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

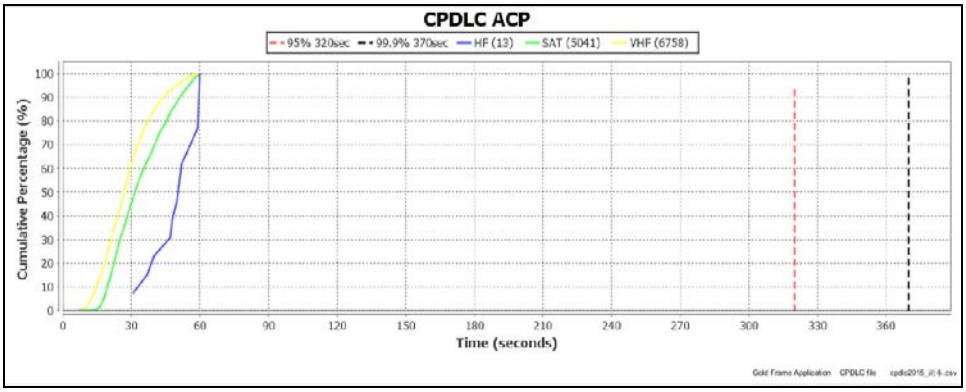

Figure 1: Urumqi FIR ACP per Media Type

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

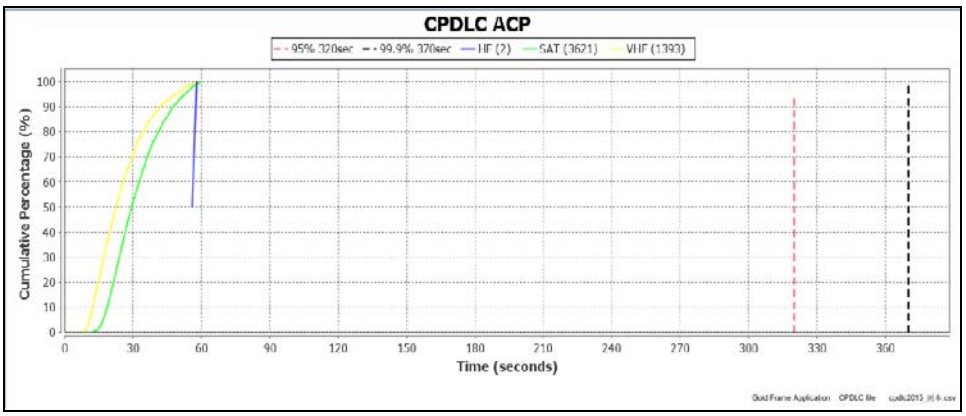

Figure 2: Lanzhou FIR ACP per Media Type

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

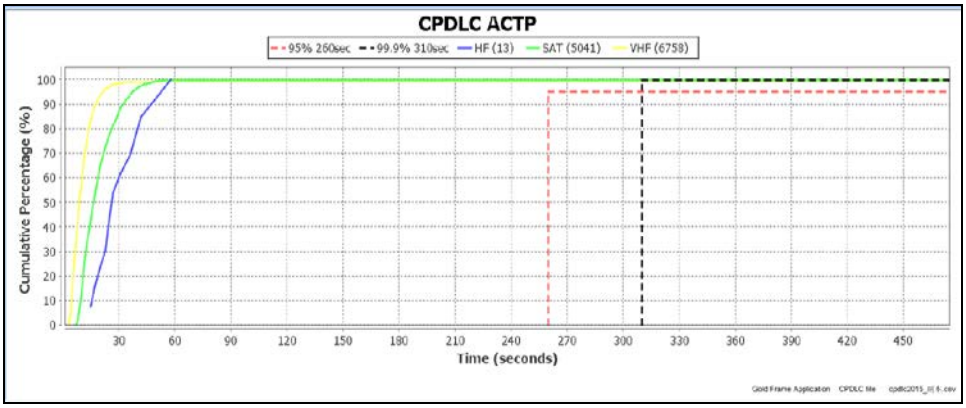

Figure 3: Urumqi FIR ACTP by Data Link Media Type

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

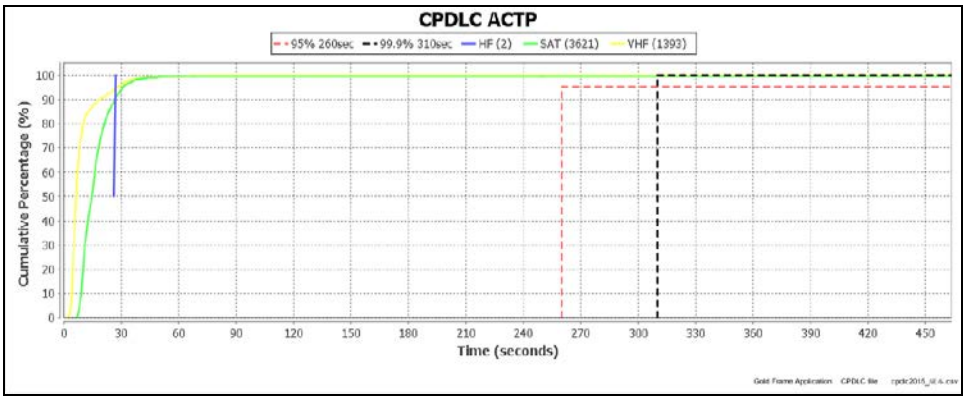

Figure 4: Lanzhou FIR ACTP by Data Link Media Type

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

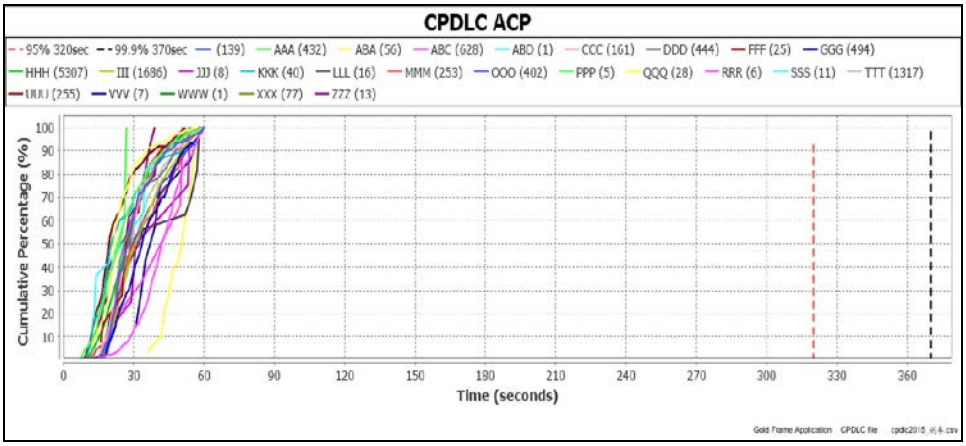

Figure 5: Urumqi FIR CPLC ACP per Operator

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

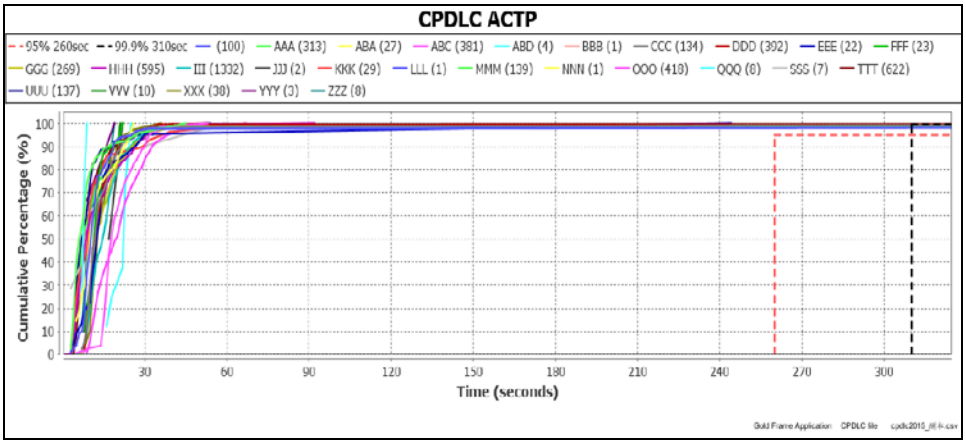

Figure 6: Lanzhou FIR CPLC ACP per Operator

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

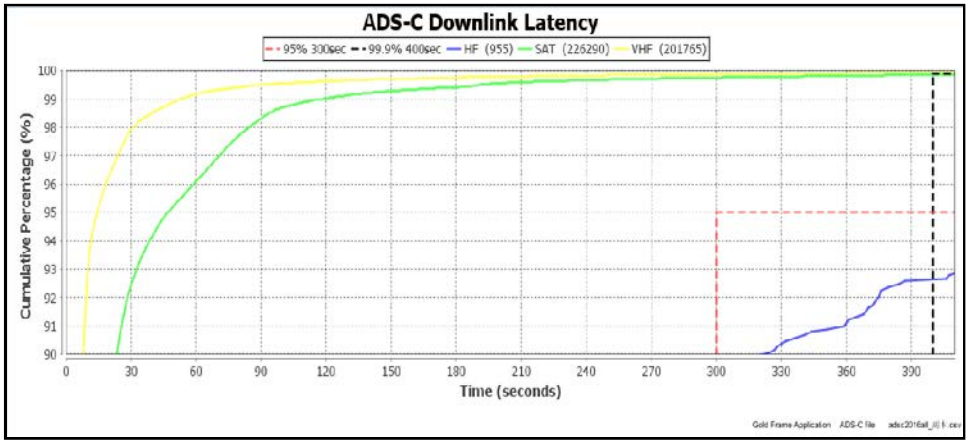

Figure 7: Urumqi FIR ADS-C Downlink Latency

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

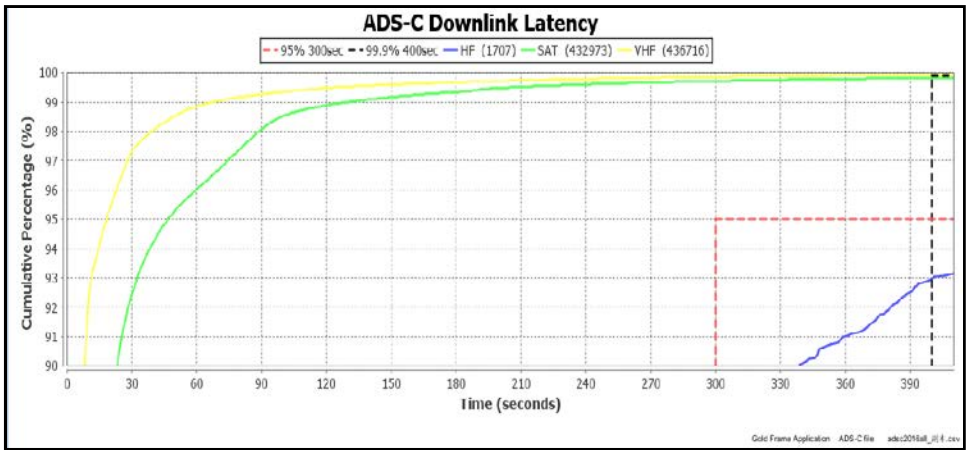

Figure 8: Lanzhou FIR ADS-C Downlink Latency

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

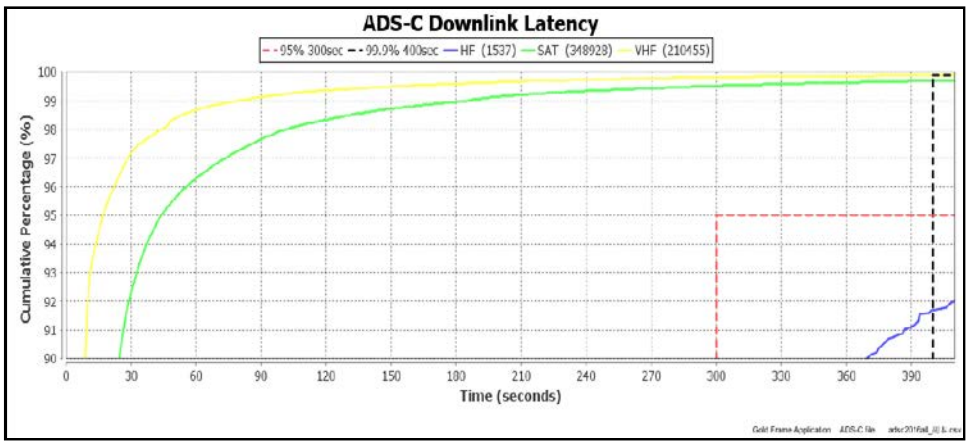

Figure 9: Chengdu FIR ADS-C Downlink Latency

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

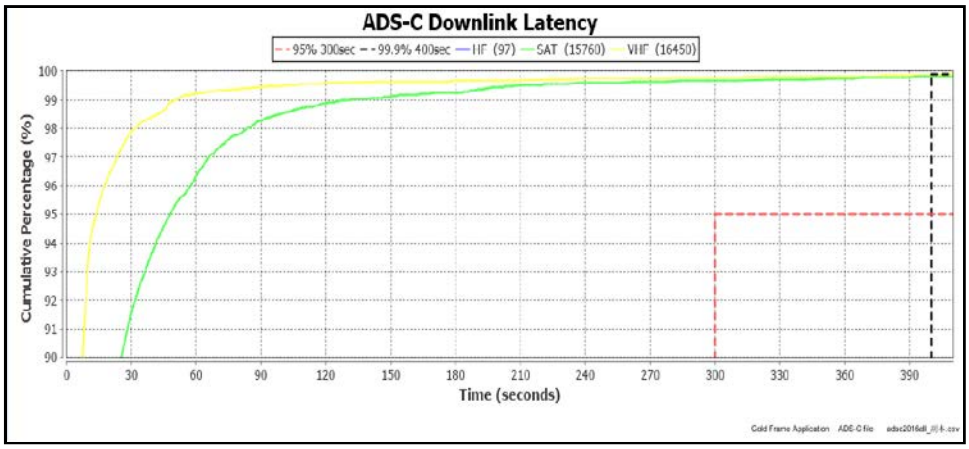

Figure 10: Kunming FIR ADS-C Downlink Latency

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.

…….

ATTACHMENT A – ADDITIONAL ANALYSIS

1. CPDLC ACTUAL COMMUNICATION PERFORMANCE(ACP)

CPDLC Actual Communications Performance (ACP) per Month – Satellite

1.1 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.

1.2 **Table 1** and **Figure 1** present CPDLC ACP per month for messages sent within the Urumqi FIR (ZWWW) by Satellite data link, for the period Jan. 2015 to Dec. 2015. The ACP for CPDLC messages sent via satellite, VHF and HF all meet the 95% and 99.9% pencentage criteria.

Urumqi FIR CPDLC ACP per Month - Satellite				
