



International Civil Aviation Organization

**SECOND SATELLITE DATA LINK OPERATIONAL CONTINUITY
MEETING TO REVIEW THE PERFORMANCE AND PROVISION OF
SATELLITE COMMUNICATIONS IN THE ASIA AND PACIFIC
REGIONS**

(Bangkok, Thailand, 8-10 February 2012)

Agenda Item 4: Global strategy for use of SATCOM data-link Services

4.3 Aircraft/operator requirements and changes

THE USE OF HF DL FOR FANS1/A IN NZZO OCEANIC FIR

(Presented by New Zealand)

SUMMARY

This paper provides an overview of current High Frequency Data-link Operations (HF DL) operations in the Auckland NZZO Oceanic FIR.

1 INTRODUCTION

1.1 A number of Airbus fleets are operating in NZZO with HF DL used in a “next on busy” mode (as coined by Airbus) to describe an architecture for ATC FANS1/A downlinks where if the SATCOM channel is busy transmitting another downlink HF DL will be used for the pending downlink message. We currently observe some A388 and A322 fleets using this architecture and have seen some A340 fleets using it in the past.

1.2 No aircraft fleets are currently operating using HF DL to replace SATCOM.

1.3 If an aircraft is logged on the uplink media priority routing used by the Communication Service Providers is 1. VHF, 2. SATCOM, 3. HF DL. Generally, this is adhered to by the CSP’s however we have filed FANS problems reports on a number of occasions that have identified uplinks sent via HF DL instead of SATCOM.

2 DISCUSSION

2.1 In 2011 NZZO observed around 1750 ADS-C downlinks via HFDL this is a small percentage of the 219,762 ADS-C downlinks received via SATCOM. In 2011 only 11 CPDLC transactions were recorded where the uplink and downlink part of the transaction were via HFDL. Total transactions via SATCOM were 27,602. This small percentage of HFDL use means that little impact is seen in overall performance when looking at ALL fleets. This is illustrated below in Figure 1.

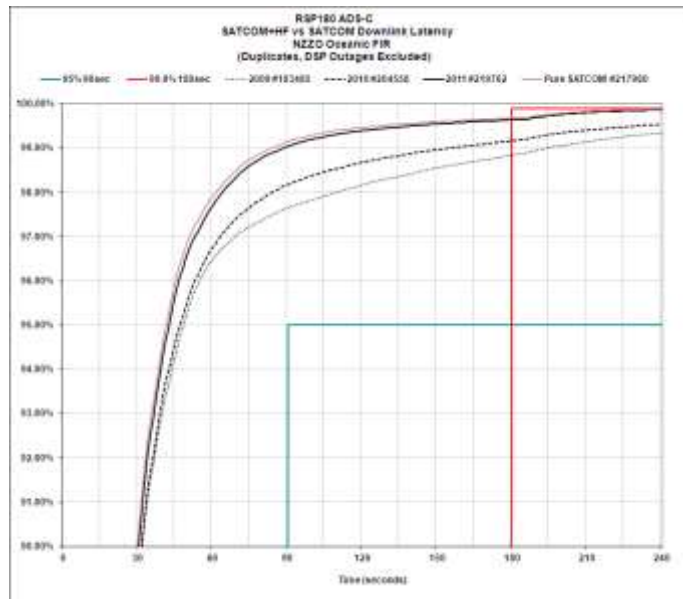


Figure 1: SATCOM+HF vs SATCOM All Aircraft

2.2 We know that HFDL on its own does not meet the RCP240/RSP180 requirements for the application of reduced distance based separations. However, the use of HFDL with SATCOM in the Airbus “next on busy” mode is close to meeting the RCP240/RSP180 requirements. All operations using SATCOM+HFDL in next on busy mode meet the 95% normal operations requirements, and reduced distance based separations are applied on these fleets.

2.3 An assessment of the impact of HFDL when used in “next on busy” mode does have a measurable impact on observed performance when performance is assessed on a fleet by fleet basis. Typically when accessing ADS-C latency HFDL degrades overall performance by around 0.2-0.5% at the 99.9% 180 second level. This is depicted in Figure 2 below which depicts two A388 fleets and 1 A332 fleet operating in NZZO during 2011.

2.4 When HFDL ADS-C performance is assessed against the RSP400 requirements our observations have shown that while the media meets the 95% normal operations requirement it is often below the 99.9% requirements. This is illustrated in Figure 3 below. While we have small numbers of data points to measure when compared with SATCOM or VHF we have been observing the performance of HFDL for a long time. On a number of occasions we have had instances where HFDL became the primary media either because of onboard SATCOM failure or the satellite failure last year. Observed performance of HFDL on these occasions has been variable to say the least.

