International Civil Aviation Organization

The Fifth Meeting of the Future Air Navigation Systems Interoperability Team-Asia (FIT-Asia/5)

Bangkok, Thailand, 05 – 06 May 2016

Agenda Item 3: Review of ADS/CPDLC Operations

DATA LINK PERFORMANCE REPORT FOR CHINA (L888 ROUTE)

(Presented by China)

SUMMARY

This paper presents data link performance data for 2015 for the Urumqi, Lanzhou, Chengdu and Kunming FIR for the period of Jan. 2015 to Dec. 2015

- Urumqi FIR (ZWWW)
- Lanzhou FIR (ZLLL)
- Chengdu FIR (ZUUU)
- Kunming FIR (ZPPP)

1. INTRODUCTION

1.1 Data-link communications have been used for CPDLC and ADS-C for many years, and data-link performance requirements have been established. Specific requirements are published in the Global Operational Data-link Document (GOLD), and reflect those contained in Doc 9869, Manual on Required Communication Performance. States are invited to ensure that the appropriate data link performance monitoring is undertaken and reported to CRAs/FITs, as required, in a timely manner.

1.2 China has officially started providing data link services on FANS-L888 routes in the remote airspace Western China since 2001. The data link system in this airspace comprises a variety of ground systems that may provide data link services to FANS 1/A aircraft.

1.3 This paper provides observed performance of the operational data link system along L888 route, collected from Urumqi, Lanzhou, Chengdu and Kunming FIR for the period of Jan. 2015 to Dec. 2015.

		ADS-C		CPDLC	
Performance Measure	Percentage of Messages Required to Meet Criteria	RSP180 Criteria(sec)	**RSP400 Criteria(sec)**	RCP240 Criteria(sec)	**RCP400 Criteria(sec)**
ASP	95%	90	**300**		
	99.90%	180	**400**		
ACTP	95%			120	**260**
	99.90%			150	**310**
ACP	95%			180	**320**
	99.90%			210	**370**
PORT	95%			60	**60**

1.4 The performance data observed from the CPDLC and ADS-C systems are measured against the Required Communication Performance (RCP) 400 specification and Required Surveillance Performance (RSP) 400 (please refer to the table above and the criteria highlighted in red) to demonstrate that safety objectives which rely on the communications infrastructure can be met by the aircraft and ground systems. The provision of the data-link performance is presented in the reporting template revised in WP/05 of FIT-ASIA/4 meeting, 2015.

1.5 For the operational status of data link application along L888 route and the improvement that China made in promoting the problem reporting mechanism, please refer to the other working papers that China submitted to this FIT-Asia meeting.

2. DISCUSSION

2.1 This section presents a summary of of the data link performance monitoring. Further analysis is provided in **Attachment A**. The statistic of CPDLC/ADS-C messages applied for the analysis for the period of Jan. 2015 to Dec. 2015 is provided in **Attachment B**.

2.2 The follwing anaysis are provided in the discussion:

- ACP for Urumqi and Lanzhou FIR
- ACTP for Urumqi and Lanzhou FIR
- CPDLC ACP per Operator (de-identified) for Urumqi and Lanzhou FIR
- ADS-C Downlink Latency for Urumqi, Lanzhou, Chengdu and Kunming FIR

2.3 The ACP is used for monitoring the RCP requirement time allocation for the communication transaction (TRN). The TRN is the portion of the total transaction time that does not include the message composition time or recognition of the operational response.

2.4 **Table 1** and **Figure 1** present overall CPDLC Actual Communications Performance (ACP) for messages sent within Urumqi FIR (ZWWW) by media type (Satellite, VHF , HF and the combined total), for the period Jan. 2015 to Dec. 2015. The ACP for CPDLC messages sent via satellite, VHF and HF meet both of the 95 and 99.9 percentage criteria.