Month	**Messages**	**% < 320 sec (Target 95%)**	**%< 370 sec (Target 99.9%)**	**Remarks**
Jan.	189	100.00%	100.00%	-
Feb.	188	100.00%	100.00%	-
Mar.	251	100.00%	100.00%	-
Apr.	464	100.00%	100.00%	-
May	394	100.00%	100.00%	-
Jun.	433	100.00%	100.00%	-
Jul.	914	100.00%	100.00%	-
Aug.	1,056	100.00%	100.00%	-
Sep.	306	100.00%	100.00%	-
Oct.	308	100.00%	100.00%	-
Nov.	293	100.00%	100.00%	-
Dec.	245	100.00%	100.00%	-
Total	5,041	100.00%	100.00%	-

Table 1: Urumqi FIR CPDLC ACP per Month - Satellite

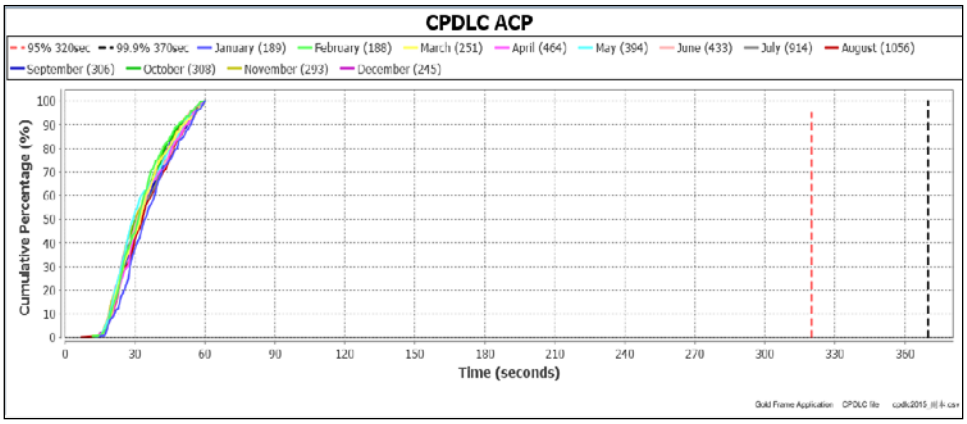

Figure 1: Urumqi FIR ACP per Month - Satellite

1.3 **Table 2** and **Figure 2** present CPDLC ACP per month for messages sent within the Lanzhou FIR (ZLLL) by Satellite data link, for the period Jan. 2015 to Dec. 2015. The ACP for CPDLC messages sent via satellite, VHF and HF all meet the 95% and 99.9% pencentage criteria.

Lanzhou FIR CPDLC ACP per Month - Satellite				
Month	**Messages**	**% < 320 sec (Target 95%)**	**%< 370 sec (Target 99.9%)**	**Remarks**
Jan.	157	100.00%	100.00%	-
Feb.	186	100.00%	100.00%	-
Mar.	278	100.00%	100.00%	-

Lanzhou FIR CPDLC ACP per Month - Satellite				
Month	**Messages**	**% < 320 sec (Target 95%)**	**%< 370 sec (Target 99.9%)**	**Remarks**
Apr.	311	100.00%	100.00%	-
May	353	100.00%	100.00%	-
Jun.	316	100.00%	100.00%	-
Jul.	298	100.00%	100.00%	-
Aug.	286	100.00%	100.00%	-
Sep.	314	100.00%	100.00%	-
Oct.	537	100.00%	100.00%	-
Nov.	311	100.00%	100.00%	-
Dec.	274	100.00%	100.00%	-
Total	3,621	100.00%	100.00%	-

Table 2: Lanzhou FIR CPDLC ACP per Month - Satellite

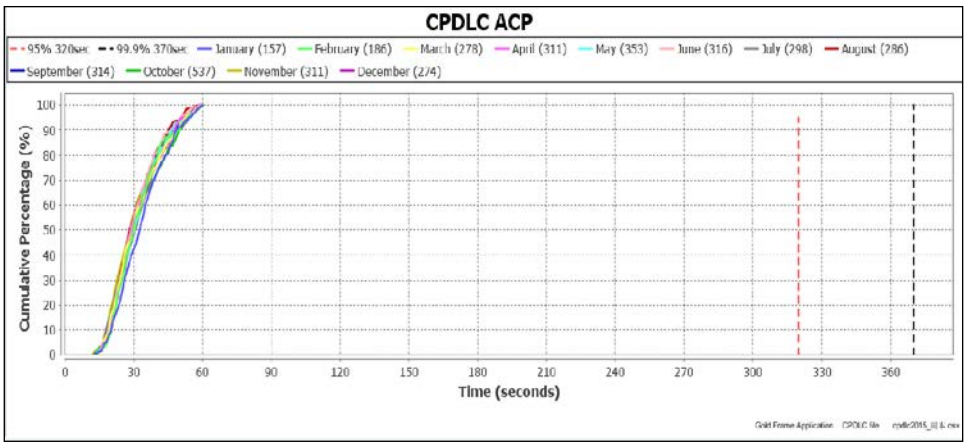

Figure 2: Lanzhou FIR ACP per Month - Satellite

CPDLC Actual Communications Performance (ACP) per Month – VHF

1.4 **Table 3** and **Figure 3** present CPDLC ACP (VHF) per month for messages sent within the Urumqi FIR (ZWWW) by VHF data linnk, for the period Jan. 2015 to Dec. 2015. The ACP for CPDLC messages sent via satellite, VHF and HF all meet the 95% and 99.9% pencentage criteria.