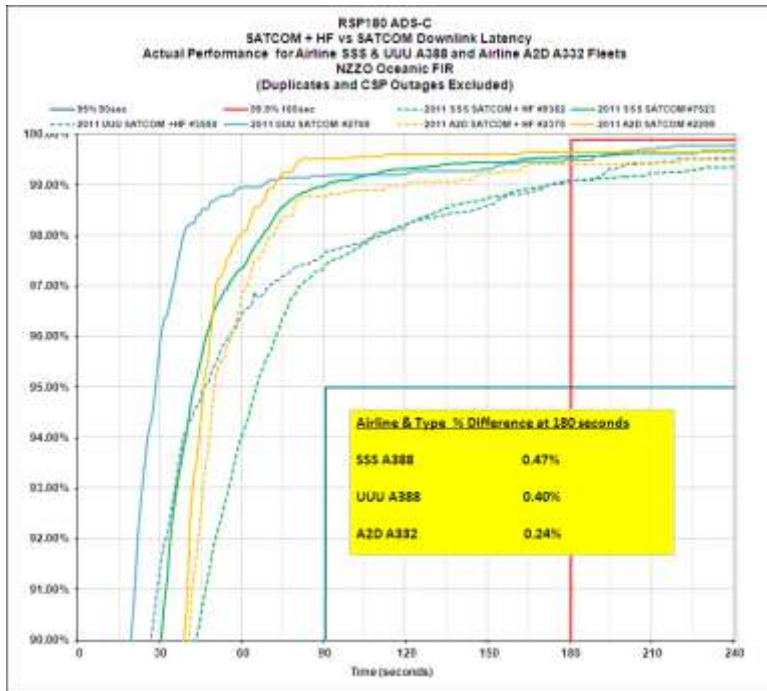


Figure 2: SATCOM+HF vs SATCOM Individual Fleets

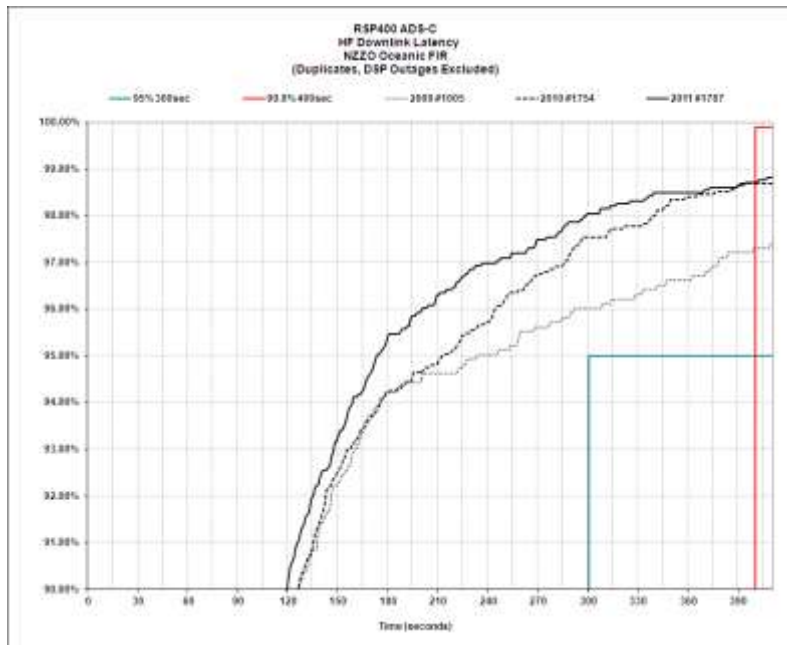


Figure 3: HFDL and RSP400

2.5 The information below is extracted from an Airways NZ analysis of the Inmarsat I3 outage in the Pacific Ocean Region in October 2011.

2.5.1 During the outage one A332 and one A388 that were operating SATCOM + HF DL continued on HF DL. Only 1 CPDLC transaction was completed using HF DL during the outage with an ACP of 201 seconds which is within RCP240/400 requirements.

2.5.2 16 ADS-C downlinks were received via HF DL during the outage. Using RSP400 requirements only 75% of messages achieved the 300” 95% normal operations requirement while only 81% of messages achieved the 400” 99.9% requirement. Using RSP180 requirements only 38% of messages achieved the 90” 95% normal operations requirement while only 50% achieved the 180” 99.9% requirement. HF DL ADS-C latency during the outage failed to meet either the RSP180 or RSP400 criteria.

2.6 In 2010 an aircraft lost SATCOM during flight and reverted to HF DL the performance observed during that flight was also below RSP400 and is depicted in Figure 4 below.

