Twenty Fifth Meeting of the
Informal South Pacific Air Traffic Services Co-ordinating Group
(ISPACG/25)

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FANS Interoperability Team Meeting (FIT/18)

Honolulu, Hawaii, USA, 22-23 March 2011

Agenda Item 4: Working Papers

A380 PERFORMANCE

Presented by Airbus

SUMMARY

This paper is an answer to the Airways Corporation of New Zealand document: "A388 Performance Review, FANS1/A Performance" dated Sept 2010. The goal is to provide some explanations and corrective actions launched to improve the performance of the A388 FANS A+ system.

1.   INTRODUCTION

1.1   In September 2010, ACNZ issued a document "A388 Performance Review, FANS 1/A Performance" which showed that the A380 FANS A performance in the South Pacific happened to be below both that observed from the A340 fleets and more importantly, below that needed to satisfy all of the safety and performance requirements defined in the Oceanic Safety and Performance Standard (Oceanic SPR) for the application of the reduced distance based separation standards.

1.2   The goal of this paper is to answer the questions (points and recommendations) raised in the ACNZ document, to give some explanations to the issues raised and to report on the corrective actions Airbus has planned to implement on the A380 fleet.

2.   DISCUSSION

2.1   Recommendation 1: Ground system software.
An issue with Airways OCS, latency delays introduced by a significant increase in message traffic caused by looping of the AFN address forwarding process during short sector transits of the Nandi FIR. Airways should have initiated a software upgrade that will resolve the looping issue. The issue is being tracked through the ISPACG CRA using the FANS problem report process.
No Airbus action at that stage.

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2.2   Recommendation 2: Overall performance.
While overall performance has generally improved for the A388 fleets further performance improvements are required to enable these fleets to meet RCP240 and type 180 requirements.
As a preliminary remark, Airbus notes that Data3 fix on GES should significantly enhance the SATCOM performance.
In addition, a continuous Airbus action has been launched to :
- Monitor in service performance
- Improve Data link Comm means design when required.
For future SATCOM (after SBB Mod B L4 delivery), additional efforts will be done with suppliers to ensure Data3 / Data2 segregation and limit effect on RCP compliance for Satcom. This will be common with A330/340 fleet.

HFDL Performance
50 % HFDL issues have been solved on A380 through:
- Technical and industrial improvements (HFDR couplers, feeders, antenna bondings, connector changes...)
- FCOM update (October 10) to recommend HF1 as data radio
- Airlines maintenance recommendations for HFDR
In addition, a new coupler rack design has been launched.

2.3   Recommendation 3: ADS-C Performance
Airways will complete another performance review in twelve months time (Sept 2011). Stakeholders should continue attempts to identify the cause of the top end delays.
A continuous Airbus action has been set up to monitor in service performance and to improve Data link Comm means design when required.

2.4   Recommendation 4: CPDLC Performance
Airways will complete another performance review in twelve months time.
Stakeholders should attempt to identify the cause of the top end PORT delays because of their negative impact on ACP
Airbus FANS A/A+ Training aids do specifically recommend a crew prompt answer to any CPDLC uplink messages. Such a recommendation is regularly raised during Airbus Operational conferences.

2.5   Recommendation 5: Impact of HFDL
The use of HFDL should be re-evaluated by the A388 airlines if they aim to achieve the RCP240 requirement.
An important survey has been done within Airbus to assess the current FANS A/A+ logics to automatically switch from Satcom to HFDL communications medium to sustain ADS-C or CPDLC message exchanges whenever the Satcom is already in use (so-called Next On Busy function). The appendix gives details of the study, the results of which are the following:
NOB Satcom => HF does not impact significantly the RCP compliance. Our detailed analysis shows:

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- 1 ADS-C report having used the NOB Satcom => HF mechanism among a total of approx 1400 ADS-C reports in our analysis (i.e. 0,07 %) was not compliant with RSP180 (99,9%), where it would have been compliant if NOB Satcom => HF had not been used.
- 6 ADS-C report having used the NOB Satcom => HF mechanism among a total of approx 1400 ADS-C reports in our analysis (i.e. 0,43 %) were not compliant with RSP180 (95%), where they would have been compliant if NOB Satcom => HF had not been used.
- 1 CPDLC transaction having used the NOB Satcom => HF mechanism among a total of approx 380 CPDLC transactions in our analysis (i.e. 0,26 %) was not compliant with RCP240 (95%), where it would have been compliant if NOB Satcom => HF had not been used.