Urumqi FIR CPDLC ACP				
Messages		**%< 320 sec (Target 95%)**	**%< 370 sec (Target 99.9%)**	**Remarks**
Satellite	5,041	100.00%	100.00%	-
VHF	6,758	100.00%	100.00%	-
HF	13	100.00%	100.00%	-
Total	11,812	100.00%	100.00%	-

Table 1: Urumqi FIR (ZWWW) CPDLC ACP per Media Type

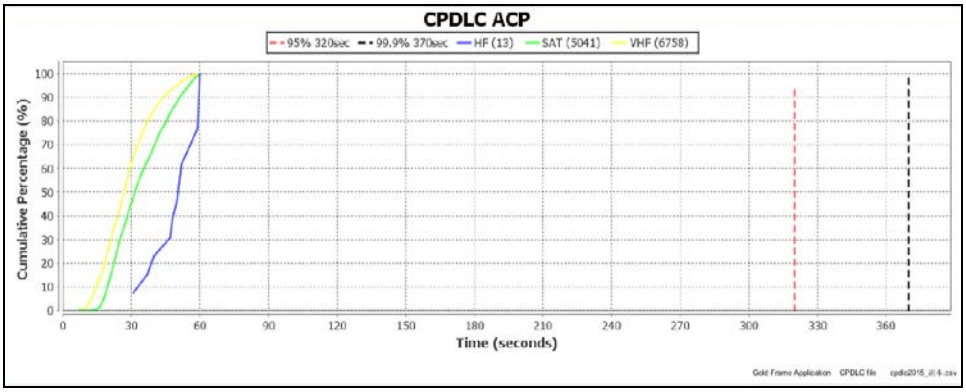

Figure 1: Urumqi FIR ACP per Media Type

2.5. **Table 2** and **Figure 2** present overall CPDLC Actual Communications Performance (ACP) for messages sent within Lanzhou FIR (ZLLL) by media type (Satellite, VHF , HF and the combined total), for the period Jan. 2015 to Dec. 2015. The ACP for CPDLC messages sent via

satellite, VHF and HF meet both of the 95 and 99.9 percentage criteria.

Lanzhou FIR CPDLC ACP				
Messages		**%< 320 sec (Target 95%)**	**%< 370 sec (Target 99.9%)**	**Remarks**
Satellite	3,621	100.00%	100.00%	-
VHF	1,393	100.00%	100.00%	-
HF	2	100.00%	100.00%	-
Total	5,016	100.00%	100.00%	-

Table 2: Lanzhou FIR CPDLC ACP per Media Type

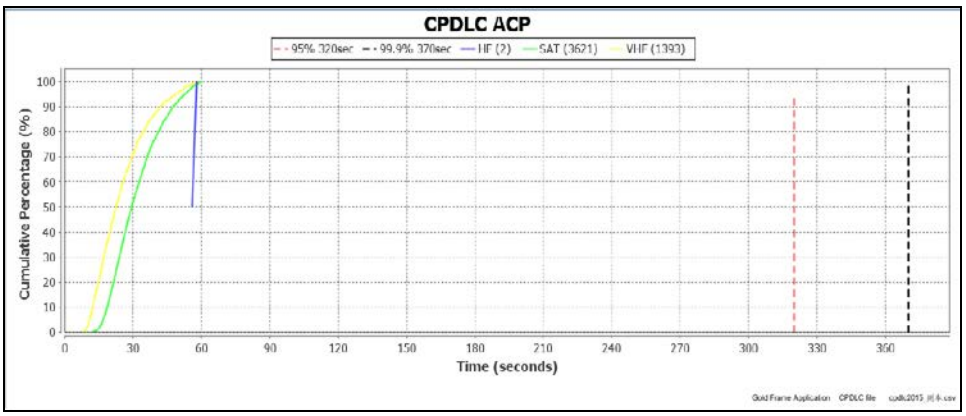

Figure 2: Lanzhou FIR ACP per Media Type

CPDLC Actual Communications Technical Performance (ACTP)

2.6 Actual communications technical performance (ACTP) is used to monitor required communication technical performance (RCTP) time allocations. The ACTP is computed in three steps. The first step is to estimate the downlink time from the difference between the time stamp on the aircraft-originated downlink message and the ATSP received time. Then, the round trip time of the uplink message is estimated from the difference between the time the uplink message was sent from the ATSP and the receipt of the message assurance (MAS) response for the uplink at the ATSP. The last step is to divide the estimated round trip time by two and add the result to the estimated downlink time.