Urumqi FIR CPDLC ACP per Month - VHF				
Month	**Messages**	**% < 320 sec (Target 95%)**	**%< 370 sec (Target 99.9%)**	**Remarks**
Jan.	350	100.00%	100.00%	-
Feb.	319	100.00%	100.00%	-
Mar.	371	100.00%	100.00%	-
Apr.	688	100.00%	100.00%	-
May	520	100.00%	100.00%	-
Jun.	538	100.00%	100.00%	-
Jul.	995	100.00%	100.00%	-
Aug.	1,459	100.00%	100.00%	-
Sep.	399	100.00%	100.00%	-
Oct.	372	100.00%	100.00%	-
Nov.	352	100.00%	100.00%	-
Dec.	395	100.00%	100.00%	-
Total	6,758	100.00%	100.00%	-

Table 3: Urumqi FIR CPDLC ACP per Month - VHF

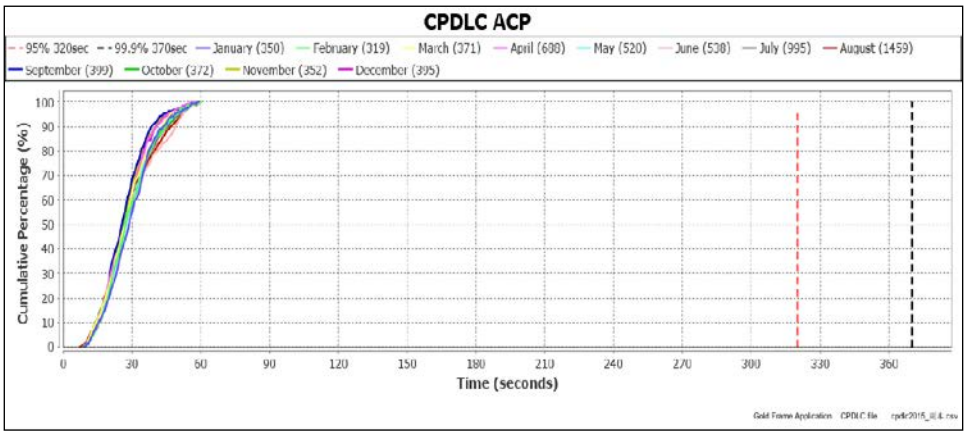

Figure 3: Urumqi FIR ACP per Month - VHF

1.5 **Table 4** and **Figure 4** present CPDLC ACP (VHF) per month for messages sent within the Lanzhou FIR (ZLLL) by VHF data linnk, for the period Jan. 2015 to Dec. 2015. The ACP for CPDLC messages sent via satellite, VHF and HF all meet the 95% and 99.9% pencentage criteria.

Lanzhou FIR CPDLC ACP per Month - VHF				
Month	**Messages**	**% < 320 sec (Target 95%)**	**%< 370 sec (Target 99.9%)**	**Remarks**
Jan.	92	100.00%	100.00%	-
Feb.	111	100.00%	100.00%	-
Mar.	126	100.00%	100.00%	-
Apr.	145	100.00%	100.00%	-
May	162	100.00%	100.00%	-
Jun.	123	100.00%	100.00%	-
Jul.	102	100.00%	100.00%	-
Aug.	101	100.00%	100.00%	-
Sep.	100	100.00%	100.00%	-
Oct.	151	100.00%	100.00%	-
Nov.	92	100.00%	100.00%	-
Dec.	88	100.00%	100.00%	-
Total	1,393	100.00%	100.00%	-

Table 4: Lanzhou FIR CPDLC ACP per Month - VHF

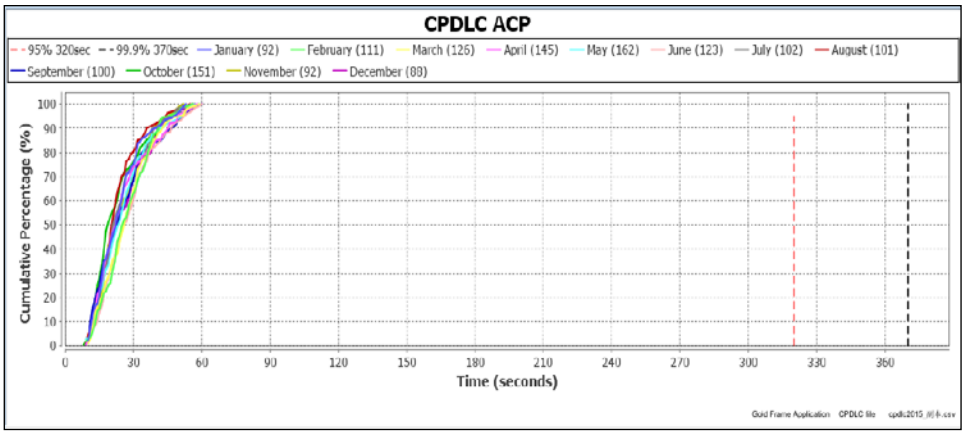

Figure 4: Lanzhou FIR ACP per Month - VHF

CPDLC Actual Communications Performance (ACP) per Month – HF

1.6 **Table 5** and **Figure 5** present CPDLC ACP measurements per month for messages sent within the Urumqi FIR (ZWWW) by HF data link, for the period Jan. 2015 to Dec. 2015. The ACP for CPDLC messages sent via satellite, VHF and HF all meet the 95% and 99.9% pencentage criteria.

Urumqi FIR CPDLC ACP per Month - HF				
Month	**Messages**	**% < 320 sec (Target 95%)**	**%< 370 sec (Target 99.9%)**	**Remarks**
Feb.	1	100.00%	100.00%	-
Mar.	2	100.00%	100.00%	-
Jun.	1	100.00%	100.00%	-
Aug.	5	100.00%	100.00%	-
Sep.	1	100.00%	100.00%	-
Oct.	1	100.00%	100.00%	-
Dec.	2	100.00%	100.00%	-
Total	13	100.00%	100.00%	-

Table 5: Urumqi FIR CPDLC ACP per Month - HF

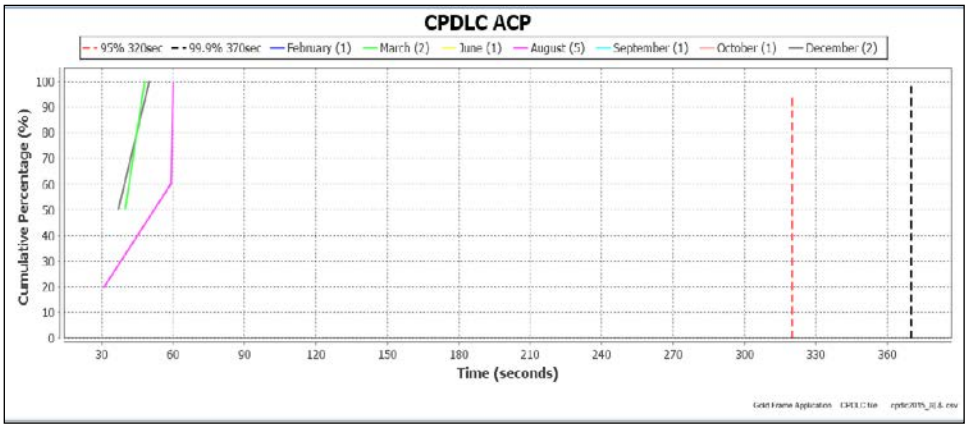

Figure 5: Urumqi FIR ACP per Month – HF

2. CPDLC ACTUAL COMMUNICATION TECHNICAL PERFORMANCE(ACTP)

CPDLC Actual Communications Technical Performance (ACTP) per Month – Satellite

2.1 **Table 6** and **Figure 6** present CPDLC ACTP per month for messages sent within the Urumqi FIR (ZWWW) by Satellite data link, for the period Jan. 2015 to Dec. 2015.

Urumqi FIR CPDLC ACTP per Month – Satellite				
Month	**Messages**	**% < 260 sec (Target 95%)**	**%< 310 sec (Target 99.9%)**	**Remarks**
Jan.	189	100.00%	100.00%	-
Feb.	188	99.56%	99.58%	-
Mar.	251	99.59%	99.62%	-
Apr.	464	100.00%	100.00%	-
May	394	99.95%	100.00%	-
Jun.	433	100.00%	100.00%	-
Jul.	914	99.90%	99.90%	-
Aug.	1,056	99.65%	99.66%	-
Sep.	306	99.73%	99.75%	-
Oct.	308	99.35%	99.39%	-
Nov.	293	100.00%	100.00%	-
Dec.	245	100.00%	100.00%	-
Total	5,041	99.77%	99.80%	-

Table 6: Urumqi FIR CPDLC ACTP per Month - Satellite

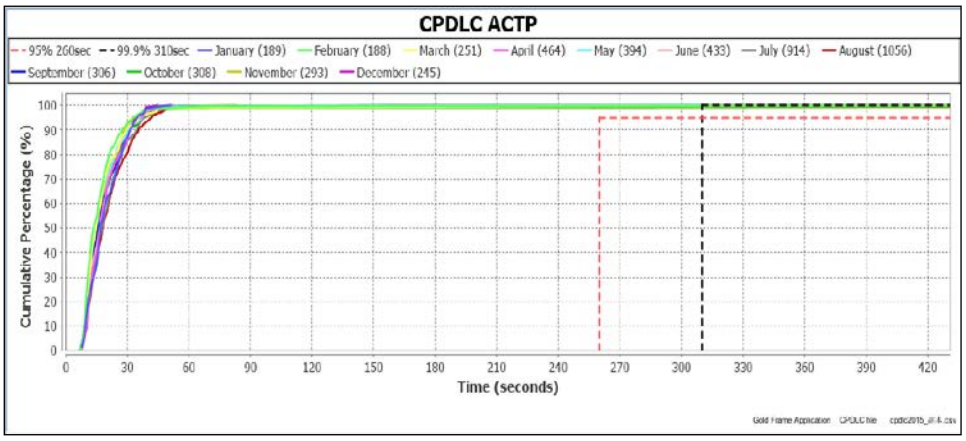

Figure 6: Urumqi FIR ACTP per Month - Satellite

2.2 **Table 7** and **Figure 7** present CPDLC ACTP per month for messages sent within the Lanzhou FIR (ZLLL) by Satellite data link, for the period Jan. 2015 to Dec. 2015.

Lanzhou FIR CPDLC ACTP per Month - Satellite				
Month	**Messages**	**% < 260 sec (Target 95%)**	**%< 310 sec (Target 99.9%)**	**Remarks**
Jan.	157	100.00%	100.00%	-
Feb.	186	100.00%	100.00%	-
Mar.	278	99.78%	99.82%	-
Apr.	311	99.42%	99.44%	-
May	353	99.19%	99.21%	-
Jun.	316	99.46%	99.48%	-
Jul.	298	99.10%	99.13%	-
Aug.	286	100.00%	100.00%	-
Sep.	314	99.07%	99.18%	-
Oct.	537	99.84%	99.85%	-
Nov.	311	100.00%	100.00%	-
Dec.	274	100.00%	100.00%	-
Total	3,621	99.59%	99.60%	-

Table 7: Lanzhou FIR CPDLC ACTP per Month - Satellite

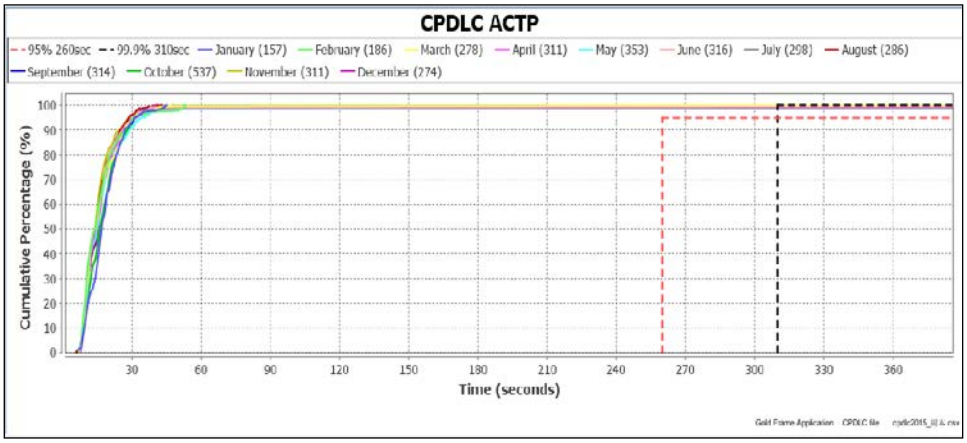

Figure 7: Lanzhou FIR ACTP per Month - Satellite

CPDLC Actual Communications Techinical Performance (ACTP) per Month – VHF

2.3 **Table 8** and **Figure 8** present CPDLC ACTP per month for messages sent within the Urumqi FIR (ZWWW) by VHF data linnk, for the period Jan. 2015 to Dec. 2015.

