Twenty Second Meeting of the
Informal South Pacific ATS Co-ordinating Group (ISPACG/22)
FANS Interoperability Team Meeting (FIT/15)

Papeete, Tahiti, 11-12 March 2008

Agenda Item 6: Enhanced ATSU Monitoring

Effect Of Multiple Downlinks On Data Link Performance

Presented by Airservices Australia

SUMMARY

This working paper provides information concerning how the transmission of multiple ADS-C reports has an effect on data link performance.

1. Introduction

1.1 During an investigation into a data link problem report, a discrepancy was observed between the time of receipt of a number of identical ADS-C waypoint reports that were transmitted to both Brisbane and Melbourne centres. Whilst there were only a small number (4) of identical reports, was noted that ADS-C reports transmitted to YBBB were received between 18 and 28 seconds earlier than the same report being received by YMMM.

2. Discussion

2.1 As a result of this discrepancy, an analysis was made of ADS-C reports received by YBBB and YMMM. The study involved extracting identical reports from the data link logs of both ATSUs, and comparing the time stamps. The study was limited to ADS-C WCE reports because the 'trigger event" for the report being sent to both ATSUs should be the same (i.e. sequencing the waypoint – the probability of identical periodic reports being transmitted is remote)

2.2 The study was based on ADS-C reports received in October 2007. The results are depicted graphically below.

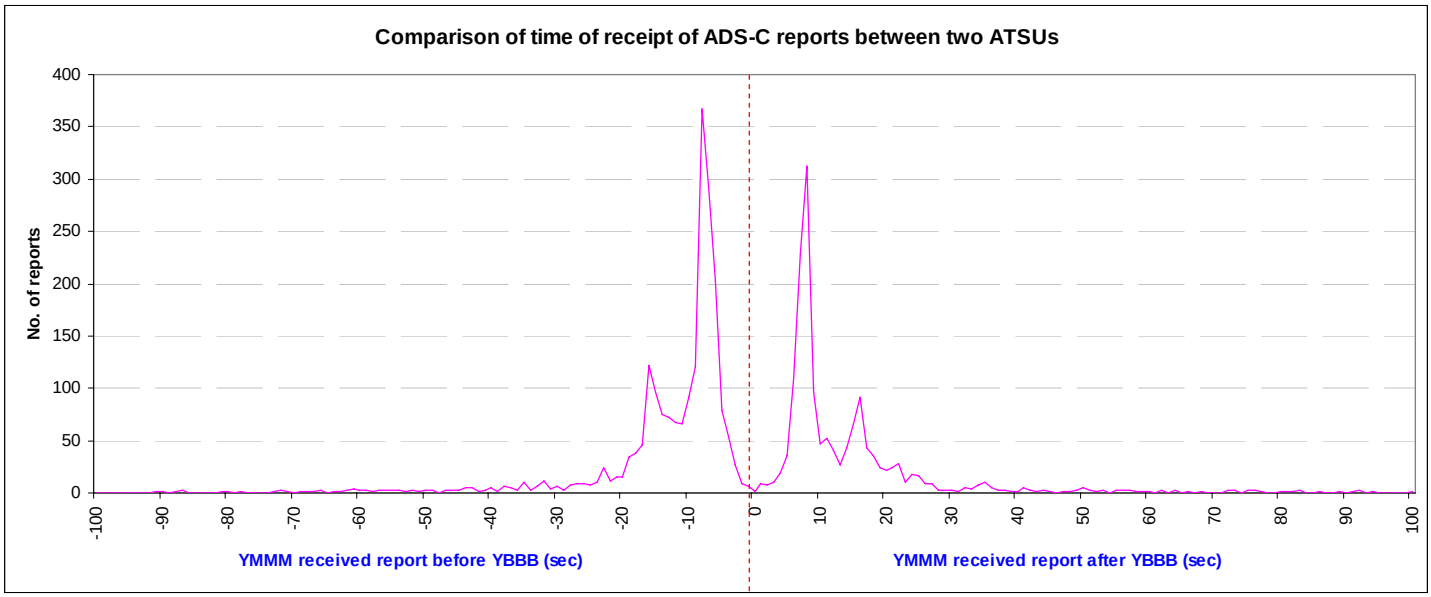

Figure1. Graph comparing transmission delays for identical ADS-C reports

2.3 Negative values (to the left of the red vertical dashed line) indicate that the ADS-C report was received by YMMM before it was received by YBBB. A positive value indicates that YBBB received the ADS-C report first.

2.4 The symmetric nature of the distribution indicates that the difference in transmission delays is not a random event. Liaison with Boeing indicates that when the avionics transmit only a single ADS-C reports at a time. If multiple reports are required to be transmitted they are buffered, and the next report is transmitted when an acknowledgement is received for the first ADS-C report. It is believed that the order of transmission of the reports is based on the order in which the ADS connections were established.

2.5 The large "spike" (± 8 seconds) is typical of the delays that might be observed when VHF data link is in use, and the smaller "spike" (± 16 seconds) is typical of Satcom data link delays.

2.6 No breakdown of data into different aircraft types and/or airlines has yet been conducted, however this could be useful when comparing different aircraft types, components and operational settings as described in FIT WP/05.

2.7 While this analysis is based on waypoint reports, it also provides an indication of the possible effect of higher than required ADS-C reporting rates, especially if an aircraft has ADS contracts with multiple units (e.g. in proximity to an FIR boundary).

3. Action by the Meeting

3.1 The meeting is invited to note the overall effect on ADS-C performance when the avionics are transmitting multiple ADS-C reports.