



*International Civil Aviation Organization*

**The 4<sup>th</sup> Meeting of the Future Air Navigation Systems Interoperability Team-Asia (FIT-Asia/4)**

Bangkok, Thailand, 25 – 26 May 2015

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**Agenda Item 3: Review of ADS/CPDLC Operations**

**DATA LINK PERFORMANCE REPORT FOR SINGAPORE FIR**

(Presented by Singapore)

**SUMMARY**

This paper presents data link performance data for Singapore FIR for 2014/15.

**1. INTRODUCTION**

1.1 This paper presents the data link performance for Singapore (WSJC) FIR from May 2014 to April 2015.

1.2 The performance data for Controller Pilot Data Link Communications (CPDLC) and Automatic Dependent Surveillance - Contract (ADS-C) is measured against the appropriate Required Communication Performance (RCP) and Required Surveillance Performance (RSP) respectively.

1.3 CPDLC performance is measured by Actual Communication Performance (ACP), Actual Communication Technical Performance (ACTP) and Pilot Operational Response Time (PORT). This paper presents CPDLC performance differentiated by media type, operator and monthly performance.

1.4 ADS-C performance is measured by Downlink Latency, differentiated by media type and monthly performance.

## 2. DISCUSSION

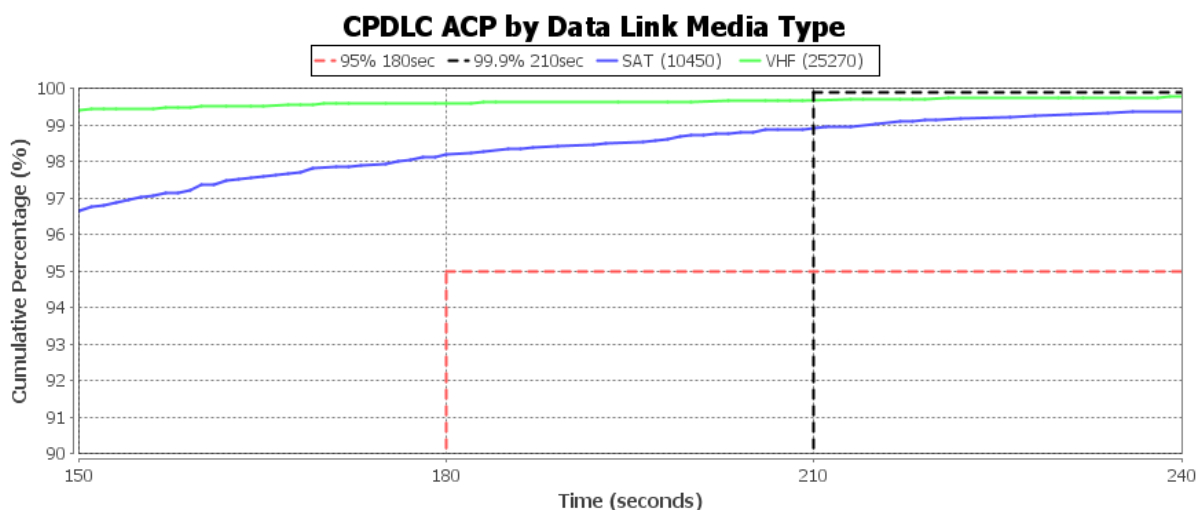
### WSJC FIR CPDLC Actual Communications Performance (ACP)

2.1 This section covers the ACP measurement for CPDLC messages sent within WSJC FIR for the period of May 2014 to April 2015, categorized by data link media type. The ACP for messages sent via Satellite and VHF meet the 95 percent criterion but marginally fall below the 99.9 percent criterion.

2.2 **Table 1** summarizes the overall CPDLC Actual Communications Performance (ACP) for messages sent within the WSJC FIR. **Figure 1** presents the ACP measurement by media type (Satellite, VHF and the combined total) from May 2014 to April 2015.

WSJC FIR CPDLC ACP by Data Link Media Type			
Messages		% > 180 sec (Target 95%)	% > 210 sec (Target 99.9%)
Satellite	10,450	98.21	98.92
VHF	25,270	99.60	99.68
Total	35,720	99.19	99.45