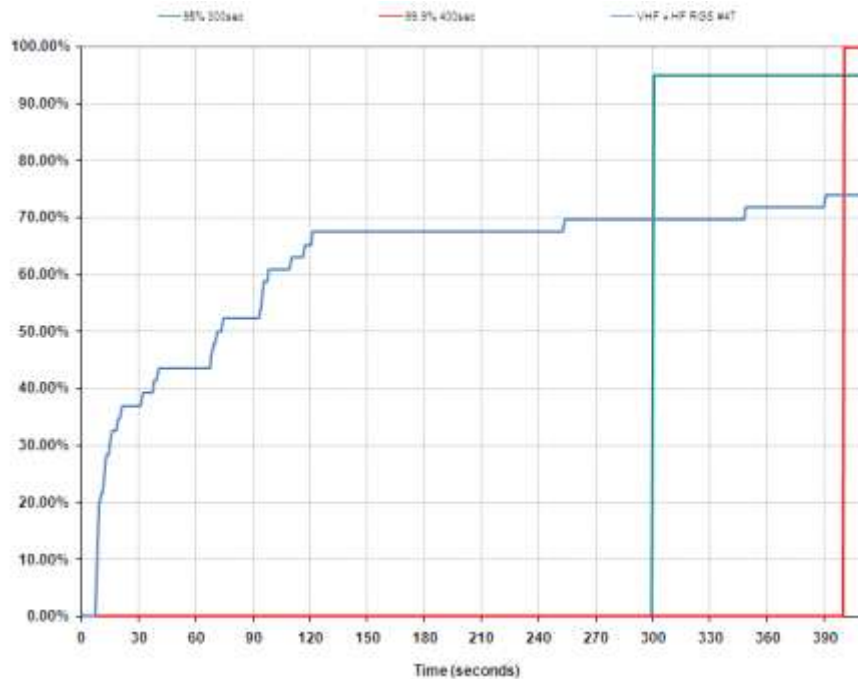
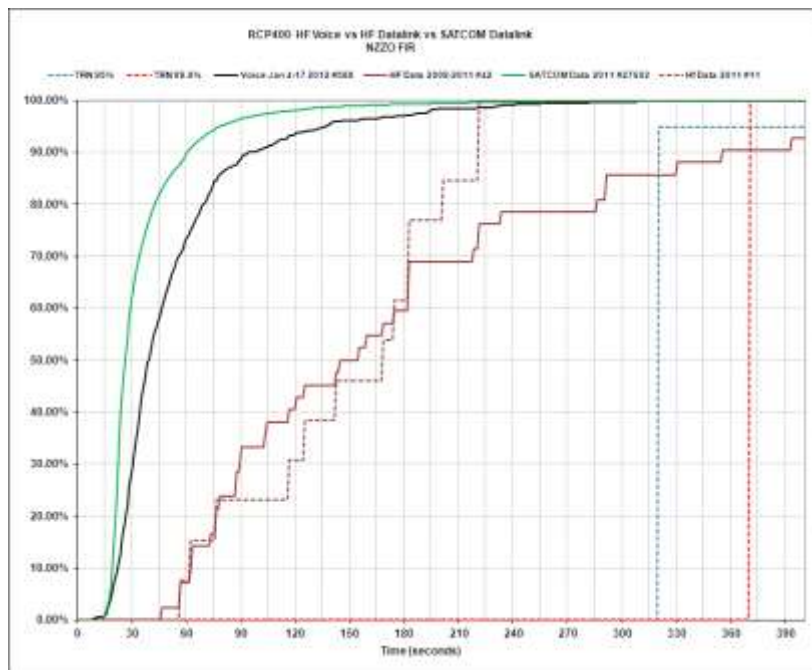


Figure 4: Observed RSP on HF DL after SATCOM failure

2.7 Performance of CPDLC via HF DL is difficult to measure in NZZO simply because of the small number of transactions. Figure 5 below illustrates observed HF DL performance for CPDLC based on transactions received from 2008-2011, against the small number of transactions observed in 2011, and compares these with RCP of HF Voice transactions and SATCOM.