2.7 **Table 3** and **Figure 3** present overall CPDLC Actual Communications Technical Performance (ACTP) for messages sent within Urumqi FIR (ZWWW) by media type (Satellite, VHF , HF and the combined total), for the period Jan. 2015 to Dec. 2015. The ACTP for CPDLC messages sent via satellite, VHF and HF meet the 95 percentage but CPDLC messages sent via satellite, VHF fall just below the 99.9 percentage criteria.

Urumqi FIR CPDLC ACTP				
Messages		**%< 260 sec (Target 95%)**	**%< 310 sec (Target 99.9%)**	**Remarks**
Satellite	5,041	99.77%	99.80%	-
VHF	6,758	99.47%	99.48%	-
HF	13	100.00%	100.00%	-
Total	11,812	99.60%	99.61%	-

Table 3: Urumqi FIR CPDLC ACTP

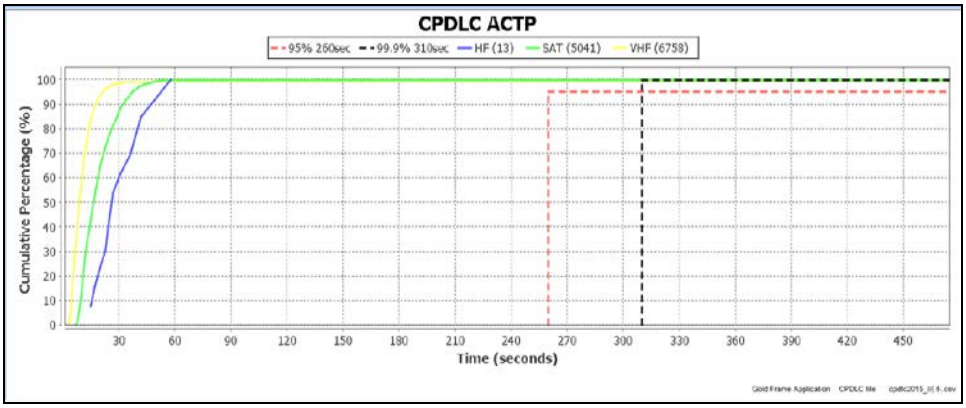

Figure 3: Urumqi FIR ACTP by Data Link Media Type

2.8 **Table 4** and **Figure 4** present overall CPDLC Actual Communications Technical Performance (ACTP) for messages sent within Lanzhou FIR (ZLLL) by media type (Satellite, VHF , HF and the combined total), for the period Jan. 2015 to Dec. 2015. The ACTP for CPDLC messages sent via satellite, VHF and HF all meet the 95 percentage but CPDLC messages sent via satellite, VHF fall just below the 99.9 percentage criteria.

Lanzhou FIR CPDLC ACTP				
Messages		**%< 260 sec (Target 95%)**	**%< 310 sec (Target 99.9%)**	**Remarks**
Satellite	3,621	99.59%	99.60%	-
VHF	1,393	99.86%	99.86%	-
HF	2	100.00%	100.00%	-
Total	5,016	99.66%	99.67%	-

Table 4: Lanzhou FIR CPDLC ACTP

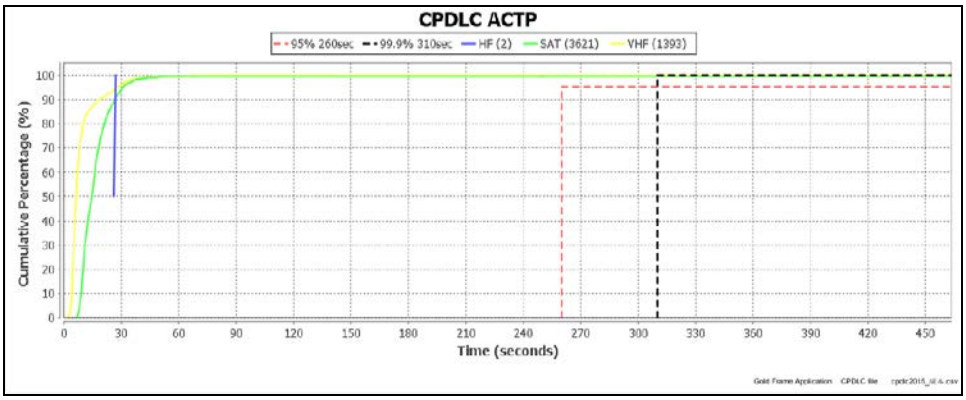

Figure 4: Lanzhou FIR ACTP by Data Link Media Type

CPDLC Actual Communications Performance (ACP) per Operator (de-identified)