**Table 1: WSJC FIR CPDLC ACP by Data Link Media Type**

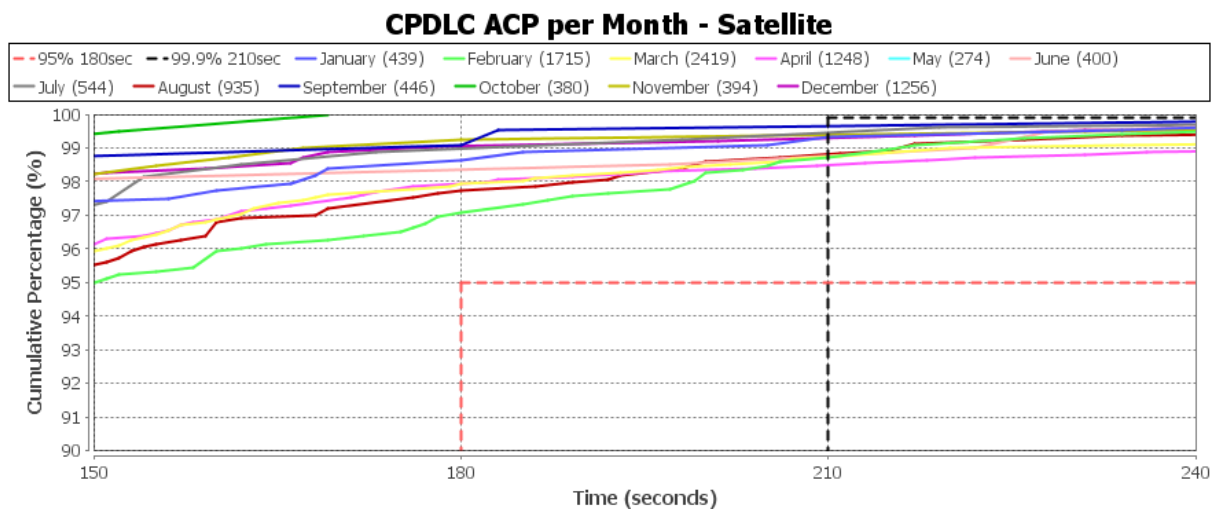


**Figure 1: WSJC FIR CPDLC ACP by Data Link Media Type**

2.3 **Table 2 to 3** summarizes the overall CPDLC Actual Communications Performance (ACP) per month by data link media type for messages sent within the WSJC FIR. **Figure 2 to 3** presents the ACP measurement per month by media type from May 2014 to April 2015.

WSJC FIR CPDLC ACP per Month - Satellite			
Month	Messages	% > 180 sec (Target 95%)	% > 180 sec (Target 99.9%)
May 2014	274	100.00	100.00
Jun 2014	400	98.34	98.76
Jul 2014	544	99.00	99.47
Aug 2014	935	97.75	98.80
Sep 2014	446	99.10	99.67
Oct 2014	380	100.00	100.00
Nov 2014	394	99.24	99.39
Dec 2014	1,256	99.06	99.29
Jan 2015	439	98.63	99.32
Feb 2015	1,715	97.08	98.72
Mar 2015	2,419	97.93	98.74
Apr 2015	1,248	97.94	98.50

**Table 2: WSJC FIR CPDLC ACP per Month - Satellite**



**Figure 2: WSJC FIR ACP per Month – Satellite**

WSJC FIR CPDLC ACP per Month - VHF			
Month	Messages	% > 180 sec (Target 95%)	% > 180 sec (Target 99.9%)
May 2014	1,259	99.28	99.33
Jun 2014	1,589	99.66	99.78
Jul 2014	2,051	99.70	99.80
Aug 2014	1,600	99.70	99.75
Sep 2014	1,875	99.71	99.77
Oct 2014	2,074	99.93	99.99
Nov 2014	1,399	99.57	99.73
Dec 2014	2,772	99.55	99.65
Jan 2015	1,195	99.42	99.45
Feb 2015	2,667	99.57	99.65
Mar 2015	4,292	99.66	99.73
Apr 2015	2,496	99.61	99.73