Urumqi FIR CPDLC ACTP per Month - VHF

Month	Messages	% < 260 sec (Target 95%)	%< 310 sec (Target 99.9%)	Remarks
Jan.	350	99.04%	99.08%	-
Feb.	319	100.00%	100.00%	-
Mar.	371	99.76%	99.78%	-
Apr.	688	99.14%	99.18%	-
May	520	99.86%	99.87%	-
Jun.	538	99.45%	99.46%	-
Jul.	995	99.82%	99.82%	-
Aug.	1,459	99.33%	99.38%	-
Sep.	399	99.56%	99.57%	-
Oct.	372	98.99%	99.01%	-
Nov.	352	99.75%	99.76%	-
Dec.	395	99.84%	99.86%	-
Total	6,758	99.47%	99.48%	-

Table 8: Urumqi FIR CPDLC ACTP per Month - VHF

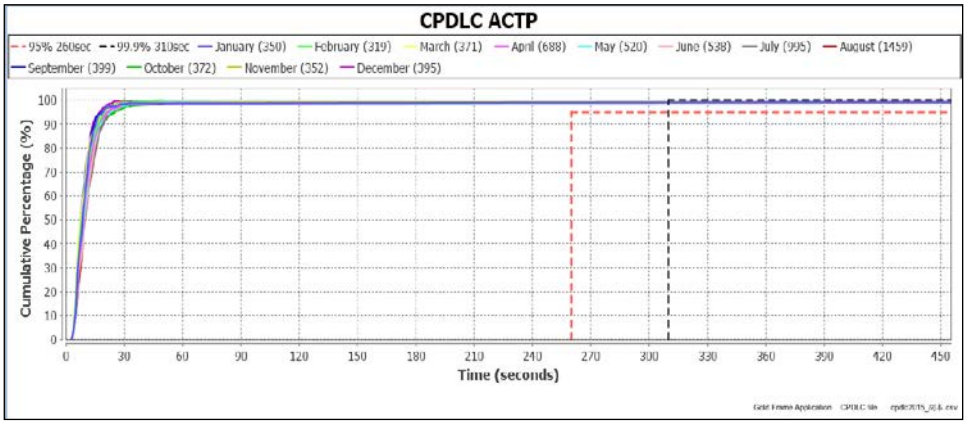

Figure 8: Urumqi FIR ACTP per Month - VHF

2.4 **Table 9** and **Figure 9** present CPDLC ACTP (VHF) per month for messages sent within the Lanzhou FIR (ZLLL) by VHF data linnk, for the period Jan. 2015 to Dec. 2015.

Lanzhou FIR CPDLC ACTP per Month - VHF				
Month	**Messages**	**% < 260 sec (Target 95%)**	**%< 310 sec (Target 99.9%)**	**Remarks**
Jan.	92	100.00%	100.00%	-
Feb.	111	100.00%	100.00%	-
Mar.	126	99.37%	99.40%	-
Apr.	145	100.00%	100.00%	-
May	162	100.00%	100.00%	-
Jun.	123	100.00%	100.00%	-
Jul.	102	100.00%	100.00%	-
Aug.	101	100.00%	100.00%	-
Sep.	100	100.00%	100.00%	-
Oct.	151	100.00%	100.00%	-
Nov.	92	99.04%	99.08%	-
Dec.	88	100.00%	100.00%	-
Total	1,393	99.86%	99.86%	-

Table 9: Lanzhou FIR CPDLC ACTP per Month - VHF

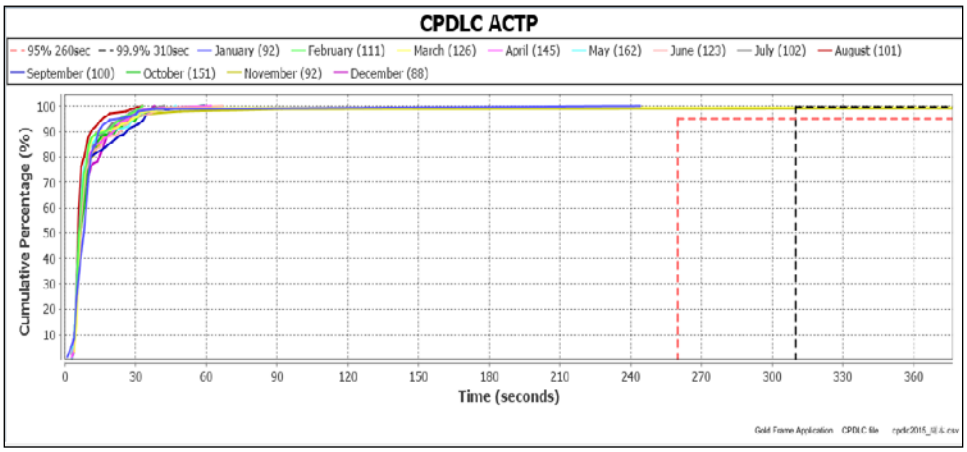

Figure 9: Lanzhou FIR ACTP per Month - VHF

CPDLC Actual Communications Technical Performance (ACTP) per Month – HF

2.5 **Table 10** and **Figure 10** present CPDLC ACTP measurements per month for messages sent within the Urumqi FIR (ZWWW) by HF data link, for the period Jan. 2015 to Dec. 2015.

Urumqi FIR CPDLC ACTP per Month - HF				
Month	**Messages**	**% < 260 sec (Target 95%)**	**%< 310 sec (Target 99.9%)**	**Remarks**
Feb.	1	100.00%	100.00%	-
Mar.	2	100.00%	100.00%	-
Jun.	1	100.00%	100.00%	-
Aug.	5	100.00%	100.00%	-
Sep.	1	100.00%	100.00%	-
Oct.	1	100.00%	100.00%	-
Dec.	2	100.00%	100.00%	-
Total	13	100.00%	100.00%	-

Table 10: Urumqi FIR CPDLC ACTP per Month - HF

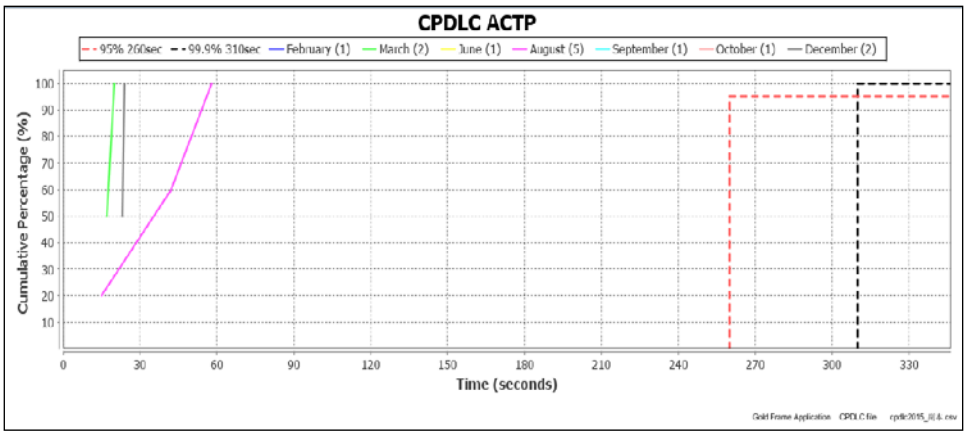

Figure 10: Urumqi FIR ACTP per Month – HF

3. CPDLC COMMUNICATION PERFORMANCE PER OPERATOR

CPDLC Actual Communications Technical Performance (ACTP) per Operator (de-identified)

3.1 **Table 11** and **Figure 11** present CPDLC Actual Communications Technical Performance per Operator (de-identified) for messages sent within Urumqi FIR (ZWWW), for the period Jan. 2015 to Dec. 2015.

Urumqi FIR CPDLC ACTP per Operator				
Operator (de-identified)	**Messages**	**% < 260 sec (Target 95%)**	**%< 310 sec (Target 99.9%)**	**Remarks**
UNK	139	100.00%	100.00%	-
AAA	432	98.72%	98.74%	-
ABA	56	100.00%	100.00%	-
ABC	628	99.19%	99.22%	-
ABD	1	100.00%	100.00%	-
CCC	161	100.00%	100.00%	-
DDD	444	99.78%	99.79%	-
FFF	25	100.00%	100.00%	-
GGG	494	99.81%	99.82%	-
HHH	5,307	99.63%	99.64%	-
III	1,686	99.81%	99.82%	-
JJJ	8	100.00%	100.00%	-
KKK	40	100.00%	100.00%	-
LLL	16	100.00%	100.00%	-
MMM	253	98.83%	98.88%	-
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	99.54%	99.58%	-
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	99.60%	99.61%	-

Table 11: Urumqi FIR CPDLC ACTP per Operator

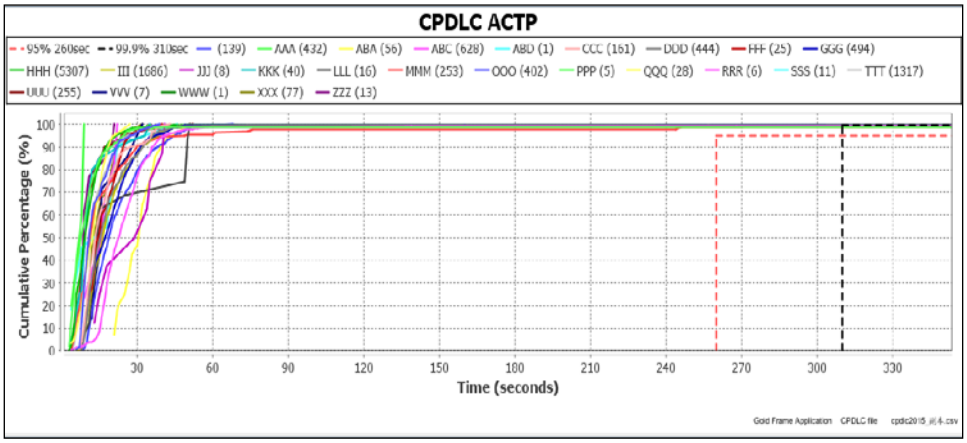

Figure 11: Urumqi FIR CPLC ACTP per Operator

3.2 **Table 12** and **Figure 12** present CPDLC Actual Communications Technical Performance per Operator (de-identified) for messages sent within Lanzhou FIR (ZLLL), for the period Jan. 2015 to Dec. 2015.