2.9 **Table 5** and **Figure 5** present CPDLC Actual Communications Performance per Operator for messages sent within Urumqi FIR (ZWWW) for the period Jan. 2015 to Dec. 2015. All the operators satisfy criteria of 95 percentage transactions within 320 seconds and 99.9 percentage transitions within 370 seconds.

Urumqi FIR CPDLC ACP per Operator				
Operator (de-identified)	**Messages**	**% < 320 sec (Target 95%)**	**%< 370 sec (Target 99.9%)**	**Remarks**
UNK	139	100.00%	100.00%	-
AAA	432	100.00%	100.00%	-
ABA	56	100.00%	100.00%	-
AAA	139	100.00%	100.00%	
ABA	432	100.00%	100.00%	
ABC	628	100.00%	100.00%	-
ABD	1	100.00%	100.00%	-
CCC	161	100.00%	100.00%	-
DDD	444	100.00%	100.00%	-
FFF	25	100.00%	100.00%	-
GGG	494	100.00%	100.00%	-
HHH	5,307	100.00%	100.00%	-
III	1,686	100.00%	100.00%	-
JJJ	8	100.00%	100.00%	-
KKK	40	100.00%	100.00%	-
LLL	16	100.00%	100.00%	-
MMM	253	100.00%	100.00%	-
OOO	402	100.00%	100.00%	-
PPP	5	100.00%	100.00%	-
QQQ	28	100.00%	100.00%	-
RRR	6	100.00%	100.00%	-
SSS	11	100.00%	100.00%	-
TTT	1,317	100.00%	100.00%	-
UUU	255	100.00%	100.00%	-
VVV	7	100.00%	100.00%	-
WWW	1	100.00%	100.00%	-
XXX	77	100.00%	100.00%	-
ZZZ	13	100.00%	100.00%	-
Total	11,812	100.00%	100.00%	-

Table 5: Urumqi FIR CPDLC ACP per Operator

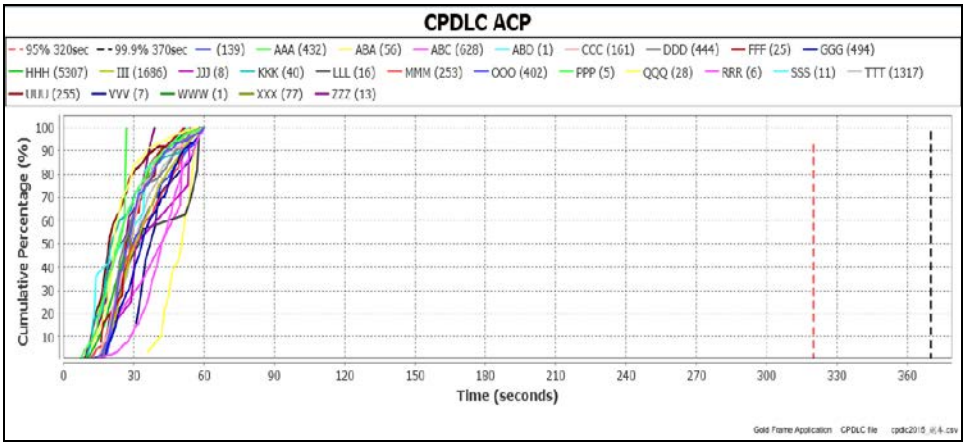

Figure 5: Urumqi FIR CPLC ACP per Operator

2.10 **Table 6** and **Figure 6** present CPDLC Actual Communications Performance per Operator for messages sent within Lanzhou FIR (ZLLL) for the period Jan. 2015 to Dec. 2015. All the operators satisfy criteria of 95 percentage transactions within 320 seconds and 99.9 percentage transitions within 370 seconds.