**Table 3: WSJC FIR CPDLC ACP per Month - VHF**

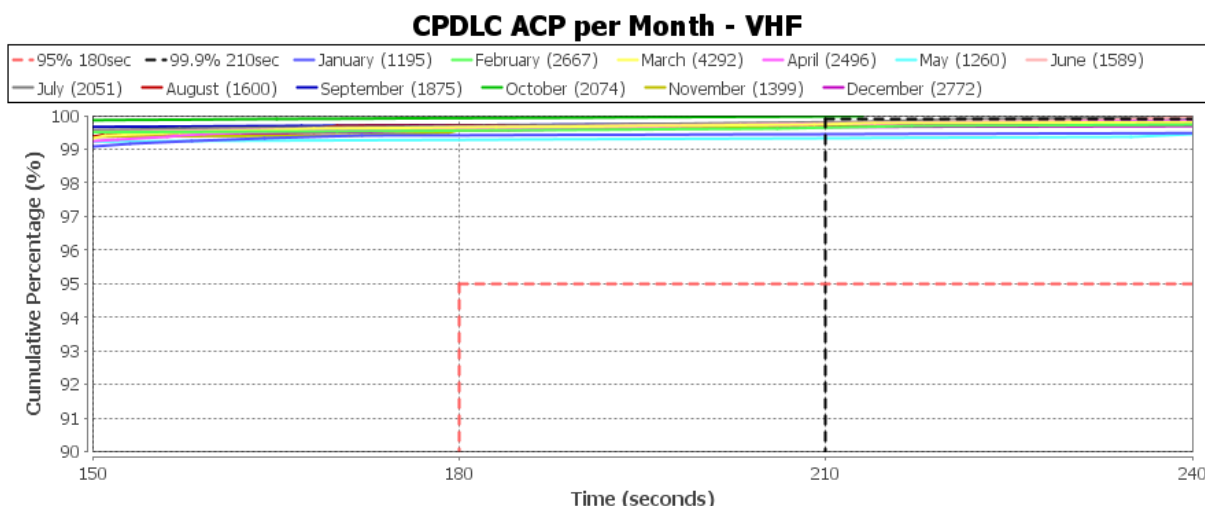


Figure 3: WSJC FIR ACP per Month – VHF

2.4 **Table 4** summarizes the CPDLC Actual Communications Performance per Operator (de-identified) for messages sent within the WSJC FIR. **Figure 4** presents the CPDLC Actual Communications Performance per Operator from May 2014 to April 2015. The performance is presented only for the top 10 operators by message count.

WSJC FIR CPDLC ACP per Operator (de-identified)			
Operator (de-identified)	Messages	% > 180 sec (Target 95%)	% > 210 sec (Target 99.9%)
OP1	2,681	98.96	99.41
OP2	1,179	99.94	99.97
OP3	1,023	100.00	100.00
OP4	986	99.21	99.43
OP5	2,893	99.49	99.61
OP6	879	99.20	99.72
OP7	5,817	98.52	98.95
OP8	995	100.00	100.00
OP9	11,474	99.69	99.77
OP0	2,115	99.39	99.70