Lanzhou FIR CPDLC ACTP per Operator				
Operator (de-identified)	**Messages**	**% < 260 sec (Target 95%)**	**%< 310 sec (Target 99.9%)**	**Remarks**
UNK	100	98.22%	98.27%	-

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	99.26%	99.30%	-
DDD	392	99.78%	99.79%	-
EEE	22	100.00%	100.00%	-
FFF	23	100.00%	100.00%	-
GGG	269	99.38%	99.41%	-
HHH	595	100.00%	100.00%	-
III	1,332	99.64%	99.65%	-
JJJ	2	100.00%	100.00%	-
KKK	29	100.00%	100.00%	-
LLL	1	100.00%	100.00%	-
MMM	139	98.71%	98.74%	-
NNN	1	100.00%	100.00%	-
OOO	418	99.19%	99.22%	-
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%	-

Table 12: Lanzhou FIR CPDLC ACTP per Operator

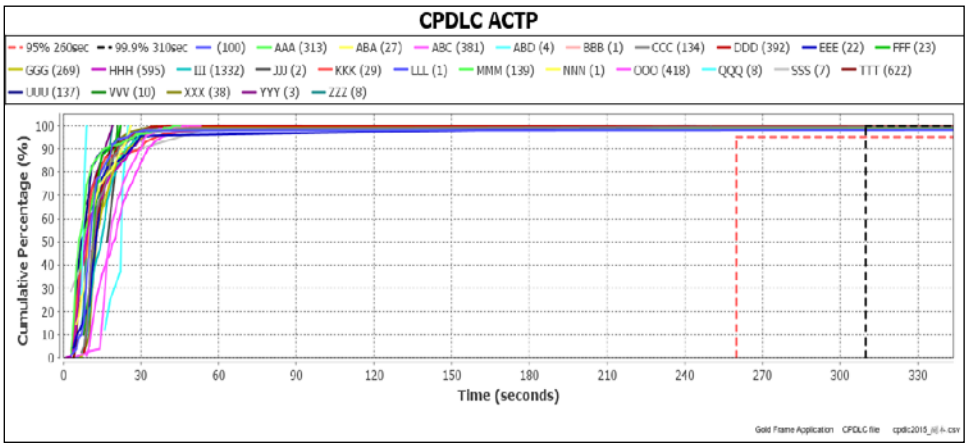

Figure 12: Lanzhou FIR CPLC ACTP per Operator

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

3.3 **Table 13** and **Figure 13** present CPDLC Pilot Operational Response Time per Operator for messages sent within Urumqi FIR (ZWWW), for the period Jan.2015 to Dec. 2015.

Urumqi FIR CPDLC PORT per Operator			
Operator (de-identified)	**Messages**	**% < 60 sec (Target 95%)**	**Remarks**
	139	100.00%	-
AAA	432	100.00%	-

ABA	56	100.00%	-
ABC	628	100.00%	-
ABD	1	100.00%	-
CCC	161	100.00%	-
DDD	444	100.00%	-
FFF	25	100.00%	-
GGG	494	100.00%	-
HHH	5,307	100.00%	-
III	1,686	100.00%	-
JJJ	8	100.00%	-
KKK	40	100.00%	-
LLL	16	100.00%	-
MMM	253	100.00%	-
OOO	402	100.00%	-
PPP	5	100.00%	-
QQQ	28	100.00%	-
RRR	6	100.00%	-
SSS	11	100.00%	-
TTT	1,317	100.00%	-
UUU	255	100.00%	-
VVV	7	100.00%	-
WWW	1	100.00%	-
XXX	77	100.00%	-
ZZZ	13	100.00%	-
Total	11,812	100.00%	-

Table 13: Urumqi FIR PORT per Operator

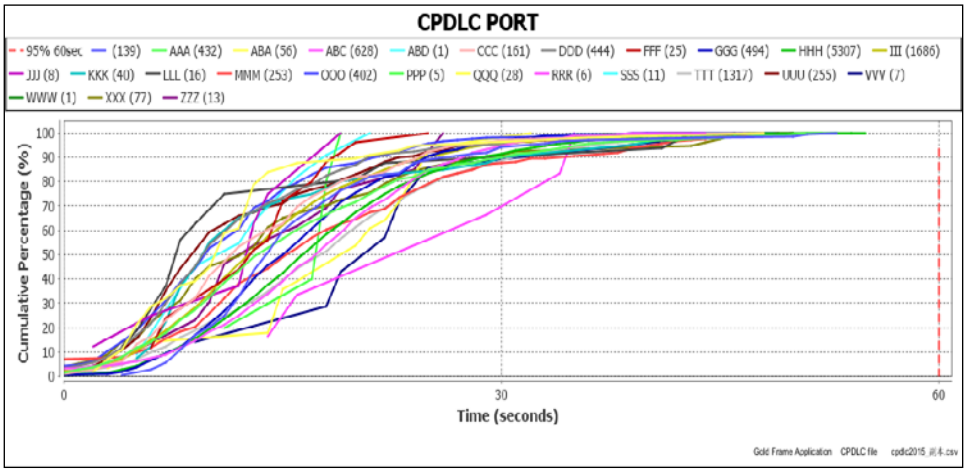

Figure 13: Urumqi FIR PORT per Operator

3.4 **1Table 4** and **Figure 14** present CPDLC Pilot Operational Response Time per Operator for messages sent within Lanzhou FIR (ZLLL), for the period Jan.2015 to Dec. 2015.

Lanzhou FIR CPDLC PORT per Operator			
Operator (de-identified)	**Messages**	**% < 60 sec (Target 95%)**	**Remarks**
	100	100.00%	-
AAA	313	100.00%	-
ABA	27	100.00%	-

ABC	381	100.00%	-
ABD	4	100.00%	-
BBB	1	100.00%	-
CCC	134	100.00%	-
DDD	392	100.00%	-
EEE	22	100.00%	-
FFF	23	100.00%	-
GGG	269	100.00%	-
HHH	595	100.00%	-
III	1,332	100.00%	-
JJJ	2	100.00%	-
KKK	29	100.00%	-
LLL	1	100.00%	-
MMM	139	100.00%	-
NNN	1	100.00%	-
OOO	418	100.00%	-
QQQ	8	100.00%	-
SSS	7	100.00%	-
TTT	622	100.00%	-
UUU	7	100.00%	-
VVV	10	100.00%	-
XXX	38	100.00%	-
YYY	3	100.00%	-
ZZZ	8	100.00%	-
Total	5,016	100.00%	-

Table 14: Lanzhou FIR PORT per Operator

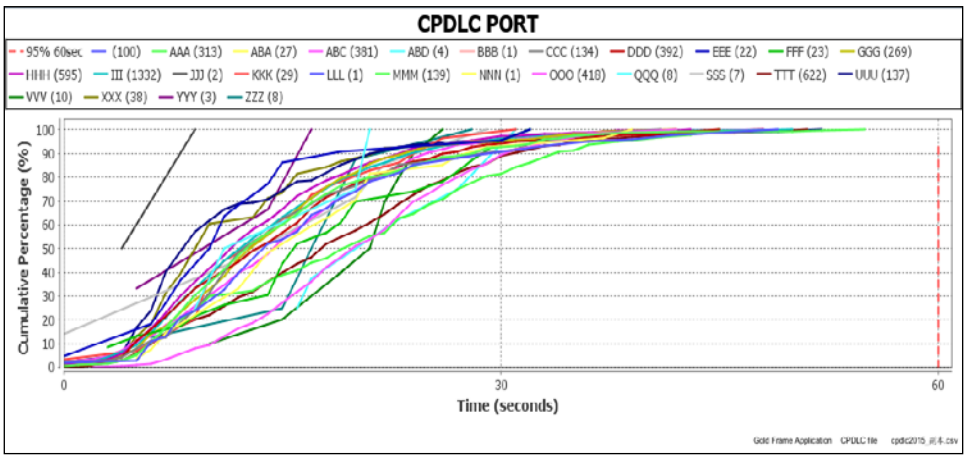

Figure 14: Lanzhou FIR PORT per Operator

4. ADS-C DOWNLINK LATENCY

ADS-C Downlink Latency per Month - Satellite

4.1 **Table 15** and **Figure 15** present ADS-C Downlink Latency per month for messages sent within Urumqi FIR (ZWWW) by Satellite data link, for the period Jan.2015 to Dec. 2015.

Urumqi FIR ADS-C Downlink Latency – Satellite

Month	Messages	% < 300 sec (Target 95%)	%< 400 sec (Target 99.9%)	Remarks
Jan.	20,268	99.79%	99.84%	-
Feb.	18,496	99.81%	99.84%	-
Mar.	20,359	99.73%	99.82%	-
Apr.	19,760	99.70%	99.82%	-
May	20,144	99.74%	99.84%	-
Jun.	17,819	99.88%	99.92%	-
Jul.	18,218	99.67%	99.81%	-
Aug.	17,105	99.78%	99.88%	-
Sep.	18,594	99.74%	99.85%	-
Oct.	18,082	99.75%	99.83%	-
Nov.	19,061	99.72%	99.88%	-
Dec.	18,384	99.82%	99.91%	-
Total	226,290	99.76%	99.85%	-

Table 15: Urumqi FIR ADS-C Downlink Latency per month - Satellite

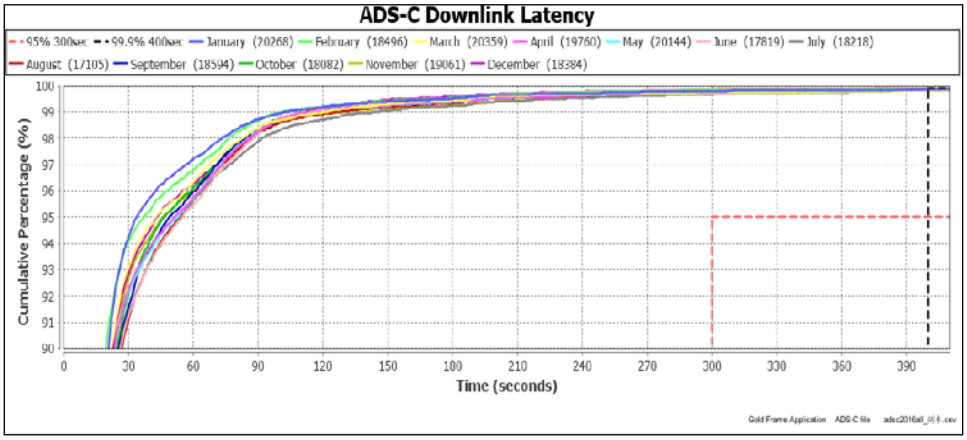

Figure 15: Urumqi FIR ADS-C Downlink Latency per month - Satellite

4.2 **Table 16** and **Figure 16** present ADS-C Downlink Latency per month for messages sent within Lanzhou FIR (ZLLL) by Satellite data link, for the period Jan.2015 to Dec. 2015.

