



International Civil Aviation Organization

The Thirteenth Meeting of the FANS Implementation Team for the Bay of Bengal (FIT-BOB/13) and the Fifth Meeting of the Bay of Bengal Reduced Horizontal Separation Implementation Task Force (BOB-RHS/TF/5)

Bangkok, Thailand, 07 – 11 February 2011

Agenda Item 3: Review Bay of Bengal ADS/CPDLC Operational Trial

**ADS/CPDLC PROGRESS AND COMMENCEMENT OF 24-HOUR OPERATIONAL TRIAL
WITHIN KUALA LUMPUR FIR**

(Presented by Malaysia)

SUMMARY

This working paper presents the progress report of the 24-hour ADS/CPDLC operational trial from 15th October 2010 at 1500 UTC in the Kuala Lumpur FIR over the Bay of Bengal Area.

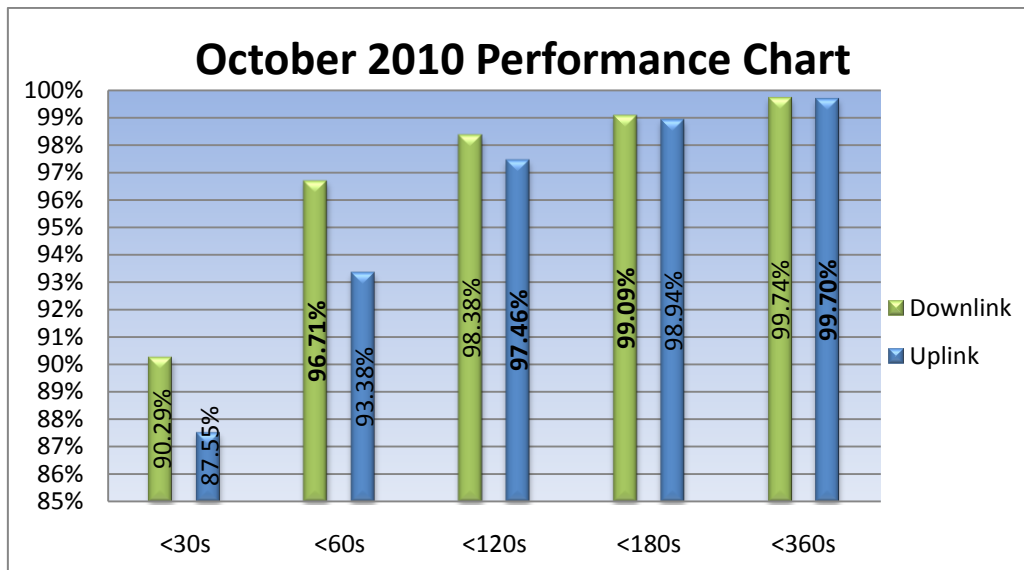
1. INTRODUCTION

- 1.1 Kuala Lumpur Area Control Centre is currently undergoing a 24-hour ADS/CPDLC Operational Trial since October 2010 over the Bay of Bengal Area. Nine RNAV and ATS routes affected are B466, L510, L645, L627, N571, P574, P628, Y337 and Y338.
- 1.2 The purpose of the 24-hour operational trial is to collect more information on the system's performance, stability and reliability during continuous operational hours. It is also to familiarize controllers with the latest ADS/CPDLC data link features and applications after undergoing a software updates and upgrades on 7th May 2010.
- 1.3 The software updates and upgrades have managed to solve most of the system's problems and may also reduce controllers' workload when the system goes for full operation soon.

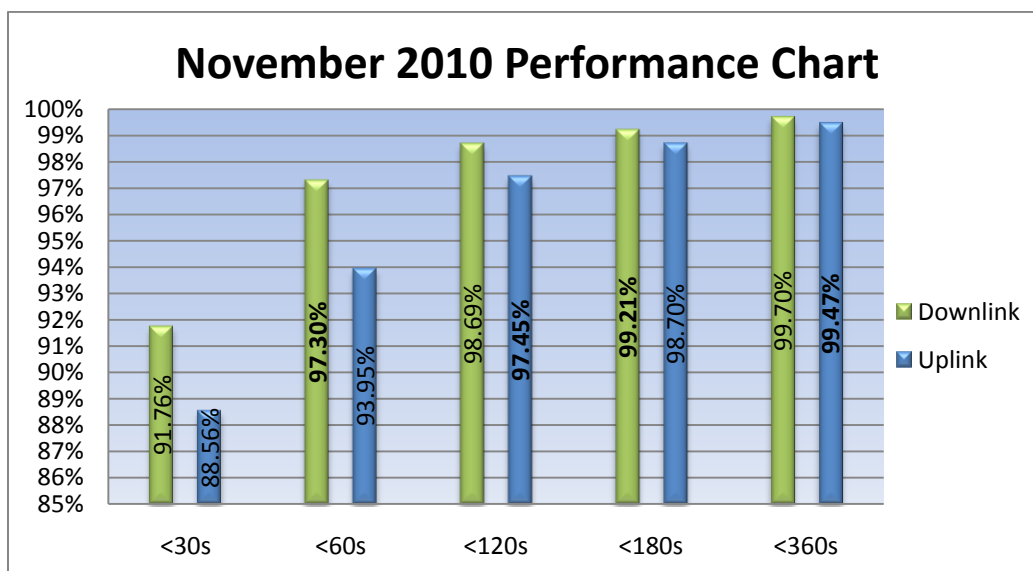
2. 24-HOURS ADS/CPDLC OPERATIONAL TRIAL OUTCOME