Table 4: WSJC FIR CPDLC ACP per operator

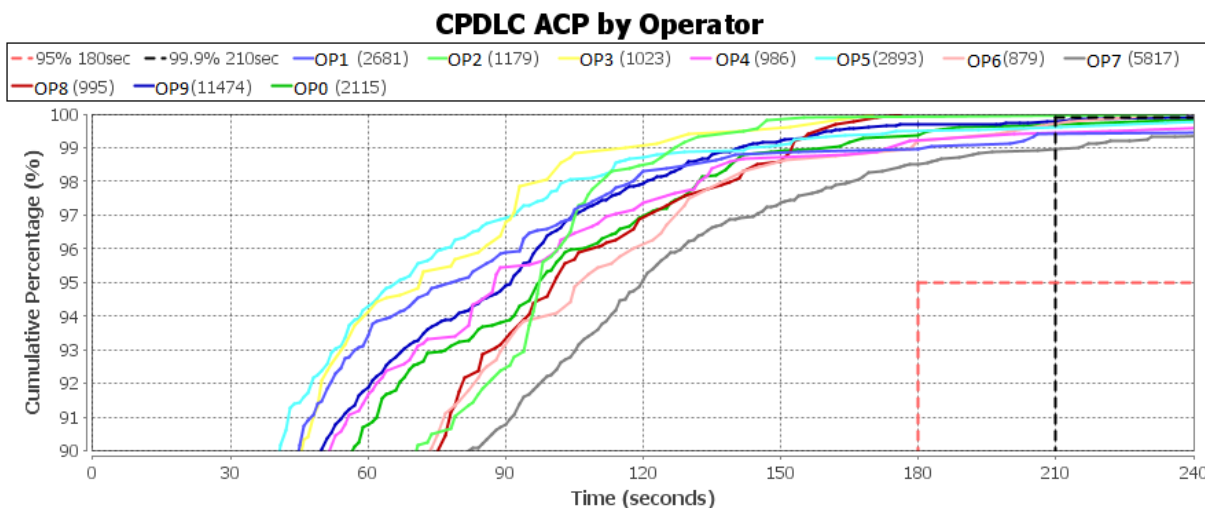


Figure 4: WSJC FIR CPDLC ACP per Operator

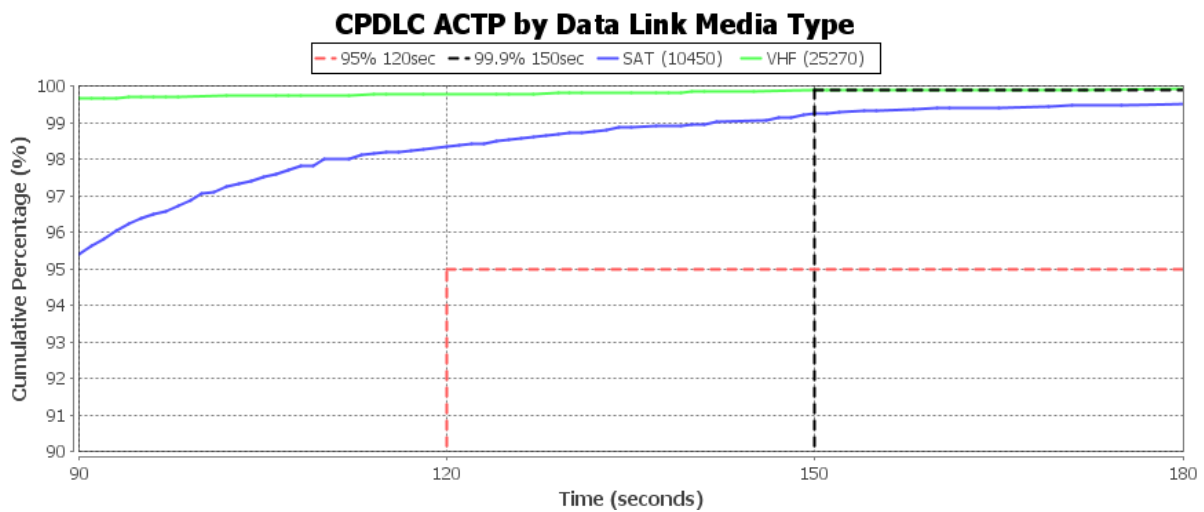
WSJC FIR CPDLC Actual Communications Technical Performance (ACTP)

2.5 This section covers the ACTP measurement for CPDLC messages sent within WSJC FIR from May 2014 to April 2015, categorized by data link media type. The ACTP for messages sent via Satellite and VHF meet the 95 percent criterion but marginally fall below the 99.9 percent criterion.

2.6 **Table 5** summarizes the overall CPDLC Actual Communications Technical Performance (ACTP) for messages sent within the WSJC FIR. **Figure 5** presents the ACTP measurement by media type (Satellite, VHF and the combined total of both) from May 2014 to April 2015.

WSJC FIR CPDLC ACTP			
Messages		% > 120 sec (Target 95%)	% > 150 sec (Target 99.9%)
Satellite	10,450	98.33	99.25
VHF	25,270	99.78	99.88
Total	35,720	99.35	99.69

**Table 5: WSJC FIR CPDLC ACTP**

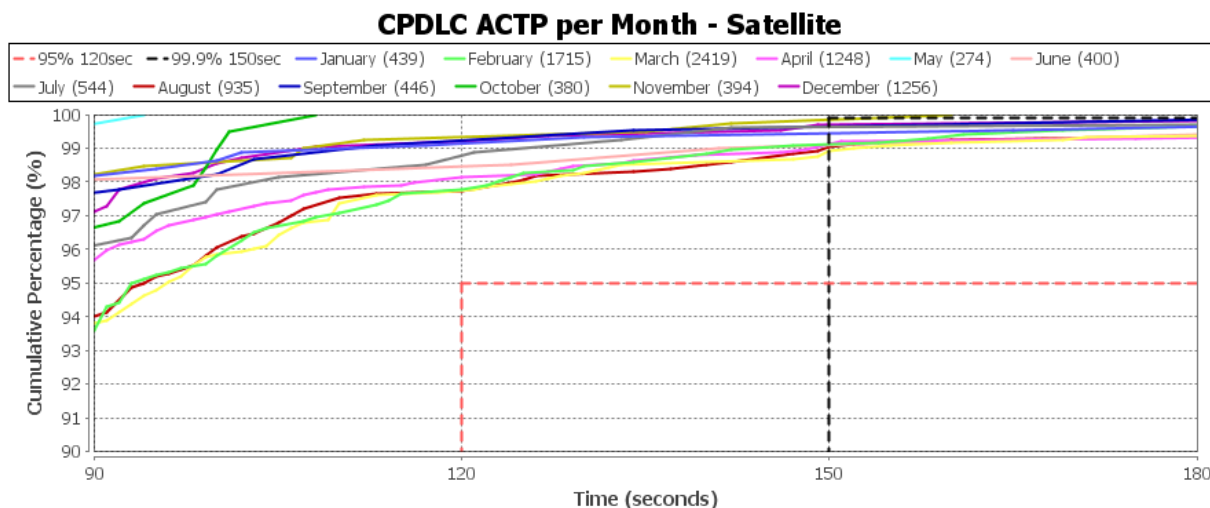


**Figure 5: WSJC FIR ACTP by Data Link Media Type**

2.7 **Table 6 to 7** summarizes the overall CPDLC Actual Communications Technical Performance (ACTP) per month by data link media type for messages sent within the WSJC FIR. **Figure 6 to 7** presents the ACTP measurement per month by data link media type from May 2014 to April 2015.