Lanzhou FIR ADS-C Downlink Latency – Satellite				
Month	**Messages**	**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**
Jan.	38,867	99.53%	99.64%	-
Feb.	33,736	99.76%	99.87%	-
Mar.	39,060	99.74%	99.86%	-
Apr.	39,559	99.76%	99.84%	-
May	38,669	99.68%	99.81%	-
Jun.	33,545	99.76%	99.87%	-
Jul.	35,312	99.67%	99.82%	-
Aug.	34,763	99.75%	99.86%	-
Sep.	34,097	99.75%	99.88%	-
Oct.	34,877	99.73%	99.84%	-
Nov.	35,760	99.72%	99.81%	-
Dec.	34,728	99.74%	99.83%	-
Total	432,973	99.71%	99.82%	-

Table 16: Lanzhou FIR ADS-C Downlink Latency per month - Satellite

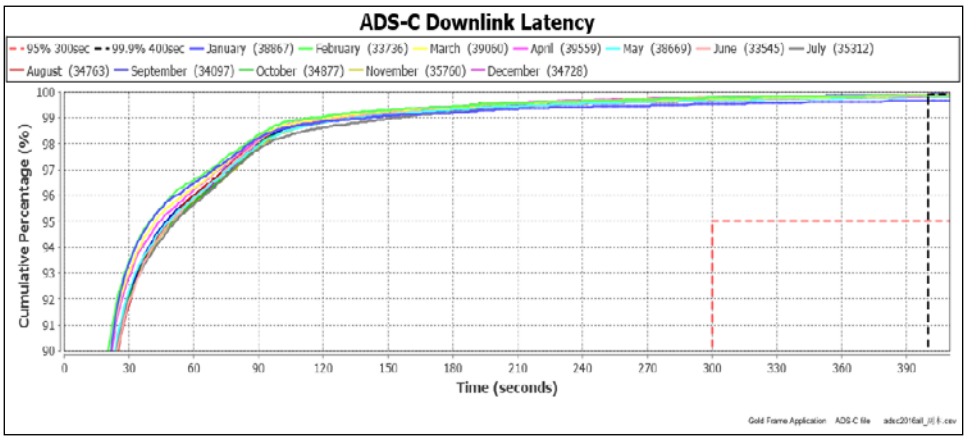

Figure 16: Lanzhou FIR ADS-C Downlink Latency per month - Satellite

4.3 **Table 17** and **Figure 17** present ADS-C Downlink Latency per month for messages sent within Chengdu FIR (ZUUU) by Satellite data link, for the period Jan.2015 to Dec. 2015.

Chengdu FIR ADS-C Downlink Latency – Satellite				
Month	**Messages**	**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**
Jan.	27,401	99.32%	99.56%	-
Feb.	21,964	99.14%	99.52%	-
Mar.	27,840	99.45%	99.67%	-
Apr.	29,781	99.57%	99.71%	-
May	30,518	99.52%	99.71%	-
Jun.	26,871	99.38%	99.26%	-
Jul.	27,232	99.36%	99.56%	-
Aug.	28,994	99.55%	99.71%	-
Sep.	31,573	99.69%	99.82%	-
Oct.	30,657	99.68%	99.80%	-
Nov.	34,413	99.73%	99.82%	-
Dec.	31,684	99.69%	99.81%	-
Total	348,928	99.52%	99.70%	-

Table 17: Chengdu FIR ADS-C Downlink Latency per month - Satellite

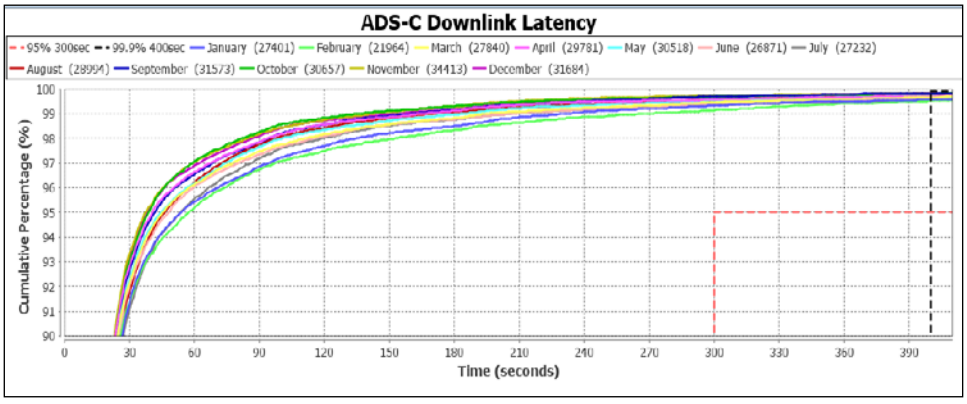

Figure 17: Chengdu FIR ADS-C Downlink Latency per month - Satellite

4.4 **Table 18** and **Figure 18** present ADS-C Downlink Latency per month for messages sent within Kunming FIR (ZPPP) by Satellite data link, for the period Jan.2015 to Dec. 2015.

Kunming FIR ADS-C Downlink Latency – Satellite				
Month	**Messages**	**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**
Jan.	2,336	99.42%	99.64%	-

Feb.	927	99.42%	99.64%	-
Mar.	626	100.00%	100.00%	-
Apr.	551	99.74%	99.80%	-
May	445	99.86%	99.96%	-
Jun.	933	99.71%	99.82%	-
Jul.	3,053	99.92%	99.95%	-
Aug.	3,014	99.58%	99.81%	-
Sep	1,581	99.64%	99.83%	-
Oct.	1,141	99.86%	100.00%	-
Nov.	804	99.69%	99.81%	-
Dec.	349	99.24%	99.32%	-
Total	15,760	99.67%	99.81%	-

Table 18: Kunming FIR ADS-C Downlink Latency per month - Satellite

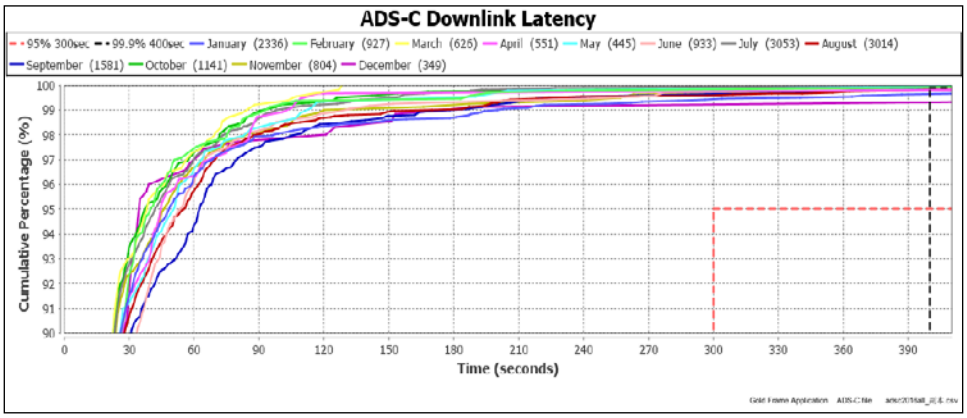

Figure 18: Kunming FIR ADS-C Downlink Latency per month - Satellite

ADS-C Downlink Latency per Month - VHF

4.5 **Table 19** and **Figure 19** present ADS-C Downlink Latency per month for messages sent within Urumqi FIR (ZWWW) by VHF data link, for the period Jan.2015 to Dec. 2015.

Urumqi FIR ADS-C Downlink Latency –VHF				
Month	**Messages**	**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**
Jan.	13,623	99.74%	99.81%	-
Feb.	13,289	99.89%	99.96%	-
Mar.	17,311	99.88%	99.95%	-
Apr.	19,174	99.89%	99.93%	-
May	19,145	99.93%	99.97%	-
Jun.	17,791	99.85%	99.94%	-
Jul.	17,132	99.84%	99.90%	-
Aug.	16,919	99.88%	99.95%	-
Sep.	18,182	99.87%	99.92%	-
Oct.	16,484	99.91%	99.97%	-
Nov.	16,201	99.86%	99.89%	-
Dec.	16,514	99.92%	99.99%	-
Total	201,765	99.87%	99.93%	-

Table 19: Urumqi FIR ADS-C Downlink Latency per month - VHF

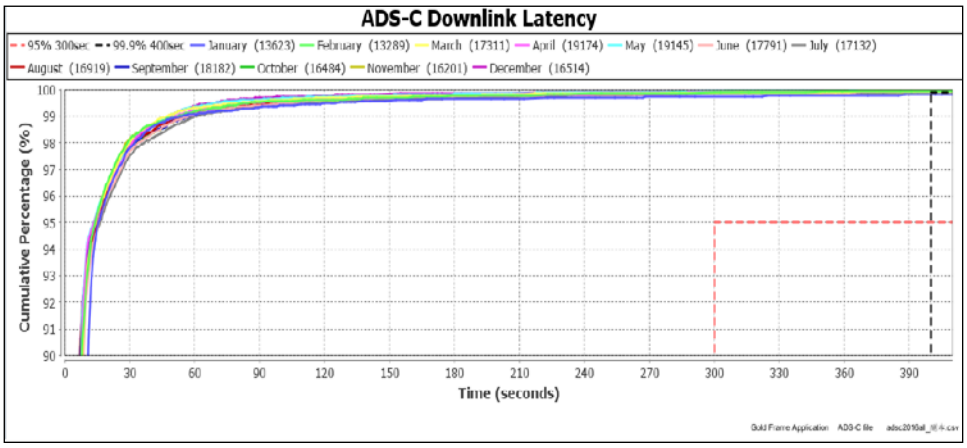

Figure 19: Urumqi FIR ADS-C Downlink Latency per month - VHF

4.6 **Table 20** and **Figure 20** present ADS-C Downlink Latency per month for messages sent within Lanzhou FIR (ZLLL) by VHF data link, for the period Jan.2015 to Dec. 2015.