2.1 System Performance and Data Collection Analysis

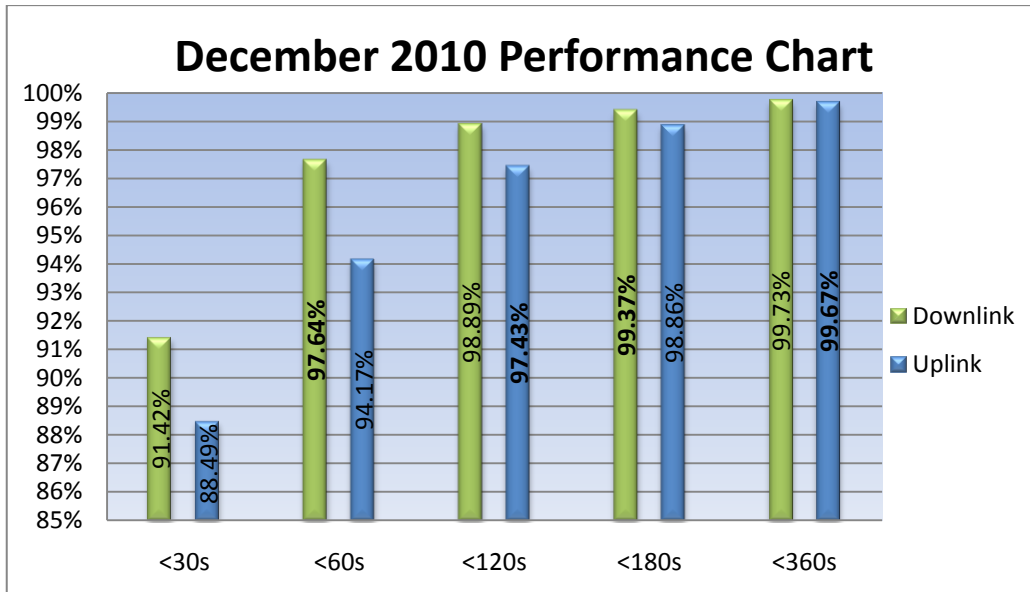
- a) Based on the data collection during the 24-hour operational trial in October, November and December 2010, Malaysia has reached the following figures for the successful rate of downlink and uplink message delivery as shown in the tables and charts below:



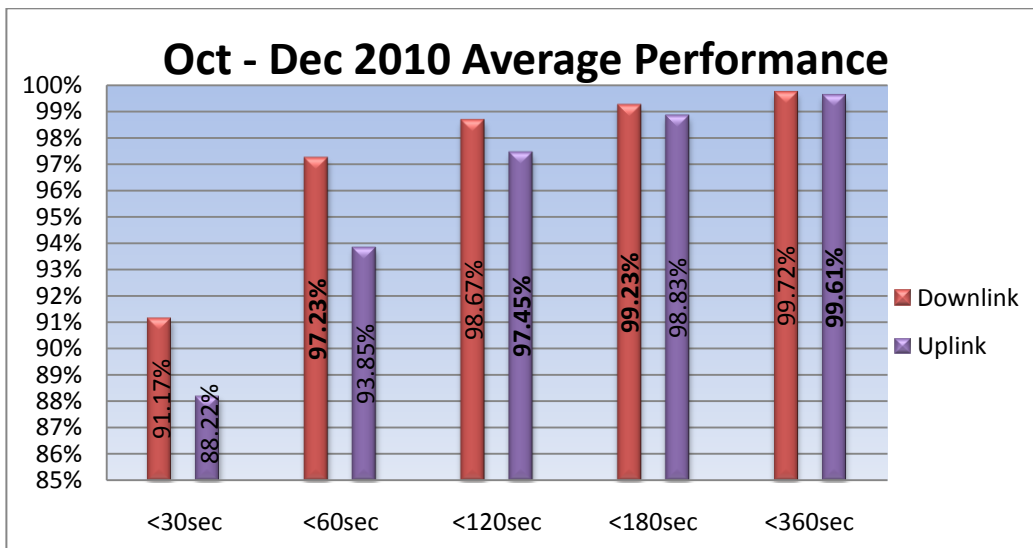
| OCTOBER 2010 | <30sec | <60sec | <120sec | <180sec | <360sec | Undelivered Message |
|-----------------|--------|--------|---------|---------|---------|---------------------|
| Downlink | 90.29% | 96.71% | 98.38% | 99.09% | 99.74% | |
| Uplink | 87.55% | 93.38% | 97.46% | 98.94% | 99.70% | 0.04% |