WSJC FIR CPDLC ACTP - Satellite			
Month	Messages	% > 120 sec (Target 95%)	% > 150 sec (Target 99.9%)
May 2014	274	100.00	100.00
Jun 2014	400	98.45	99.10
Jul 2014	544	98.81	99.65
Aug 2014	935	97.75	99.04
Sep 2014	446	99.25	99.66
Oct 2014	380	100.00	100.00
Nov 2014	394	99.33	99.86
Dec 2014	1,256	99.20	99.69
Jan 2015	439	99.14	99.45
Feb 2015	1,715	97.78	99.12
Mar 2015	2,419	97.74	98.93
Apr 2015	1,248	98.16	99.12

**Table 6: WSJC FIR CPDLC ACTP per Month - Satellite**



**Figure 6: WSJC FIR ACTP per Month – Satellite**

WSJC FIR CPDLC ACTP - VHF			
Month	Messages	% > 120 sec (Target 95%)	% > 150 sec (Target 99.9%)
May 2014	1,259	99.77	99.83
Jun 2014	1,589	99.91	99.95
Jul 2014	2,051	99.78	100.00
Aug 2014	1,600	99.71	99.82
Sep 2014	1,875	99.96	100.00
Oct 2014	2,074	100.00	100.00
Nov 2014	1,399	99.73	99.85
Dec 2014	2,772	99.87	99.89
Jan 2015	1,195	99.73	99.92
Feb 2015	2,667	99.74	99.93
Mar 2015	4,292	99.78	99.82
Apr 2015	2,496	99.73	99.85

Table 7: WSJC FIR CPDLC ACTP per Month – VHF

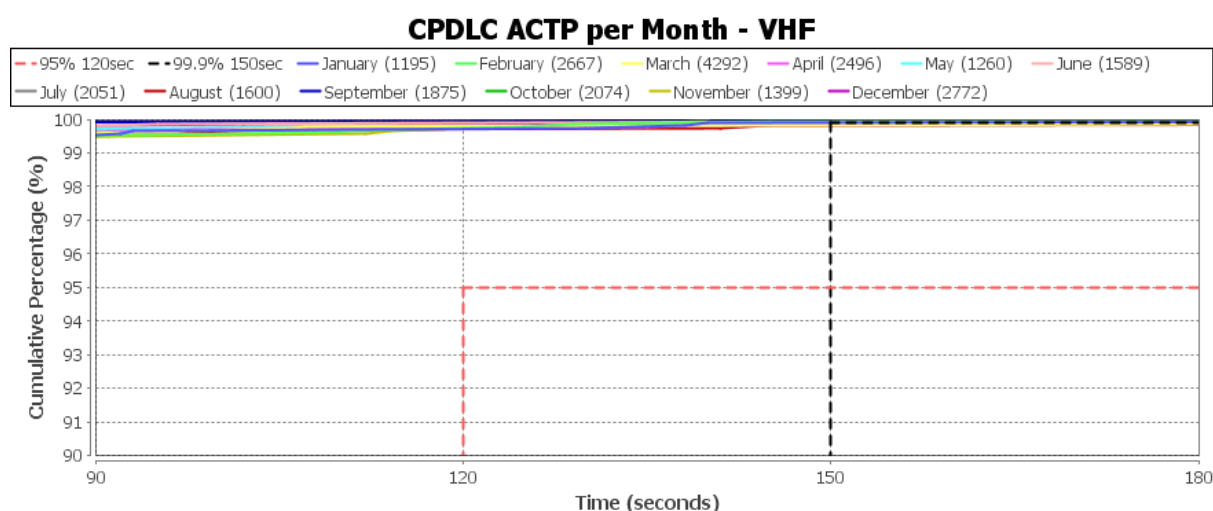


Figure 7: WSJC FIR ACTP per Month – VHF

2.8 **Table 8** summarizes the CPDLC Actual Communications Technical Performance per Operator for messages sent within the WSJC FIR. **Figure 8** presents the CPDLC Actual Communications Technical Performance per Operator from May 2014 to April 2015. The performance is presented only for the top 10 operators by message count.

WSJC FIR CPDLC ACTP per Operator (de-identified)			
Operator (de-identified)	Messages	% > 180 sec (Target 95%)	% > 210 sec (Target 99.9%)
OP1	2,681	99.25	99.37
OP2	1,179	100.00	100.00
OP3	1,023	100.00	100.00
OP4	986	99.47	99.90
OP5	2,893	99.36	99.67
OP6	879	99.41	100.00
OP7	5,817	98.93	99.57
OP8	995	99.61	100.00
OP9	11,474	99.65	99.90
OP0	2,115	99.65	99.77