Lanzhou FIR ADS-C Downlink Latency – VHF				
Month	**Messages**	**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**
Jan.	29,189	99.80%	99.93%	-
Feb.	28,605	99.88%	99.88%	-
Mar.	34,423	99.87%	99.94%	-
Apr.	40,410	99.89%	99.94%	-
May	42,749	99.89%	99.95%	-
Jun.	37,054	99.85%	99.95%	-
Jul.	36,993	99.88%	99.94%	-
Aug.	40,530	99.84%	99.92%	-
Sep.	36,990	99.83%	99.92%	-
Oct.	37,084	99.87%	99.94%	-
Nov.	35,884	99.85%	99.91%	-
Dec.	36,805	99.93%	99.96%	-
Total	436,716	99.51%	99.84%	-

Table 20: Lanzhou FIR ADS-C Downlink Latency per month - VHF

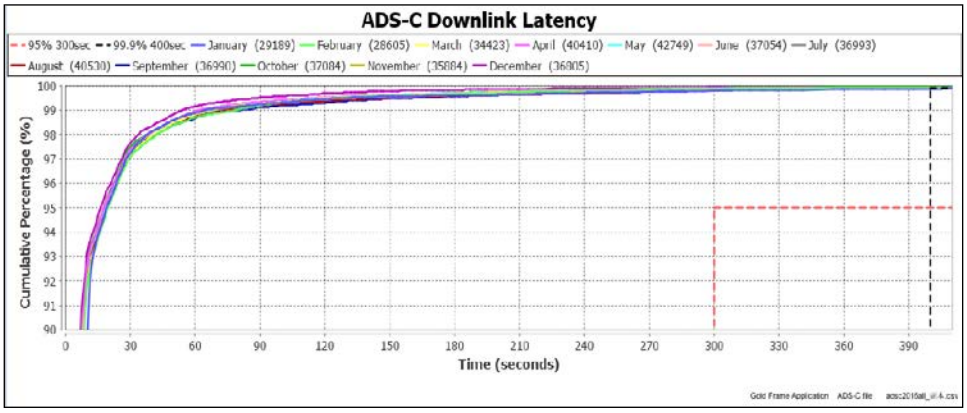

Figure 20: Lanzhou FIR ADS-C Downlink Latency per month - VHF

4.7 **Table 21** and **Figure 21** present ADS-C Downlink Latency per month for messages sent within Chengdu FIR (ZUUU) by VHF data link, for the period Jan.2015 to Dec. 2015.

Chengdu FIR ADS-C Downlink Latency – VHF				
Month	**Messages**	**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**

Jan.	16,596	99.82%	99.89%	-
Feb.	14,510	99.75%	99.82%	-
Mar.	18,261	99.86%	99.93%	-
Apr.	17,106	99.90%	99.95%	-
May	18,223	99.87%	99.93%	-
Jun.	15,700	98.82%	99.88%	-
Jul.	17,862	98.69%	99.83%	-
Aug.	17,924	99.66%	99.77%	-
Sep.	18,284	99.86%	99.91%	-
Oct.	18,841	99.82%	99.89%	-
Nov.	18,629	99.86%	99.91%	-
Dec.	18,519	99.89%	99.92%	-
Total	210,455	99.84%	99.90%	-

Table 21: Chengdu FIR ADS-C Downlink Latency per month - VHF

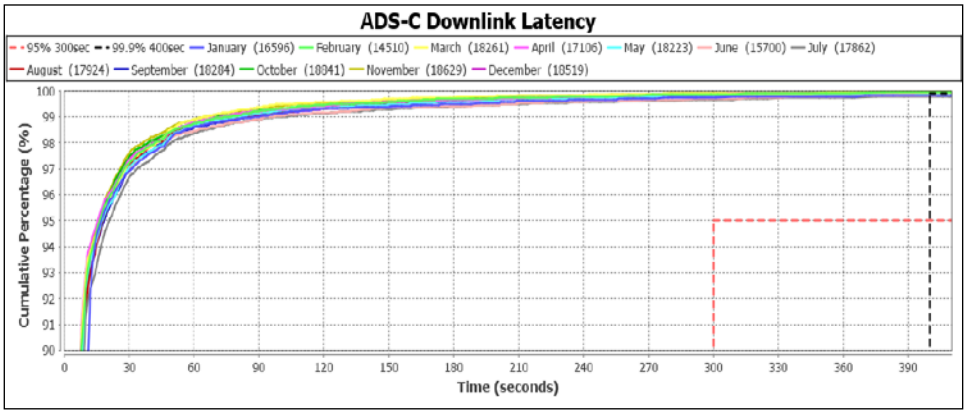

Figure 21: Chengdu FIR ADS-C Downlink Latency per month - VHF

4.8 **Table 22** and **Figure 22** present ADS-C Downlink Latency per month for messages sent within Kunming FIR (ZPPP) by VHF data link, for the period Jan.2015 to Dec. 2015.

Kunming FIR ADS-C Downlink Latency – VHF				
Month	**Messages**	**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**
Jan.	1,622	99.50%	99.61%	-
Feb.	622	100.00%	100.00%	-
Mar.	652	100.00%	100.00%	-
Apr.	631	99.66%	99.85%	-
May	1,042	100.00%	100.00%	-
Jun.	916	99.64%	99.72%	-
Jul.	3,286	99.95%	99.97%	-
Aug.	3,369	99.80%	99.86%	-
Sep.	2,072	99.96%	100.00%	-
Oct.	999	99.61%	99.73%	-
Nov.	795	99.46%	99.86%	-
Dec.	444	99.85%	99.89%	-
Total	16,450	99.79%	99.87%	-

Table 22: Kunming FIR ADS-C Downlink Latency per month – VHF

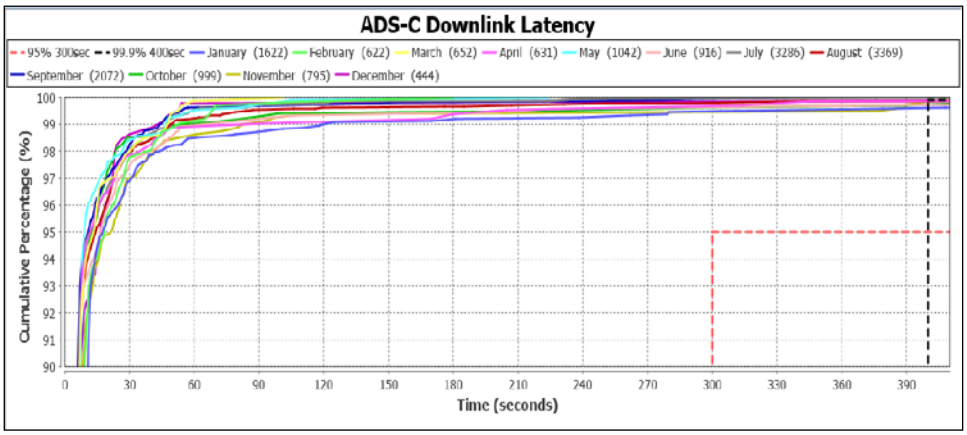

Figure 22: Kunming FIR ADS-C Downlink Latency per month - VHF

ADS-C Downlink Latency per Month - HF

4.9 **Table 23** and **Figure 23** present ADS-C Downlink Latency per month for messages sent within Urumqi FIR (ZWWW) by HF data link, for the period Jan.2015 to Dec. 2015.

Urumqi FIR ADS-C Downlink Latency –HF				
Month	**Messages**	**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**
Jan.	83	97.26%	100.00%	-
Feb.	106	85.89%	87.59%	-
Mar.	83	90.36%	93.12%	-
Apr.	99	96.46%	98.77%	-
May	88	91.29%	95.90%	-
Jun.	84	84.75%	92.11%	-
Jul.	92	85.75%	90.40%	-
Aug.	64	93.78%	98.80%	-
Sep.	64	97.06%	97.60%	-
Oct.	66	85.84%	90.45%	-
Nov.	50	87.90%	91.65%	-
Dec.	76	79.51%	82.41%	-
Total	955	89.11%	92.64%	-

Table 23: Urumqi FIR ADS-C Downlink Latency per month - HF

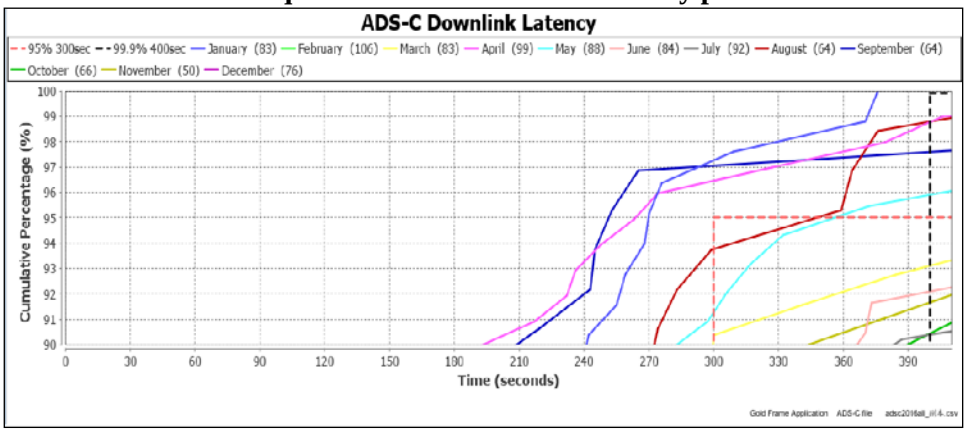

Figure 23: Urumqi FIR ADS-C Downlink Latency per month - HF

4.10 **Table 24** and **Figure 24** present ADS-C Downlink Latency per month for messages sent within Lanzhou FIR (ZLLL) by HF data link, for the period Jan.2015 to Dec. 2015.

Lanzhou FIR ADS-C Downlink Latency – HF				
Month	**Messages**	**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**

Jan.	200	89.00%	94.68%	-
Feb.	138	84.39%	90.21%	-
Mar.	158	90.99%	97.48%	-
Apr.	160	94.55%	97.02%	-
May	140	90.48%	95.00%	-
Jun.	148	87.88%	91.44%	-
Jul.	167	90.17%	93.78%	-
Aug.	98	90.66%	95.86%	-
Sep.	91	93.81%	94.78%	-
Oct.	101	90.37%	93.16%	-
Nov.	173	73.60%	82.18%	-
Dec.	133	91.25%	96.14%	-
Total	1,707	88.22%	92.97%	-

Table 24: Lanzhou FIR ADS-C Downlink Latency per month - HF

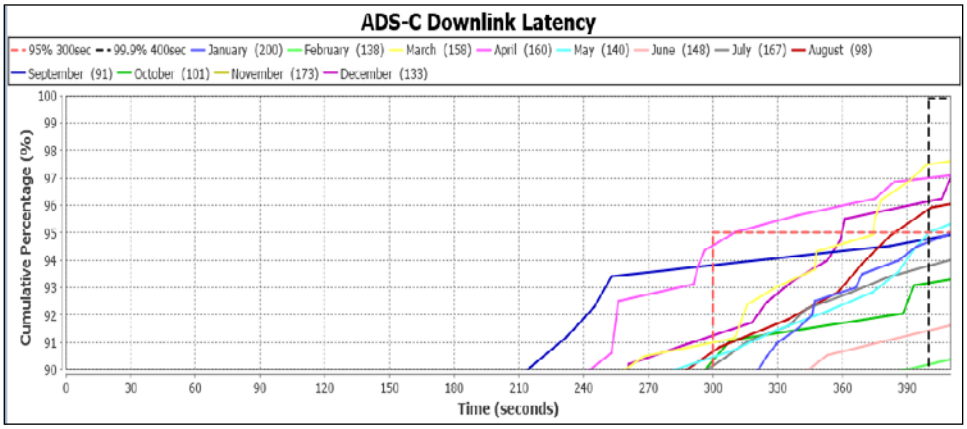

Figure 24: Lanzhou FIR ADS-C Downlink Latency per month - HF

4.11 **Table 25** and **Figure 25** present ADS-C Downlink Latency per month for messages sent within Chengdu FIR (ZUUU) by HF data link, for the period Jan.2015 to Dec. 2015.