3 ACTION BY THE MEETING

3.1 The Meeting is invited to note the information in this paper.

FANS1/A HFDL Performance NZZO

SOCM

Bangkok, Thailand, 9-10 February, 2012

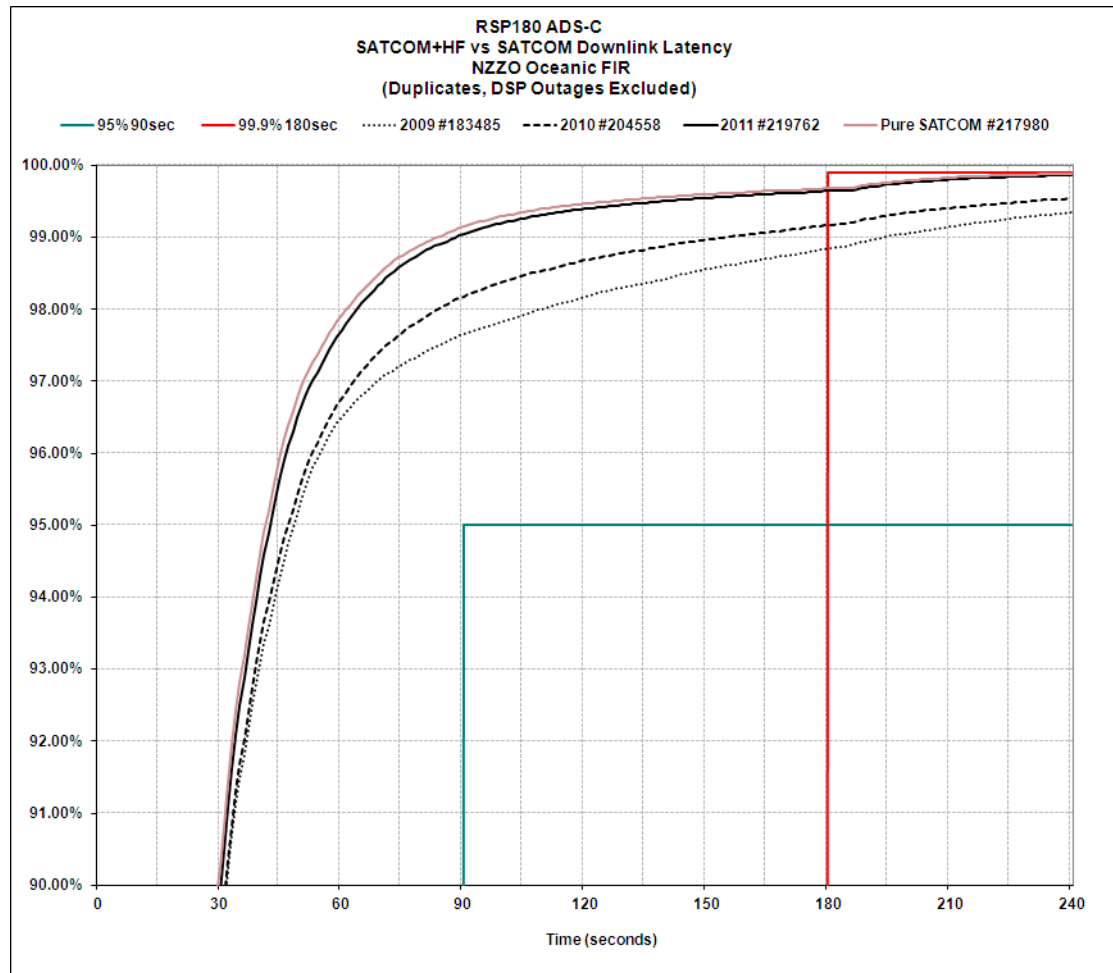


Introduction

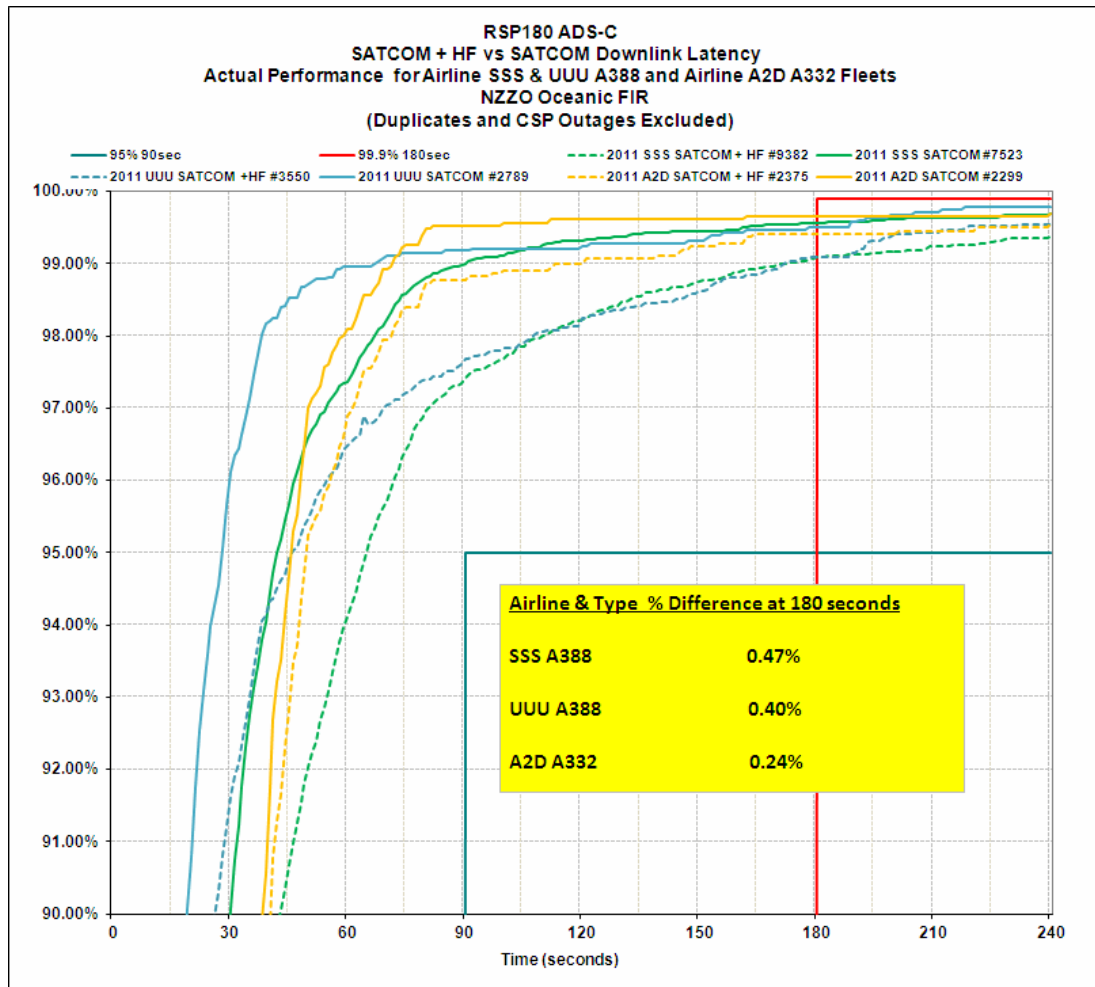
- **No aircraft fleets are currently operating using HF DL as primary media.**
- **A number of Airbus fleets are operating with HF DL used in “next on busy” mode for ATC FANS1/A downlinks where if the SATCOM channel is busy transmitting another downlink HF DL will be used for the pending downlink message.**
- **If an aircraft is logged on with SATCOM all FANS1/A uplinks are required to be sent via SATCOM if no VHF is available.**