Table 8: WSJC FIR CPDLC ACTP per operator

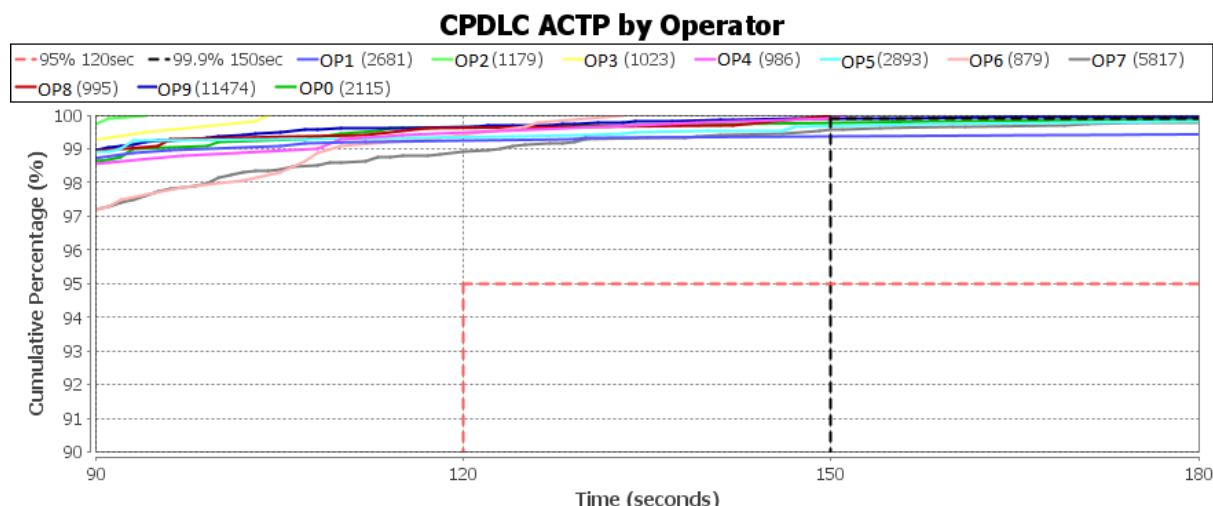


Figure 8: WSJC FIR CPDLC ACTP per operator

WSJC FIR CPDLC Pilot Operational Response Time (PORT) per Operator (de-identified)

2.9 **Table 9** summarizes CPDLC Pilot Operational Response Time per Operator for messages sent within the WSJC FIR. **Figure 9** presents the CPDLC Pilot Operational Response Time per Operator from May 2014 to April 2015.

WSJC FIR CPDLC PORT per Operator		
Operator (de-identified)	Messages	% > 60 sec (Target 95%)
OP1	2,681	98.00
OP2	1,179	98.30
OP3	1,023	98.21
OP4	986	97.57
OP5	2,893	98.72
OP6	879	97.50
OP7	5,817	96.51
OP8	995	97.39
OP9	11,474	98.57
OP0	2,115	98.30

