International Civil Aviation Organization

Thirteenth Meeting of the FANS Interoperability Team – Asia (FIT–Asia/13)

Bangkok, Thailand, 06 – 09 June 2023

Agenda Item 4: Review of ADS/CPDLC Operations and Performance

DATA LINK PERFORMANCE REPORT FOR MALAYSIA

(Presented by MALAYSIA/CIVIL AVIATION AUTHORITY OF MALAYSIA)

SUMMARY

This paper presents data link performance data for 2022 for the Kuala Lumpur FIR, and information on actions taken to identify and rectify the causes of performance issues

1. INTRODUCTION

1.1 **Tables 1 to 4** summarize Automatic Dependent Surveillance – Contract (ADS-C) and Controller-Pilot Data Link Communications (CPDLC) performance where the Required Surveillance Performance (RSP) and Required Communications Performance (RCP) criteria stipulated in ICAO Doc 4444 – Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM) were not met. Actions taken to address performance not meeting the criteria are discussed, together with the outcomes of such actions.

2. DISCUSSION

Kuala Lumpur FIR ADS-C RSP180 Performance – Media Type, RGS and GES

2.1 **Table 1** summarizes overall ADS-C performance per media type, Remote Ground Station (RGS) and Ground Earth Station (GES) for downlinks sent within the Kuala Lumpur FIR during 2022, where performance did not meet the RSP180 performance criteria.

FIR	**Kuala Lumpur FIR**					
Criteria	**RSP180**					
Period	**Jan-June 2022**			**July-December 2022**		
Colour Key Meets Criteria 99.0%-99.84% Under Criteria	**Message Counts**	**95%**	**99.90%**	**Message Counts**	**95%**	**99.90%**
		% < = 90sec	**% <= 180sec**		**% < = 90sec**	**% <= 180sec**
By Media Type						
SATCOM	101,638	98.52%	99.64%	238,178	98.95%	99.73%
VHF	68,106	99.45%	99.82%	152,712	99.67%	99.91%
HF	14	89.18%	100.00%	30	57.33%	85.13%
ALL	169,757	98.89%	99.72%	390,920	99.23%	99.80%
By Remote Ground Station (RGS) Ground Earth Station (GES)						

FIR		Kuala Lumpur FIR					
Criteria		RSP180					
Period		Jan-June 2022			July-December 2022		
Colour Key Meets Criteria 99.0%-99.84% Under Criteria		Message Counts	95% % < = 90sec	99.90% % <= 180sec	Message Counts	95% % < = 90sec	99.90% % <= 180sec
Designator	Type	(only RGS/GES with message counts >100 recorded)					
EUA1	SAT	101	95.70%	98.28%	158	100.00%	100.00%
AOR1	SAT	1,666	97.98%	99.00%	15,915	99.72%	99.89%
APK1	SAT	63,542	98.82%	99.78%	139,798	99.29%	99.87%
APK2	SAT	15,009	97.04%	99.08%	38,611	98.24%	99.45%
IGW1	SAT	2,873	92.06%	97.98%	7,559	92.00%	97.39%
BTJ1	VHF	3,203	96.52%	98.53%	23,283	99.01%	99.70%
IXZ1	VHF	16,818	99.29%	99.80%	6,613	99.35%	99.92%
KUL1	VHF	232	98.14%	98.83%	310	99.79%	99.97%
VTZ1	VHF				124	96.98%	97.90%

Table 1: Kuala Lumpur FIR ADS-C Downlink Latency per Media Type, RGS and GES

2.2 In summary the RSP180 performance from both halves of 2022 differentiated by media type remain consistent despite seeing message counts doubled in the latter half. HF media type insignificantly failed all the performance criteria except for 99.9% for the duration of Jan-June. VHF media type achieved all the performance criteria except for 99.9% for the duration of Jan-June, where it only fell marginally below the requirement. SATCOM media type meet the criteria for the 95% and fell short of the 99.9% for both halves of 2022. From table 1, IGW1 unable to meet all the criteria throughout the whole year. Other RGS/GES showed improvement during the second half of 2022.

2.3 Limited VHF Coverage over the Bay of Bengal within Kuala Lumpur FIR may affect the transition duration from VHF to SATCOM. The assessment for ADS-C performance on HF is not statistically significant due to the low number of data.

2.4 The RGS/GES RSP180 performance has been monitored throughout 2022 and there was still no improvement for the IGW1 but with slight improvement for the other RGS/GES. Information on IGW1 was forwarded to CRA.

2.5 Malaysia continuously monitors the performance of RSP180.

Kuala Lumpur FIR ADS-C RSP180 Performance – Aircraft Operator/Type

2.6 **Table 2** summarizes overall ADS-C performance per Aircraft Operator/Type for downlinks sent within the KUALA LUMPUR FIR during 2022, where performance did not meet the RSP180 performance criteria.