Lanzhou FIR CPDLC ACP per Operator				
Operator (de-identified)	**Messages**	**% < 320 sec (Target 95%)**	**%< 370 sec (Target 99.9%)**	**Remarks**
UNK	100	100.00%	100.00%	-
AAA	313	100.00%	100.00%	-
ABA	27	100.00%	100.00%	-
ABC	381	100.00%	100.00%	-
ABD	4	100.00%	100.00%	-
BBB	1	100.00%	100.00%	-
CCC	134	100.00%	100.00%	-
DDD	392	100.00%	100.00%	-
EEE	22	100.00%	100.00%	-
FFF	23	100.00%	100.00%	-
GGG	269	100.00%	100.00%	-
HHH	595	100.00%	100.00%	-
III	1,332	100.00%	100.00%	-
JJJ	2	100.00%	100.00%	-
KKK	29	100.00%	100.00%	-
LLL	1	100.00%	100.00%	-
MMM	139	100.00%	100.00%	-
NNN	1	100.00%	100.00%	-
OOO	418	100.00%	100.00%	-
QQQ	8	100.00%	100.00%	-
SSS	7	100.00%	100.00%	-
TTT	622	100.00%	100.00%	-
UUU	137	100.00%	100.00%	-
VVV	10	100.00%	100.00%	-
XXX	38	100.00%	100.00%	-
YYY	3	100.00%	100.00%	-
ZZZ	8	100.00%	100.00%	-
Total	5,016	100.00%	100.00%	-

Table 6: Lanzhou FIR CPDLC ACP per Operator

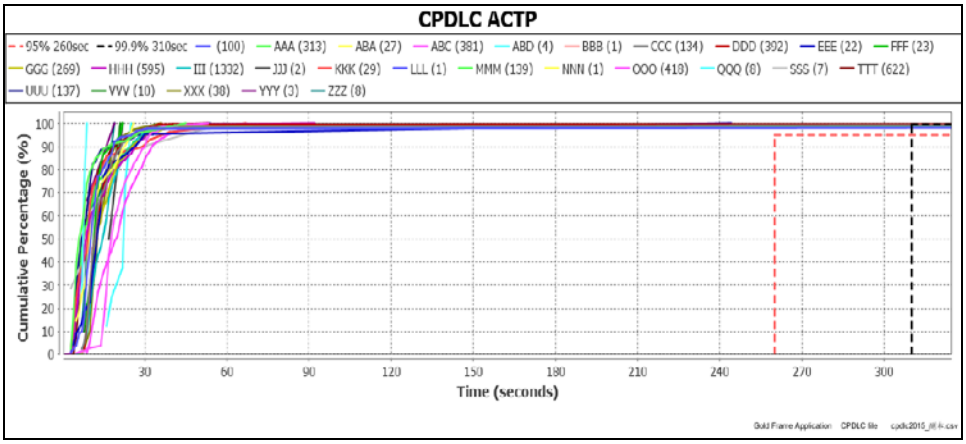

Figure 6: Lanzhou FIR CPLC ACP per Operator

ADS-C Downlink Latency

2.11 **Table 7** and **Figure 7** present ADS-C Downlink Latency for messages sent within Urumqi FIR per media type (Satellite, VHF , HF and combined total), for the period for the period Jan. 2015 to Dec. 2015. It is observed that the RSP ADS-C data link messages sent via satellite and VHF meet the 95 percentage, but messages sent via HF fall below both 95 and 99.9 percentage criteria.