Table 9: WSJC FIR CPDLC PORT per Operator

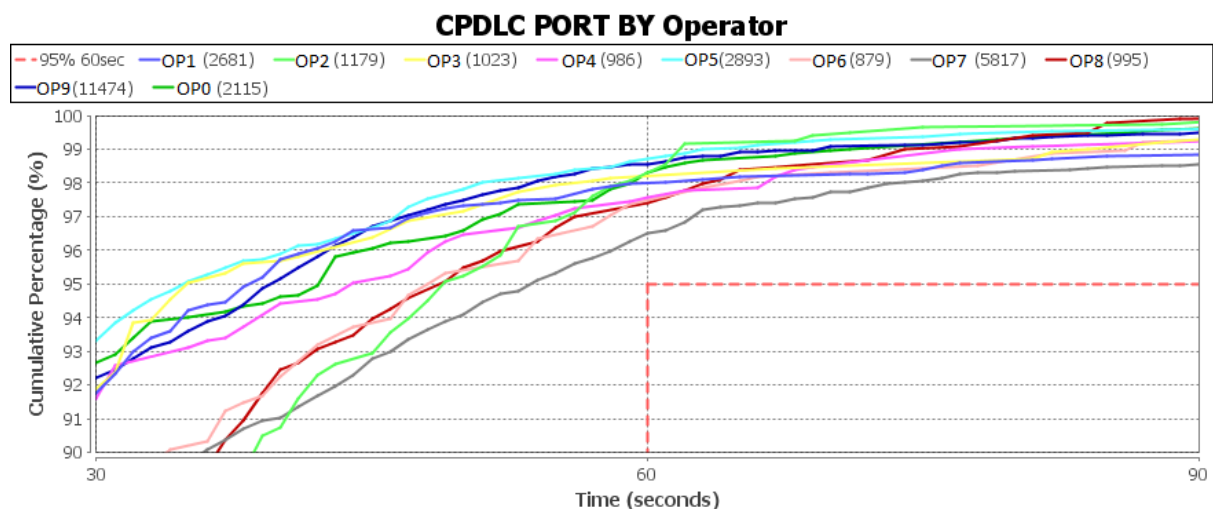


Figure 9: WSJC FIR CPDLC PORT per Operator



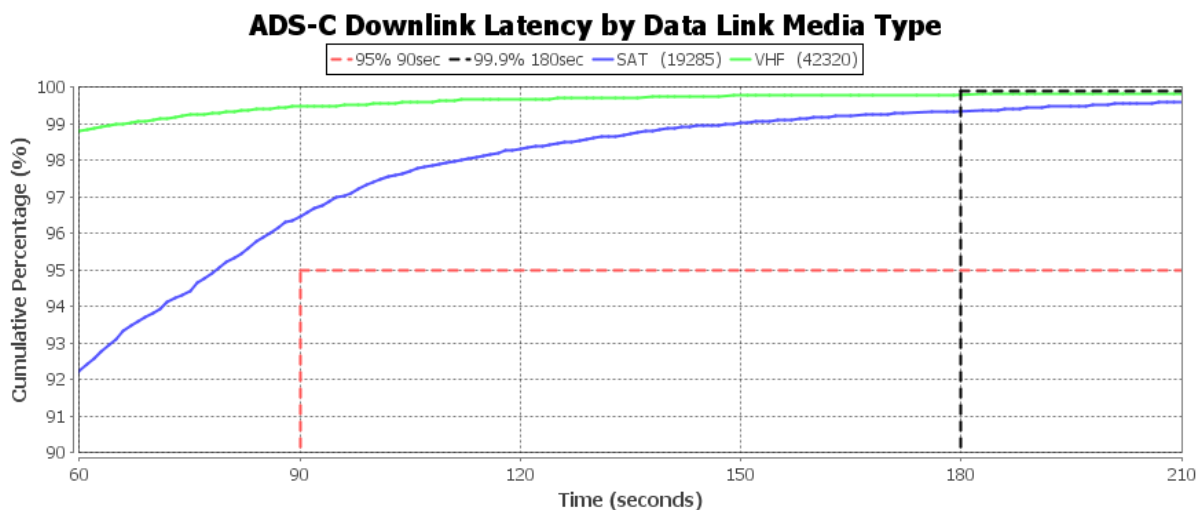
WSJC FIR ADS-C Downlink Latency

2.10 This section covers the Downlink Latency measurement for ADS-C messages sent within WSJC FIR from May 2014 to April 2015, categorized by data link media type. The Downlink Latency for messages sent via Satellite and VHF meet the 95 percent criterion but falls marginally below the 99.9 percent criterion.

2.11 **Table 10** summarizes ADS-C Downlink Latency for messages sent within the WSJC FIR. **Figure 10** presents the ADS-C Downlink Latency per media type (Satellite, VHF and the combined total) from May 2014 to April 2015.

WSJC FIR ADS-C Downlink Latency			
Messages		% > 90 sec (Target 95%)	% > 180 sec (Target 99.9%)
Satellite	19,285	96.45	99.34
VHF	42,320	99.47	99.80
Total	61,605	98.52	99.65

**Table 10:** WSJC FIR ADS-C Downlink Latency by Data Link Media Type

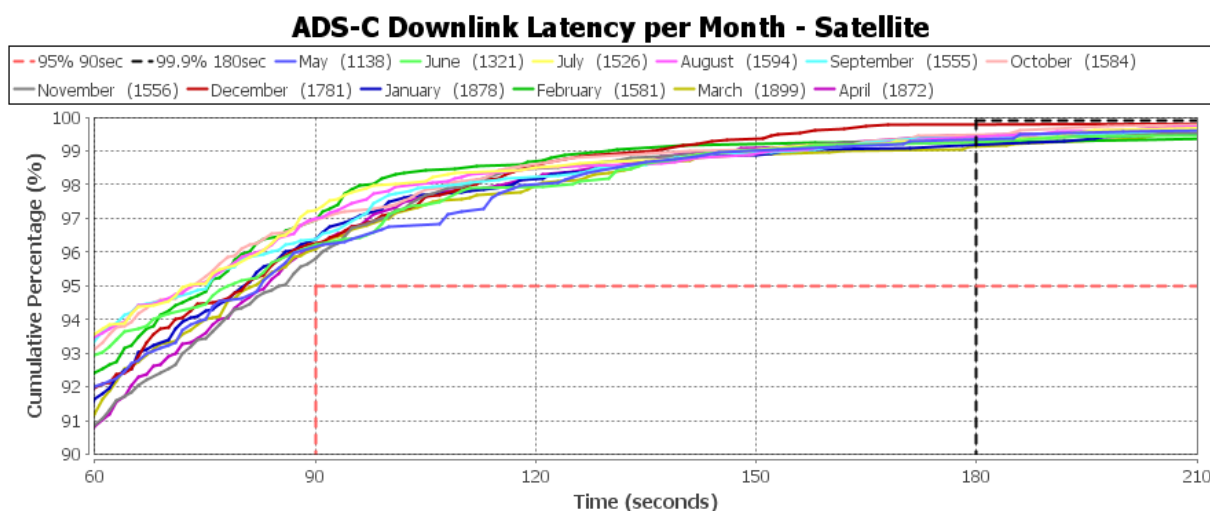


**Figure 10:** WSJC FIR ADS-C Downlink Latency

2.12 **Table 11 - 12** summarizes ADS-C Downlink Latency measurements per month by data link media type for messages sent within the WSJC FIR. **Figure 11 - 12** presents the ADS-C Downlink Latency measurement per month by data link media type from May 2014 to April 2015.