2.6   Recommendation 6: Qantas latency.
The specific ACARS channel speed used on the QANTAS A388 fleet should be reviewed. If the fleet is currently using the high speed channels then further investigation is needed to explain the performance difference.
The QFA Satcom ORT reconfiguration table does not show significant difference with UAE equipage. The difference might be due to a significant use of Data3.

2.7   Recommendation 7: Reduced distance based separation.
Airways have reviewed the performance data and will continue to apply reduced distance based separations in the Auckland FIR at this time.
No specific Airbus action.

2.8   Recommendation 8: Near boundary latency delays.
Airways will investigate ways to reduce the use of waypoint event reports for flights departing NZZO airspace.
No specific Airbus action.

3.   ACTION BY THE MEETING

3.1   The meeting is invited to:

   a)   Take note of the Airbus answers to improve the A388 Datalink Performance.

   b)   [*Any additional actions required?*]

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APPENDIX
Next On Busy Function:
Airbus study on the contribution of the NOB to FANS performance

1.1. The following details the analysis that has been conducted by Airbus to quantify the contribution of the Next On Busy Function to the FANS A+ performance of the A380. In particular, the goal was to assess three points:
- The amount of ATC messages sent by using the "Next On Busy" function,
- The effect of the "Next On Busy" SATCOM → HF function on RCP compliance and
- The time required to send a CPDLC downlink and receive its associated ack

1.2. The NOB function allows for CPDLC and ADS-C messages to be sent through another communications medium whenever the "normal" one is already in use. Messages are sent through VDL, Satcom or HFDL in that priority order (i.e. whenever VDL is not available because out of range or being currently used for Datalink transmission, Satcom is used, and in the same way, whenever Satcom is not available or already busy for Datalink transmission, HFDL is used).

1.3 This study was performed by analyzing FANS A+ messages exchanged between A380 aircraft and ground ATC centers during:
- 10 flights performed between Sydney (SYD) and Los Angeles (LAX) with QANTAS A380-800
- 1 flight performed between Melbourne (MEL) and Los Angeles (LAX) with QANTAS A380-800

ADS-C or CPDLC messages were sent through Next On Busy whenever:
- both VHF and SATCOM means are available, each ATC message exchanged on SATCOM link was sent by using the "Next on Busy" function,
- both SATCOM and HFDL means are available, each ATC message exchanged on HFDL link was sent by using the "Next on Busy" function.

1.4. Out of the 11 considered flights, 1989 downlink messages were sent, among which, 136 were sent via NOB function. 49 ATC messages sent by SATCOM whereas VHF was busy and 87 ATC messages sent by HF whereas SATCOM was busy. The following repartition was noted:
- 90 ADS reports (66,17%)
- 15 CPDLC (11,03%)
- 31 AFN (22,8%)

1.5. The NOB study was then focused on the switching Satcom to HFDL so as to address the impact of the function on the RCP 240. To this end, a comparison was done between the actual performance reached with the NOB activated and the estimated performance if the NOB had been deactivated.