Urumqi FIR ADS-C Downlink Latency				
Messages		**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**
Satellite	226,290	99.76%	99.85%	-
VHF	201,765	99.87%	99.93%	-
HF	955	89.11%	92.64%	-
Total	429,010	99.79%	99.87%	-

Table 7: Urumqi FIR ADS-C Downlink Latency per Media Type

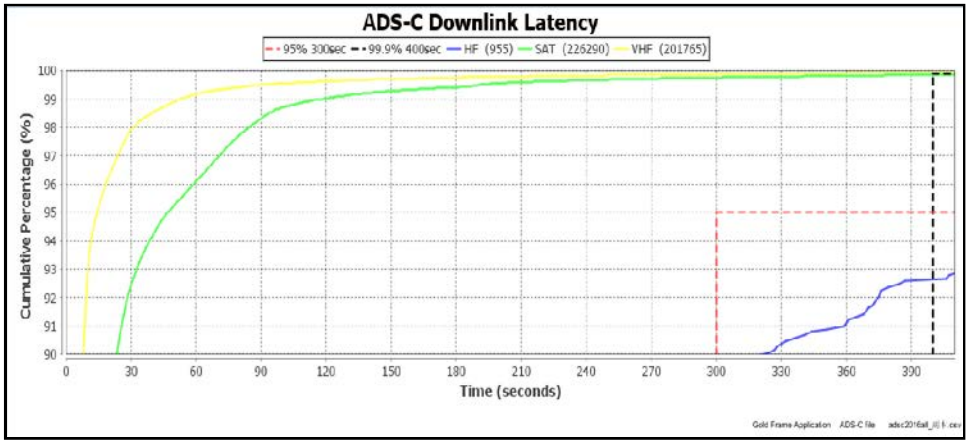

Figure 7: Urumqi FIR ADS-C Downlink Latency

2.12 **Table 8** and **Figure 8** present ADS-C Downlink Latency for messages sent within Lanzhou FIR per media type (Satellite, VHF , HF and combined total), for the period for the period Jan. 2015 to Dec. 2015. It is observed that the RSP ADS-C data link messages sent via satellite and VHF meet the 95 percentage, but messages sent via HF fall below both 95 and 99.9 percentage criteria.

Lanzhou FIR ADS-C Downlink Latency				
Messages		**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**
Satellite	432,973	99.71%	99.82%	-
VHF	436,716	99.86%	99.93%	-
HF	1,707	88.22%	92.97%	-
Total	871,396	99.77%	99.86%	-

Table 8: Lanzhou FIR ADS-C Downlink Latency per Media Type

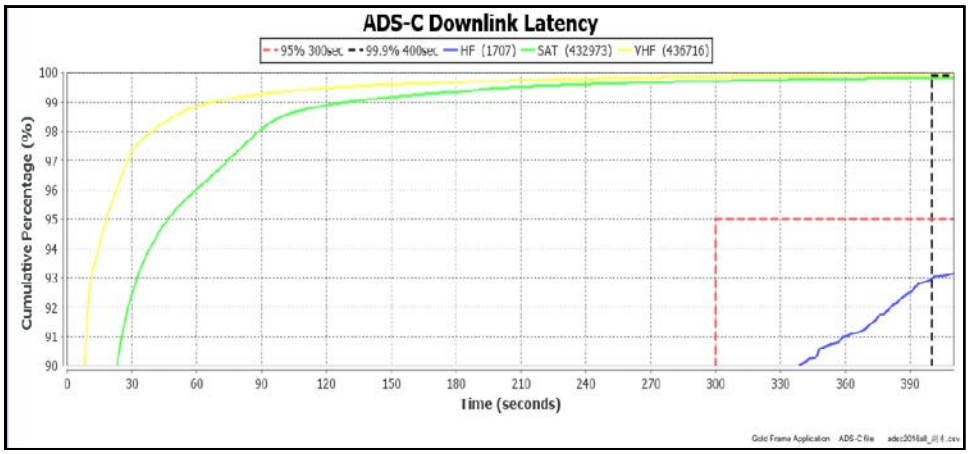

Figure 8: Lanzhou FIR ADS-C Downlink Latency

2.13 **Table 9** and **Figure 9** present ADS-C Downlink Latency for messages sent within Chengdu FIR per media type (Satellite, VHF , HF and combined total), for the period for the period Jan. 2015 to Dec. 2015. It is observed that the RSP ADS-C data link messages sent via satellite and VHF meet the 95 percentage, but messages sent via all media types fall below the 99.9% percentage.