WSJC FIR ADS-C Downlink Latency - Satellite			
Month	Messages	% > 90 sec (Target 95%)	% > 180 sec (Target 99.9%)
May 2014	1,138	96.16	99.35
Jun 2014	1,321	96.21	99.26
Jul 2014	1,526	97.25	99.33
Aug 2014	1,594	96.99	99.40
Sep 2014	1,555	96.40	99.40
Oct 2014	1,584	96.97	99.47
Nov 2014	1,556	95.82	99.34
Dec 2014	1,781	96.27	99.79
Jan 2015	1,878	96.38	99.17
Feb 2015	1,581	96.96	99.28
Mar 2015	1,899	96.10	99.12
Apr 2015	1,872	96.15	99.48

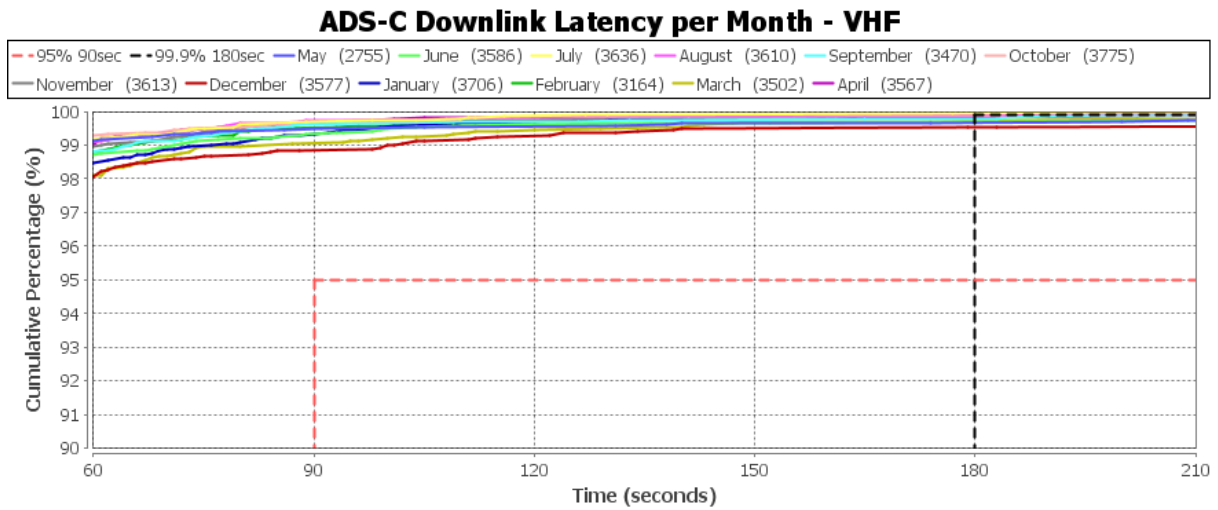
**Table 11:** WSJC FIR ADS-C Downlink Latency per Month - Satellite



**Figure 11:** WSJC FIR ADS-C Downlink Latency per Month – Satellite

WSJC FIR ADS-C Downlink Latency - VHF			
Month	Messages	% > 90 sec (Target 95%)	% > 180 sec (Target 99.9%)
May 2014	2,755	99.48	99.68
Jun 2014	3,586	99.34	99.69
Jul 2014	3,636	99.70	99.95
Aug 2014	3,610	99.72	99.91
Sep 2014	3,470	99.63	99.79
Oct 2014	3,775	99.71	99.85
Nov 2014	3,613	99.65	99.92
Dec 2014	3,577	98.86	99.53
Jan 2015	3,706	99.33	99.85
Feb 2015	3,164	99.51	99.86
Mar 2015	3,502	99.07	99.73
Apr 2015	3,567	99.70	99.91

**Table 12:** WSJC FIR ADS-C Downlink Latency per Month - VHF



**Figure 12: WSJC FIR ADS-C Downlink Latency per Month - VHF**

**3. ACTION BY THE MEETING**

- 3.1 The meeting is invited to:
  - a) note the information contained in this paper; and
  - b) discuss any relevant matters as appropriate.

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