| NOVEMBER 2010 | <30sec | <60sec | <120sec | <180sec | <360sec | Undelivered Message |
|-----------------|--------|--------|---------|---------|---------|---------------------|
| Downlink | 91.76% | 97.30% | 98.69% | 99.21% | 99.70% | |
| Uplink | 88.56% | 93.95% | 97.45% | 98.70% | 99.47% | 0.01% |



| DECEMBER 2010 | <30sec | <60sec | <120sec | <180sec | <360sec | Undelivered Message |
|-----------------|--------|--------|---------|---------|---------|---------------------|
| Downlink | 91.42% | 97.64% | 98.89% | 99.37% | 99.73% | |
| Uplink | 87.49% | 93.17% | 97.43% | 98.86% | 99.67% | 0.02% |

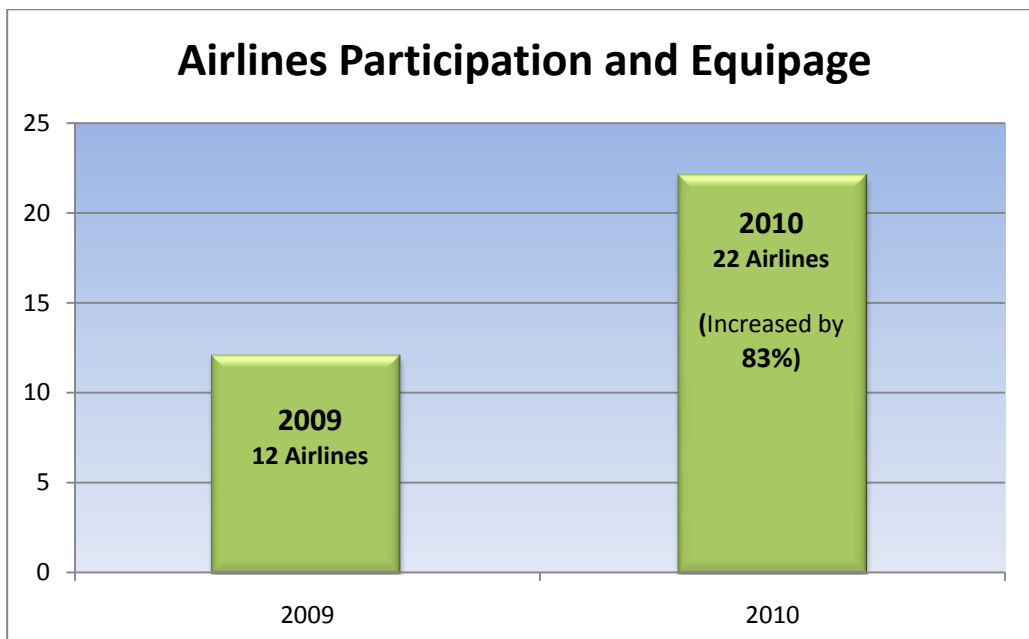


| Oct-Dec 2010 | <30sec | <60sec | <120sec | <180sec | <360sec | Undelivered Message |
|-----------------|--------|--------|---------|---------|---------|---------------------|
| Downlink | 91.17% | 97.23% | 98.67% | 99.23% | 99.72% | |
| Uplink | 87.22% | 93.85% | 97.45% | 98.83% | 99.61% | 0.02% |

- b) These data performance analyses indicate that the system was in compliance with FANS 1/A Operation Manual document as stated in the contract between DCA Malaysia and the system supplier;
 - i. Uplink (round trip)
 - 95% of all messages must be sent less than 120 sec;
 - 99% of all messages must be sent less than 360 sec.
 - ii. Downlink (one way)
 - 95% of all messages must be sent less than 60 sec;
 - 99% of all messages must be sent less than 180 sec.
 - iii. Undelivered messages must be less than 1% of all attempts.