Chengdu FIR ADS-C Downlink Latency				
Messages		**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**
Satellite	348,928	99.52%	99.70%	-
VHF	210,455	99.82%	99.89%	-
HF	1,537	86.47%	91.69%	-
Total	560,920	99.60%	99.75%	-

Table 9: Chengdu FIR ADS-C Downlink Latency per Media Type

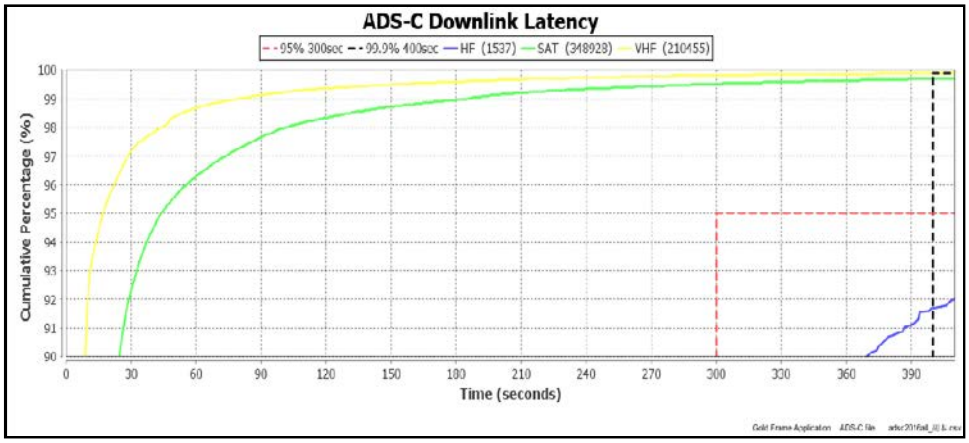

Figure 9: Chengdu FIR ADS-C Downlink Latency

2.14 **Table 10** and **Figure 10** present ADS-C Downlink Latency for messages sent within Kunming FIR per media type (Satellite, VHF , HF and combined total), for the period for the period Jan. 2015 to Dec. 2015. It is observed that the RSP ADS-C data link messages sent via satellite and VHF meet the 95 percentage, but messages sent via all media types fall below the 99.9% percentage.

Kunming FIR ADS-C Downlink Latency				
Messages		**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**
Satellite	15,760	99.67%	99.81%	-
VHF	16,450	99.79%	99.87%	-
HF	97	85.39%	88.23%	-
Total	32,307	99.68%	99.80%	-

Table 10: Kunming FIR ADS-C Downlink Latency per Media Type

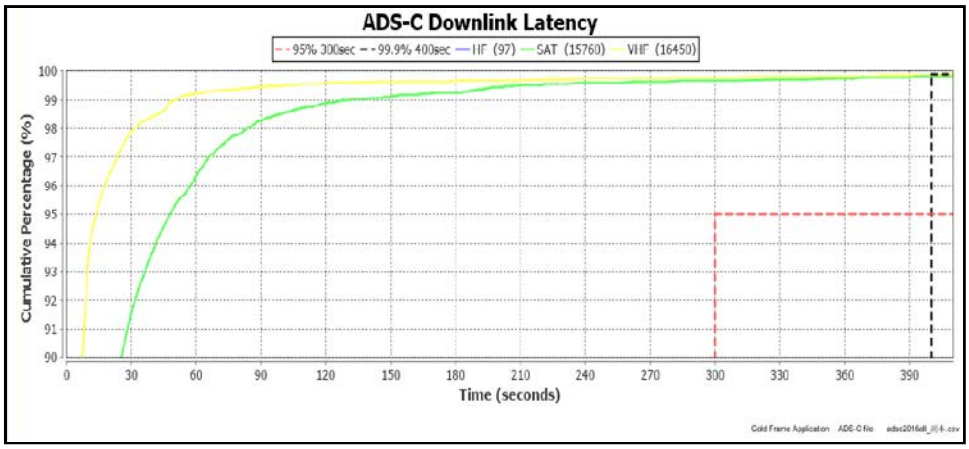

Figure 10: Kunming FIR ADS-C Downlink Latency

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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