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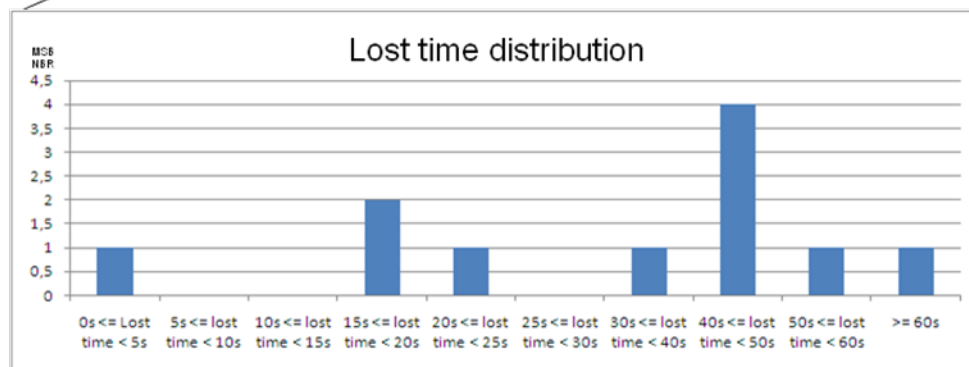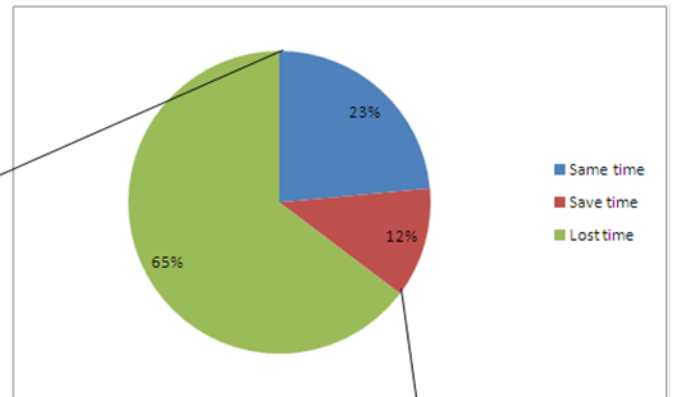**FIT/18**

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1.6 The effect of NOB Satcom => HF on CPDLC is such that it increases the time to deliver the CPDLC messages in 65% of the cases.
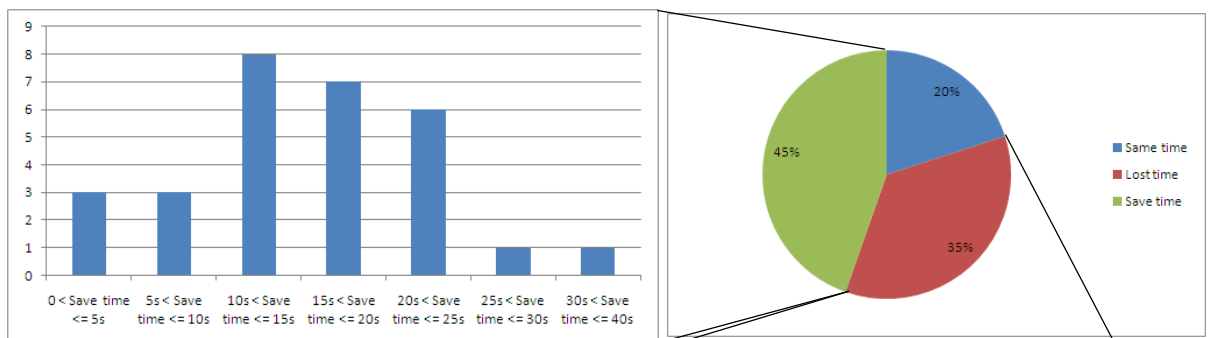

Same time = 4 messages

Save time = 2 messages (4s and 15s)
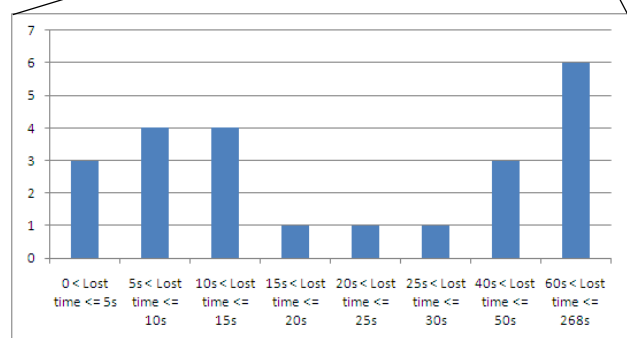
Lost time = 11 messages

No time saving thanks to NOB S → H for 65% of CPDLC studied cases

1.7 The effect of NOB Satcom => HF on ADS-C is such that it increases the time to deliver the ADS-C messages in 35% of the cases only.

No time saving thanks NOB S → H for 35% of ADS studied cases

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1.7 It is to be noted that for both CPDLC and ADS-C, whenever time is lost due to NOB, the loss is quite important whereas whenever time is gained due to NOB, the gain is somehow small. Thus, globally the NOB decreases the overall performance (because of HFDL performance on some remote oceanic areas).

1.8 But, as far as compliance with RCP requirements is concerned, NOB Satcom => HF mechanism does not impact significantly the RCP compliance.