4.2 The outage notifications were not specific and usually just referred to “degraded” operations.
- 4.3 As the sole data connection to the Iridium satellite network, the Tempe GES is a single point of failure for the Iridium network. A second data GES is being considered to improve network reliability.

5 Conclusion

- 5.1 The single major satellite outage to the Inmarsat network has reduced the availability below the safety target of less than 520 minutes total outage per year. Until this event, the efficiency target had been met for 4 months.
- 5.2 The nominal times for CPDLC and ADS-C continuity are being achieved, but some improvement is necessary to reach the target for expiration time.
- 5.3 Availability of the Iridium network appears likely to be compromised by the single point of failure at the Tempe GES.
- 5.4 While this paper relates to the Auckland Oceanic FIR, anecdotal evidence suggests that similar results apply across the region.

6 Recommendation

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

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