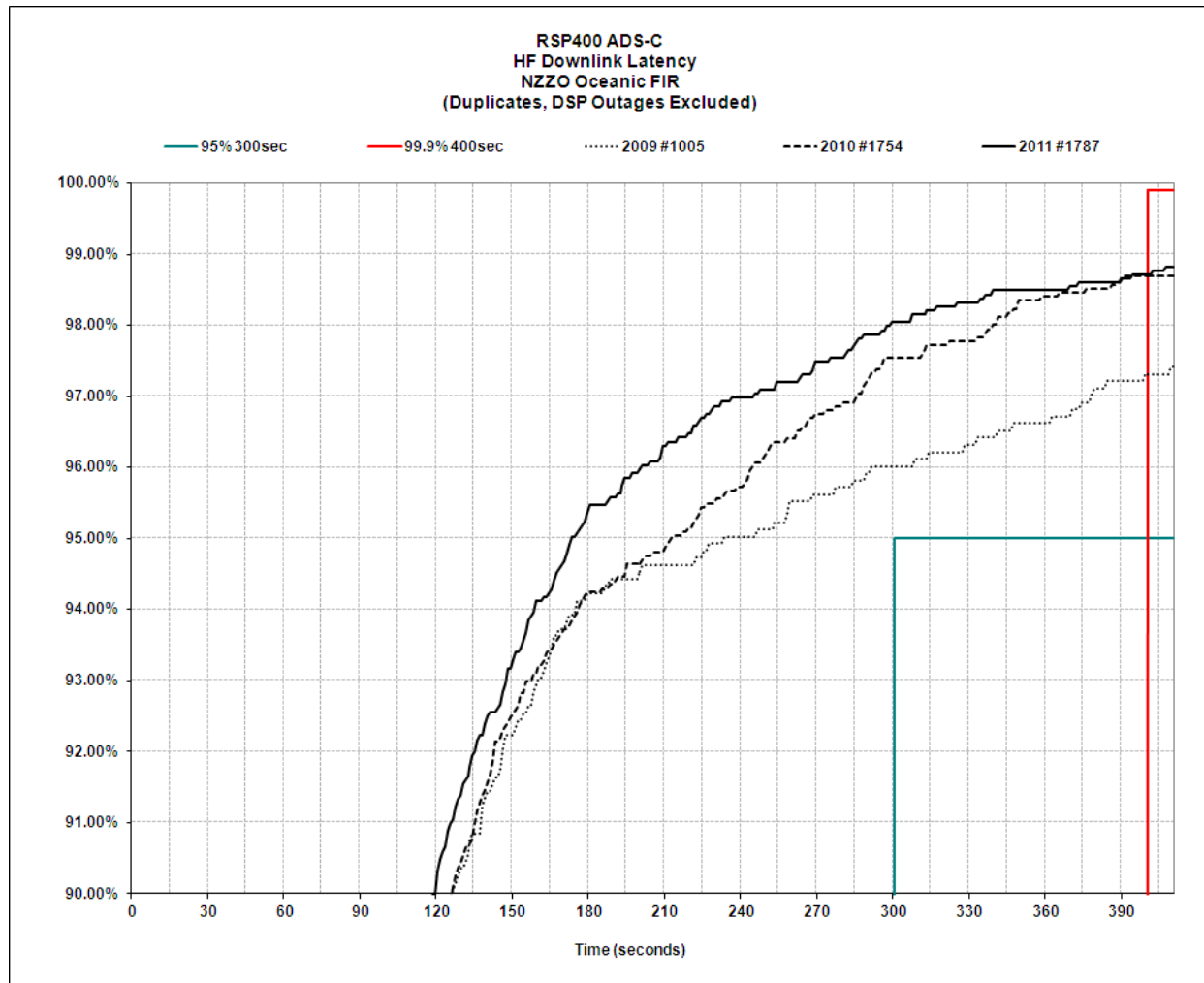
SATCOM + HFDL vs SATCOM all fleets 2011



SAT + HF vs SATCOM individual fleets 2011



HFDL – RSP400 ADS-C



From the Airways report on Inmarsat I3 outage in POR – October 2011

CSN A332 and QFA A388 that could operate HFDL continued on HFDL.

Only 1 CPDLC transaction was completed using HFDL during the outage with an ACP of 201 seconds which is within RCP240/400 requirements.