Chengdu FIR ADS-C Downlink Latency – HF				
Month	**Messages**	**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**
Jan.	147	92.35%	94.91%	-
Feb.	128	82.52%	88.91%	-
Mar.	157	85.39%	93.06%	-
Apr.	176	86.96%	88.75%	-
May	162	83.69%	89.80%	-
Jun.	187	83.96%	89.76%	-
Jul.	93	82.99%	89.12%	-
Aug.	98	91.84%	96.11%	-
Sep.	117	94.74%	98.32%	-
Oct.	68	87.12%	91.56%	-
Nov.	79	75.41%	87.45%	-
Dec.	125	92.40%	96.88%	-
Total	1,537	86.47%	91.69%	-

Table 25: Chengdu FIR ADS-C Downlink Latency per month - HF

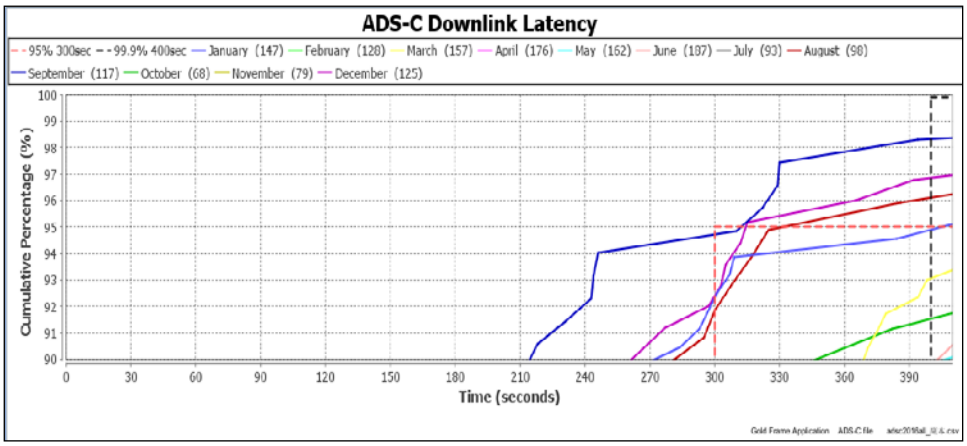

Figure 25: Chengdu FIR ADS-C Downlink Latency per month - HF

4.12 **Table 26** and **Figure 26** present ADS-C Downlink Latency per month for messages sent within Kunming FIR (ZPPP) by HF data link, for the period Jan.2015 to Dec. 2015.

Kunming FIR ADS-C Downlink Latency – HF				
Month	**Messages**	**% < 300 sec (Target 95%)**	**%< 400 sec (Target 99.9%)**	**Remarks**
Jan.	10	94.22%	96.11%	-
Feb.	1	100.00%	100.00%	-
Mar.	15	100.00%	100.00%	-
Apr.	1	100.00%	100.00%	-
Jun.	1	100.00%	100.00%	-
Jul.	30	71.64%	77.71%	-
Aug.	22	81.31%	85.18%	-
Sep.	6	100.00%	100.00%	-
Oct.	8	100.00%	100.00%	-
Nov.	2	100.00%	100.00%	-
Dec.	1	100.00%	100.00%	-
Total	97	85.39%	88.23%	-

Table 26: Kunming FIR ADS-C Downlink Latency per month - HF

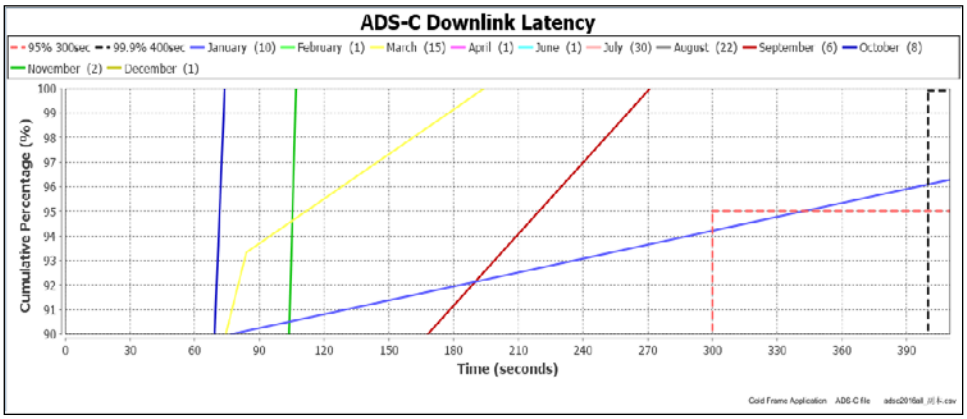

Figure 26: Kunming FIR ADS-C Downlink Latency per month - HF

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Attachment B The statistic of CPDLC/ADS-C messages applied for the data-link performance analysis for China for the period of Jan. 2015 to Dec. 2015

1.1 **Table 1** presents the number of ADS-C raw messages applied for the data-link performance analysis for China for the period Jan.2015 to Dec. 2015 by FIR.

FIR	No. of ADS-C raw msgs
ZLLL	913780
ZUUU	573710
ZWWW	459782
ZPPP	32969
	1980241

Table 1 Breakdown of ADS-C raw messages by FIR

1.2 **Table 2** presents the number of CPDLC raw messages applied for the data-link performance analysis for China for the period Jan.2015 to Dec. 2015 by FIR.

ATSP	No. of CPDLC raw msgs(Downlink)	No. of CPDLC raw msgs(Uplink)
ZLLL	72831	76517
ZWWW	52112	61120
ZUUU	10906	31
ZPPP	7	24
	135856	137692

Table 2 Breakdown of CPDLC raw messages by FIR

1.3 **Table 3** presents the number and proportion of CPDLC uplink raw messages applied for the data-link performance analysis for China for the period Jan.2015 to Dec. 2015 by uplink message element. (Proportion = the number of CPDLC uplink messages of with certain UM type divided by the total number of CPDLC uplink messages).

	No. of Uplink CPDLC msgs(proportion)	Uplink message element (UM)	Message Intent/Use
1	39819 (28.92%)	163	Notification to the pilot of an ATSU identifier
2	21636 (15.71%)	161	Notification to the avionics that the data link connection with the current data authority is being terminated.
3	21024 (15.27%)	3	Indicates that ATC has received and understood the message ：ROGER
4	16031 (11.64%)	169	FREE TEXT
5	12619 (9.16%)	160	Notification to the avionics that the specified data authority is the next data authority. If no data authority is specified, this indicates that any previously specified next data authority is no longer valid.
6	9421 (6.84%)	121	Instruction that at the specified position the ATS unit with the specified ATS unit name is to be monitored on the specified frequency. Note.— *The flight crew is not required to check in.*
7	6080 (4.42%)	147	Instruction to make a position report. Note.— *To be used if the controller does not receive a scheduled position report.*
8	1532 (1.11%)	117	Instruction that the ATS unit with the specified ATS unit name is to be contacted on the specified frequency.
9	1132 (0.82%)	1	Indicates that ATC has received the message and will

	No. of Uplink CPDLC msgs(proportion)	Uplink message element (UM)	Message Intent/Use
			respond. Note.— *The flight crew is informed that the request is being assessed and there will be a short-term delay (e.g. as appropriate, given the situation, but not to exceed 10 minutes). The exchange is not closed and the request will be responded to when conditions allow.* STANDBY
10	485 (0.35%)	118	Instruction that at the specified position the ATS unit with the specified ATS unit name is to be contacted on the specified frequency.
	89960(65.3%)		

Table 3 Breakdown of CPDLC uplink messages by uplink message element

1.4 **Table 4** presents the number and proportion of CPDLC downlink raw messages applied for the data-link performance analysis for China for the period Jan.2015 to Dec. 2015 by downlink message element. (Proportion = the number of CPDLC downlink messages of with certain DM type divided by the total number of CPDLC downlink messages).

	No. of Downlink CPDLC msgs(proportion)	Downlink message element (UM) (DM)	Message Intent/Use
1	39977 (29.43%)	73	A system-generated message indicating the software version number. FANS 1/A – ATN.— FANS 1/A *aircraft uses this message.*
2	27872 (20.52%)	48	Position report.
3	16669 (12.27%)	3	Message received and understood.
4	15059 (11.08%)	0	The instruction is understood and will be complied with. WILCO
5	13520 (9.95%)	67	FREE TEXT
6	12674 (9.33%)	62	A system-generated message that the avionics has detected an error.
7	3373 (2.48%)	64	Notification to the ground system that the specified ATSU is the current data authority.
8	2924 (2.15%)	9	Request to climb to the specified level.
9	1402 (1.03%)	63	A system-generated denial to any CPDLC application message sent from a ground facility that is not the current data authority.
10	515 (0.38%)	31	Notification of passing the specified position.
	133985(98.6%)		

Table 4 Breakdown of CPDLC downlink messages by downlink message element

1.5 **Table 5** presents the number CPDLC uplink messagess that receive a single DM 0 WILCO response for the data-link performance analysis for China for the period Jan.2015 to Dec. 2015 by media. (Proportion = the number of CPDLC uplink messages by media divided by the total number of CPDLC uplink messagess).

Media	No. of CPDLC	proportions

messages		
All	16833	
HF	15	0.09%
SAT	8667	51.49%
VHF	8151	48.42%

Table 5 Breakdown of CPDLC messages (by media) that receive a single DM 0 WILCO response for China for the period Jan.2015 to Dec. 2015

1.6 **Table 6** presents the number ADS-C messages for the data-link performance analysis for China for the period Jan.2015 to Dec. 2015 by media. (Proportion = the number of ADS-C messages by media type divided by the total number of ADS-C for data-link performance analysis).

Media	No. of ADS-C messages	proportions
All	1893633	
HF	4,296	0.23%
SAT	1,023,951	54.07%
VHF	865,386	45.70%

Table 6 Breakdown of ADS-C messages (by media) for the data-link performance analysis for China for the period Jan.2015 to Dec. 2015