2.2 Airlines Participation

- a) The data collection also indicates 83% increase in the number of airlines that participated in the trial and FANS equipage from the previous year as shown in the chart below;



- b) Malaysia would like to thank all the airline operators for their full cooperation and support during these trial periods and hope will continue to do so.

The 3 airlines with the most FANs traffic with KULCAYA are Malaysia Airlines, Singapore Airlines and Emirates. The list of other airlines that participated is shown in the table below in no particular order;

| | | | | | | | | | | | | |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2009 | AFR | BAW | DLH | ETD | JEC | JST | MAS | QFA | QTR | SIA | SQC | UAE |
| 2010 | AFR | BAW | CLX | DLH | ETD | JAI | JEC | JST | KFR | KLM | MAS | |
| | MPH | MSR | QFA | QTR | RBA | SIA | SLK | SQC | THY | UAE | XAX | |

2.3 Problem Report and System Reliability

- a) **Sudden loss of ADS/CPDLC connection** – This event was random in time, location, flight level, aircraft type, and operator. It did not occur daily.

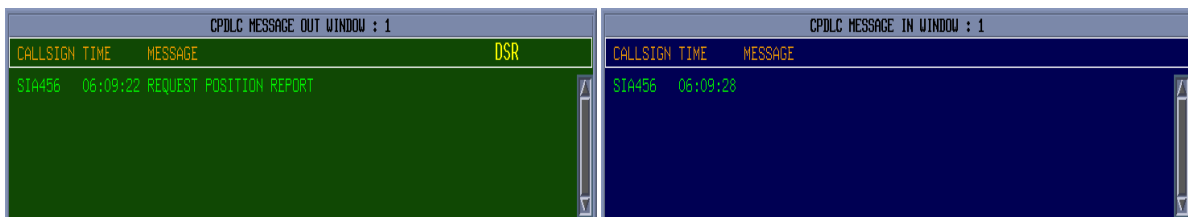


| ADSF List : 6 | | | | | | | |
|---------------|---|-----|------|-----|------|---|-----------|
| CALLSIGN | D | ACS | C | CCS | U | D | E CAD NDA |
| SIA376 | | Y | CONN | Y | CONN | | N N-S SEN |
| MUSG | | Y | CONN | Y | CONN | | N N-S SEN |
| MAB14 | | Y | CONN | Y | CONN | | N N-S SEN |
| DLH791 | | Y | DISC | Y | CONN | | N N-S SEN |
| BH016 | | Y | CONN | Y | CONN | | N N-S SEN |
| AFR257 | | Y | DISC | Y | CONN | | N N-S SEN |

Fig – DLH791 & AFR257 sudden lost of ADS connection

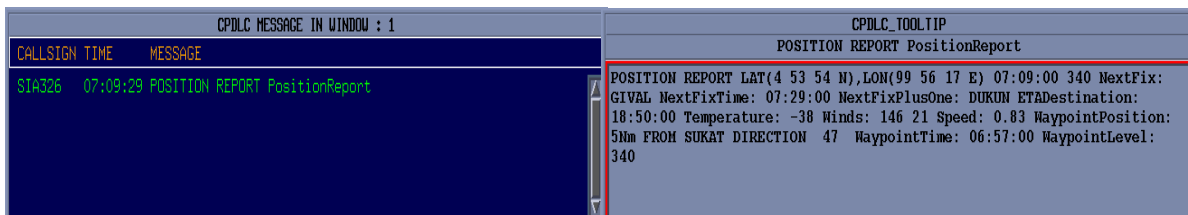
Unable to reconnect – When the above event occurred [2.3 (a)], aircraft that have lost ADS/CPDLC connection were unable reconnect to WMFC. The details for these occurrences have been sent to Boeing Lab for assistance and at the same time, internal investigation from the system service provider is also ongoing to find the source and solution to this problem.