16 ADS-C downlinks were received via HFDL during the outage.

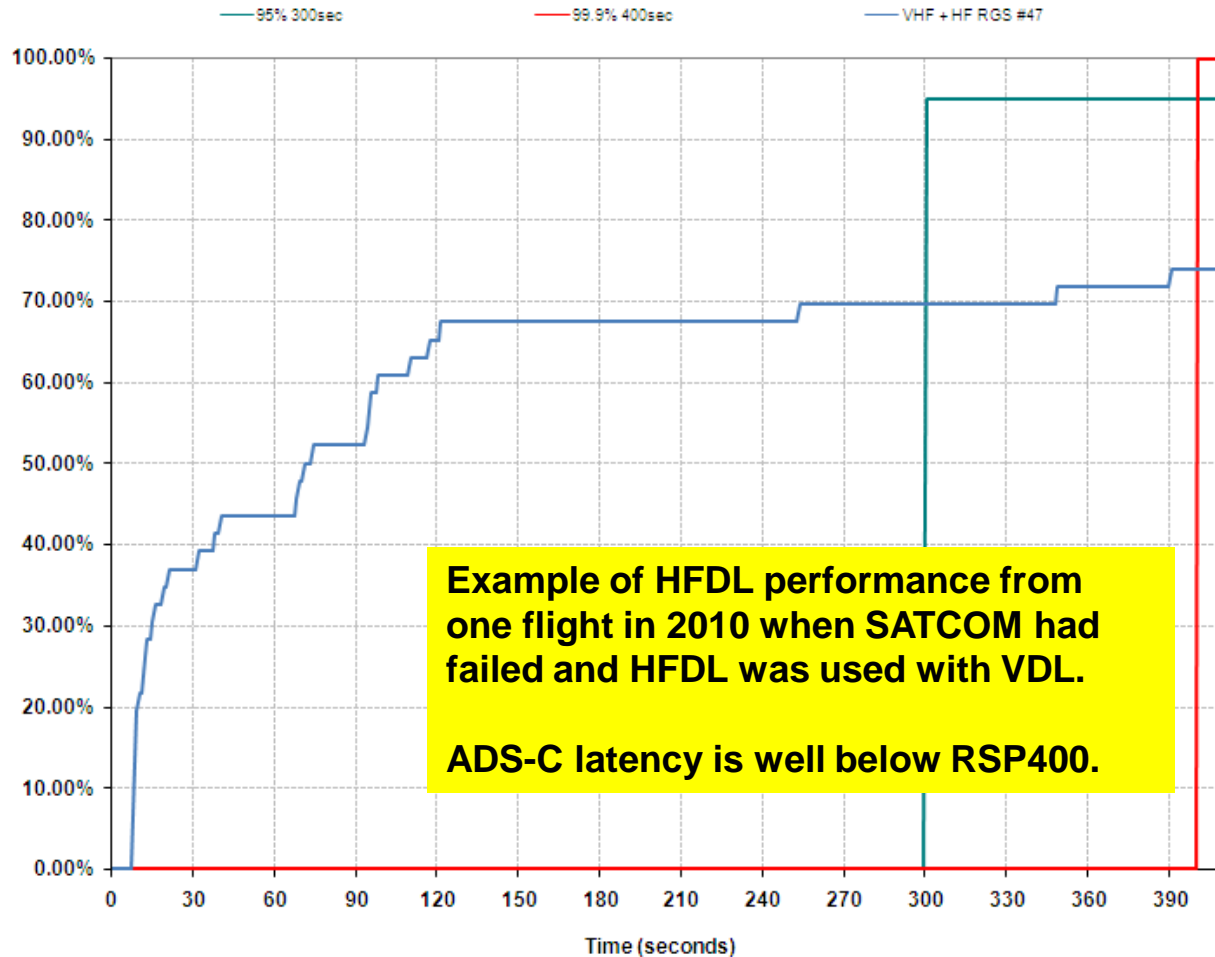
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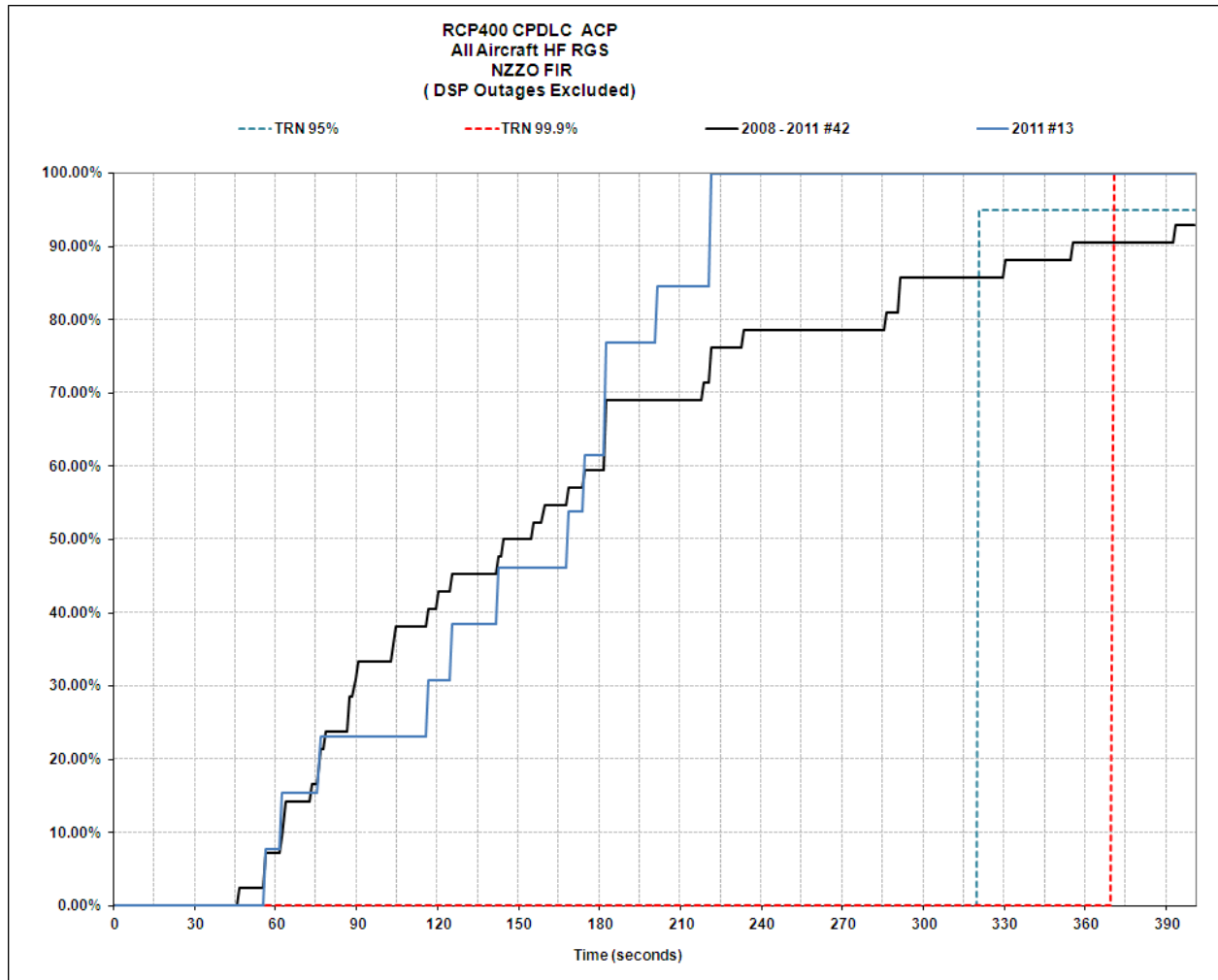
HFDL failed to meet either the RSP180 or RSP400 criteria.



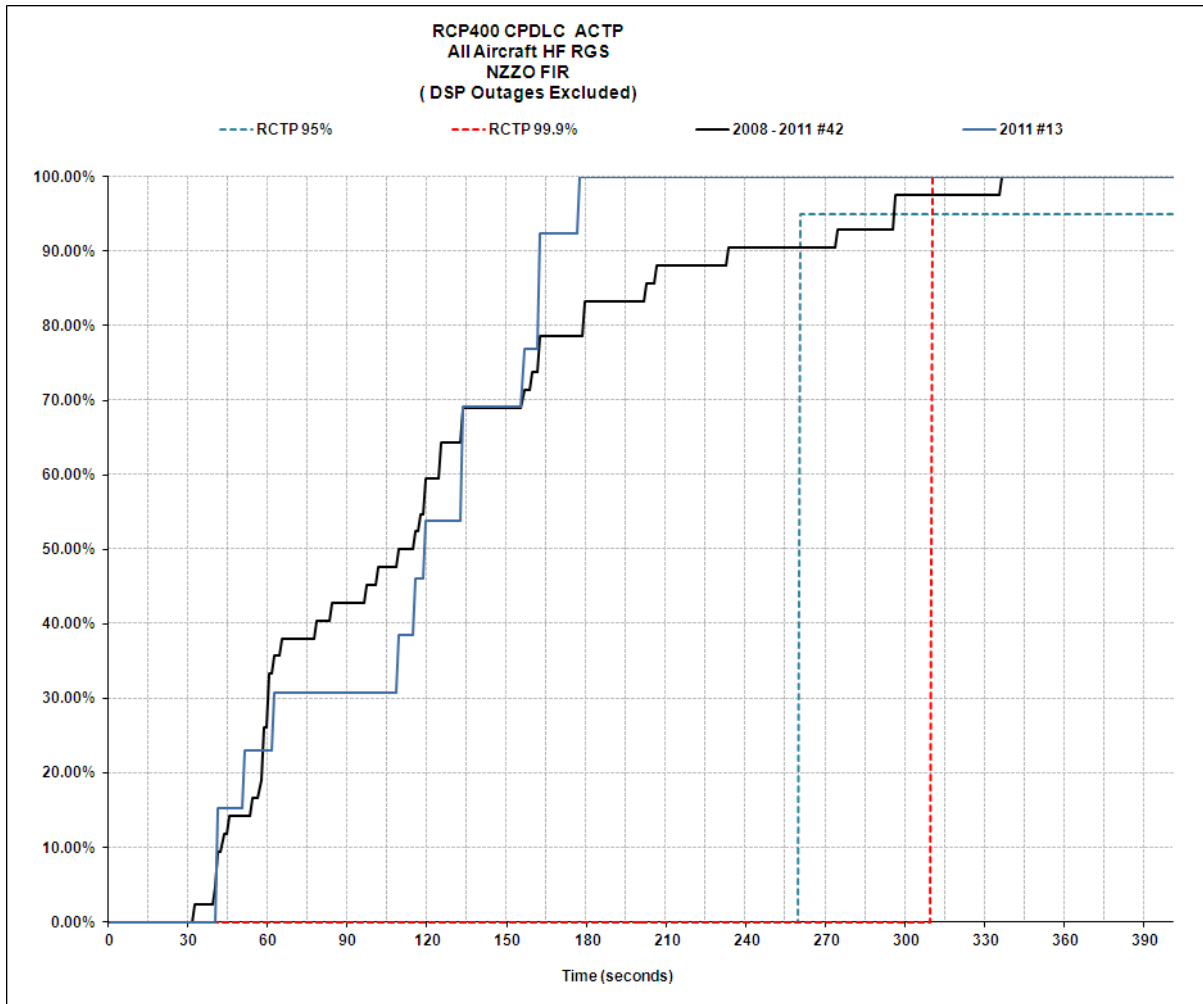
ADS-C via HFDL after SATCOM failure



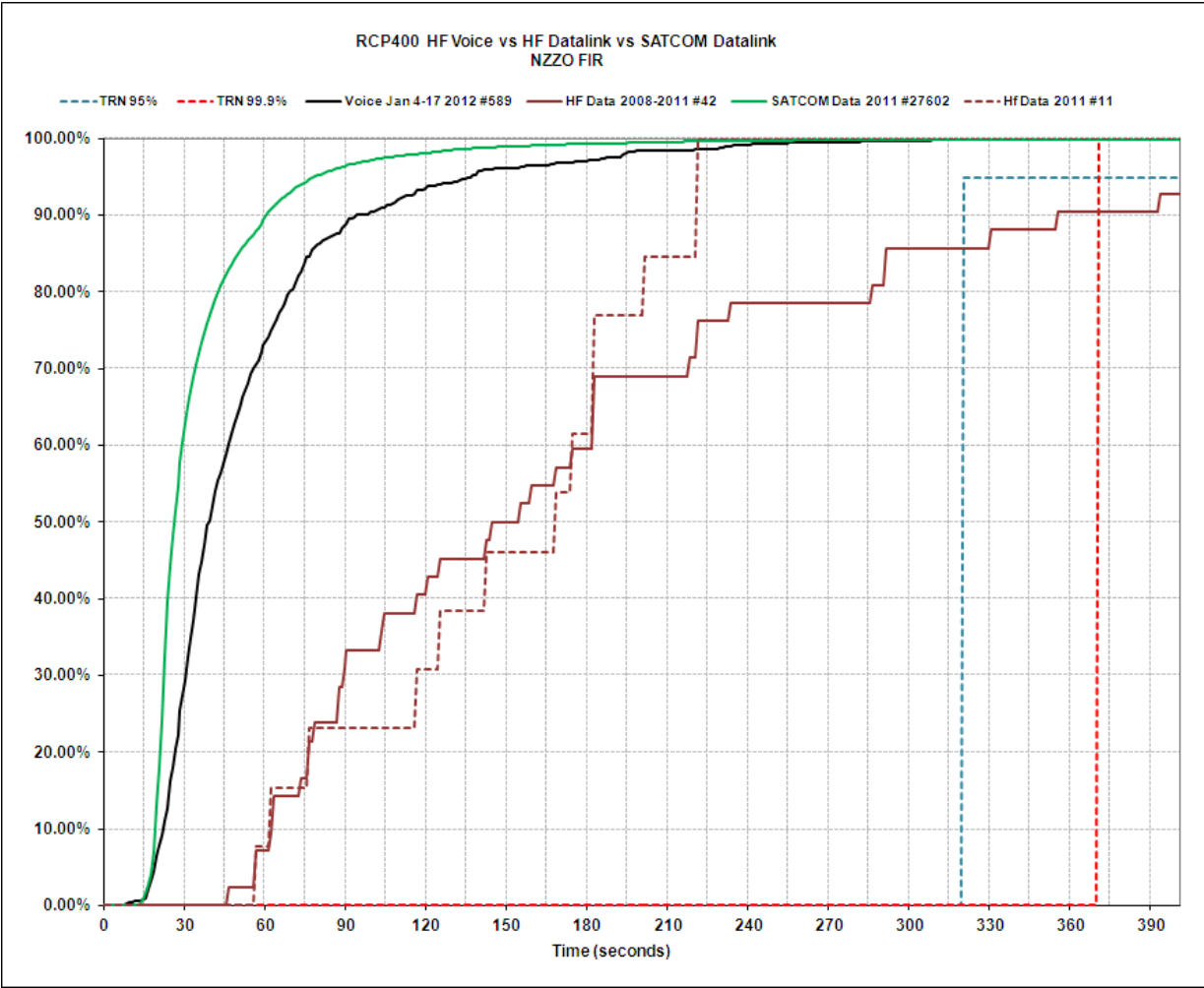
CPDLC via HF/DL RCP400



CPDLC via HF DL RCTP400



ACP – HFDDL vs Voice vs SATCOM





Thank you

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