- b) **Blank position report** – Every position report sent via CPDLC by Airbus type aircraft was received with empty downlink messages. In-house investigation is ongoing and at the same time assistance from parties such as Airbus, Boeing lab, SITA, ARINC and Airlines representatives has been sought to find the source and solution to this problem.



| CPDLC MESSAGE OUT WINDOW : 1 | | | CPDLC MESSAGE IN WINDOW : 1 | | |
|------------------------------|----------|-------------------------|-----------------------------|----------|---------|
| CALLSIGN | TIME | MESSAGE | CALLSIGN | TIME | MESSAGE |
| SIA456 | 06:09:22 | REQUEST POSITION REPORT | SIA456 | 06:09:28 | |

Fig – a “request position report” message was sent to SIA456 and a reply received from SIA457



| CPDLC MESSAGE IN WINDOW : 1 | | | CPDLC_TOOLTIP | | |
|-----------------------------|----------|--------------------------------|--|--|--|
| CALLSIGN | TIME | MESSAGE | POSITION REPORT PositionReport | | |
| SIA326 | 07:09:29 | POSITION REPORT PositionReport | POSITION REPORT LAT(4 53 54 N),LON(99 56 17 E) 07:09:00 340 NextFix: GIVAL NextFixTime: 07:29:00 NextFixPlusOne: DUKUN ETADestination: 18:50:00 Temperature: -38 Winds: 146 21 Speed: 0.83 WaypointPosition: 5Nm FROM SUKAT DIRECTION 47 WaypointTime: 06:57:00 WaypointLevel: 340 | | |

Fig – a reply that should be received by controller and a position report in detail will pop-up when the word “Position Report” in the message is clicked by a controller.

An initial finding by in-house investigation revealed that extra information within a position report sent by Airbus type aircraft such as *ground speed*, *vertical change*, *track angle* and *true heading* could not be displayed by the Kuala Lumpur ADS/CPDLC system. This has caused the system to reject the entire position report. Search for a solution to this problem is still ongoing by the system’s service provider.

- c) **System stability** – the system provider is investigating/probing the system flight data processor and the ground-to-ground communication line (AG) to determine and rectify the sudden loss of ADS/CPDLC connection and interruption of continuous 24-hour datalink service.

3. TRAINING

- 3.1 **CPDLC Training Course** - An ADS/CPDLC training and refresher course for all Area Controllers at Kuala Lumpur Air Traffic Control Centre was completed on 30 Dec 2010. All area radar and non-radar controllers in Kuala Lumpur ATCC are now trained and ready for ADS/CPDLC to be operational within Kuala Lumpur FIR.
- 3.2 **RHS Training Course** - Reduced Horizontal Separation (50/50nm) training course was delayed to accommodate priority courses such as Voice Communication Switching System course, Area Radar course and Approach Radar course.

The RHS course is expected to start on 18 April 2011 and targeted to be completed on 27 May 2011.

4 DOCUMENTATION

- 4.1 A NOTAM for the ADS/CPDLC 24-hour operational trial for Kuala Lumpur FIR was published in October 2010 (**A2127/10**). Preparation for the AIP supplement/NOTAMs for the 24-hour ADS/CPDLC operation and the Reduced Horizontal Separation 50/50NM within Kuala Lumpur FIR is ongoing.
- 4.2 A draft on ATC procedures and LOA with adjacent states for the application of RNP10 reduced horizontal and longitudinal separation is ongoing. Discussion with adjacent states will be held upon completion of both documents to avoid differences in ATC procedures on handover and takeover of traffic.
- 4.3 Operational Letters of Agreement between States for the RHS-BOB (50/50NM) is awaiting approval from Attorney General's office.
- 4.4 Qualitative Safety Assessment was done by Kuala Lumpur Safety Management System Team on 30 Dec 2010. The assessment concluded that:
- a) **For communication purposes** - Acceptable based on the risk mitigation. It might require management decision.
 - b) **For reduction of horizontal/longitudinal purposes** - Unacceptable under the existing circumstances.

5 CONCLUSION

- 5.1 The Trials have been proceeding positively, with confidence increasing amongst pilots and controllers.
- 5.2 Based on the system performance presented, ADS/CPDLC training acquired and Qualitative Safety Assessment findings, the ADS/CPDLC system in Kuala Lumpur Area Control Centre is ready for operation, with main focus only on communication

purposes, as soon as the analyses presented in this working paper is endorsed by ICAO in this meeting.

- 5.3 An intensive 5-days course is needed for the RHS (50/50nm). Currently, the Non-Radar Area controllers are using time-based longitudinal separation (10 min MNT). With the RHS 50/50, a distance-based longitudinal separation (50nm) will be introduced. A mixed separation environment or a switch on separation methods (from time-based to distance-based) will create confusion to the controllers and will result in a long course period.

6 ACTION BY THE MEETING

- 6.1 The meeting is invited to review and discuss the outcomes of the operational trials and take note of the information provided in this paper;

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