FIR	Kuala Lumpur FIR					
Criteria	RSP180					
Period	Jan-June 2022			July-December 2022		
Colour Key Meets Criteria 99.0%-99.84% Under Criteria	Message Counts	95% % <= 90sec	99.90% % <= 180sec	Message Counts	95% % <= 90sec	99.90% % <= 180sec
By Aircraft Operator / Type (only message counts >100 recorded)						
ABD/B744	236	100.00%	100.00%	951	97.06%	99.46%
AIC/B788	571	99.58%	100.00%	3,904	98.82%	99.69%
AZG/B744	411	85.24%	96.21%	784	94.03%	98.54%
CCA/B77W	153	100.00%	100.00%	604	98.16%	99.68%
CLX/B744	810	98.08%	99.97%	1,513	97.29%	99.60%
CLX/B748	5,568	99.34%	99.65%	4,970	100.00%	100.00%
FDX/B77L	2,221	97.97%	99.68%	3,776%	99.51%	99.87%
GIA/B77W	554	98.70%	100.00%	390	98.69%	99.80%
MAS/B738	2,350	96.51%	99.23%	11,389	96.39%	99.15%
MAS/A333	5,122	98.71%	99.72%	21,103	97.91%	99.87%
OMA/A332	131	100.00%	100.00%	2,924	99.44%	99.67%
OMA/A333	193	97.06%	98.54%	705	99.88%	99.92%
QQE/GLF6				415	95.95%	99.16%
QTR/A332	519	99.86%	99.83%	677	99.73%	99.81%
QTR/A359	4,387	99.39%	99.70%	8,933	99.37%	99.69%
QTR/B77L	1,980	99.27%	99.78%	3,097	99.19%	99.93%
QTR/B77W	3,719	97.36%	99.64%	7,906	97.89%	99.56%
QTR/B789	167	99.10%	99.58%	516	99.66%	100.00%
ROJ/B737				155	99.09%	99.78%
SIA/B38M	3,147	97.14%	98.68%	9,067	97.17%	98.63%
SIA/B744	4,220	95.31%	98.34%	7,508	96.40%	98.83%
SIA/B77W	10,687	97.91%	99.47%	18,714	99.09%	99.72%
TGW/A21N	153	91.83%	98.04%	153	88.09%	95.83%
TGW/B788	3,129	99.35%	99.81%	7,535	99.40%	99.81%
THY/A333	199	99.95%	100.00%	1,251	91.53%	97.44%
THY/B77L	1,108	94.01%	97.70%	1,972	98.74%	99.72%
THY/B77W	8,410	96.48%	98.97%	14,448	99.31%	99.88%
VPC/GLF6				358	99.20%	99.70%
VJT/GLEX	260	98.49%	98.77%	113	100.00%	100.00%
VTI/A21N				216	98.19%	98.83%
XAX/A333	370	95.35%	98.26%	2,115	97.18%	98.22%

Table 2: Kuala Lumpur FIR ADS-C Downlink Latency per Aircraft Operator/Type

2.7 AZG/B744, TGW/A21N failed all the criteria throughout 2022. SIA/B38M, SIA/B744 and XAX/A333 failed the 99.9% criteria for both halves. THY/B77L did not meet both of the criteria during July-Dec period. Other operator/aircraft type either improved for the latter half or remain just marginally below the criterion.

2.8 Malaysia has notified the mentioned operators of the result of the RSP180 performance for their improvement. Meanwhile, Kuala Lumpur ACC continues to monitor and improve the problem on data link connectivity interruption in ATM system that may increases in latency.

2.9 Performance of both the ATM system and the operator is the primary focus for Malaysia in order to meet the requisite standards. Observation during Q1 of 2023, operators SIA, THY and XAX managed to satisfy the 95% criterion, but marginally below in meeting the 99% criterion.

Kuala Lumpur FIR CPDLC RCP240 Performance – Media Type, RGS and GES

2.10 **Tables 3A and 3B** summarize overall CPDLC performance per Media Type, RGS and GES for messages sent within the KUALA LUMPUR FIR during 2022, where performance did not meet the RCP240 performance criteria.

FIR		**Kuala Lumpur FIR**					
Criteria		**RCP240**					
Period		**Jan - Jun 2022**					
Colour Key Meets Criteria 99.0%-99.84% Under Criteria		**Message Counts**	95% benchmark		99.9% Benchmark		95%
			ACP	**ACTP**	**ACP**	**ACTP**	**PORT**
			% < = 180sec	**% <= 120sec**	**% < = 210sec**	**% <= 150sec**	**%<60s ecs**
By Media Type							
SATCOM		24,041	98.38%	98.75%	98.96%	99.29%	95.54%
VHF		28,128	99.24%	99.43%	99.42%	99.58%	97.23%
HF		288	92.81%	89.02%	93.20%	93.82%	84.95%
ALL		52,457	98.81%	99.06%	99.17%	99.41%	96.39%
By Remote Ground Station (RGS) Ground Earth Station (GES)							
Designator	**Type**	(RGS/GES with message counts >100)					
APK1	SAT	12,711	98.04%	98.54%	98.75%	99.28%	94.34%
APK2	SAT	3,214	97.85%	97.98%	98.65%	98.58%	96.36%
IGW1	SAT	465	94.41%	94.91%	96.94%	97.67%	90.11%
BTJ1	VHF	1,494	98.64%	99.36%	98.83%	99.87%	95.45%
SIN	VHF	349	95.80%	94.70%	96.87%	95.38%	92.26%
H06	HF	183	93.70%	90.81%	94.12%	94.64%	86.70%

Table 3A: Kuala Lumpur FIR CPDLC Performance Latency per Media Type, RGS and GES – Jan-Jun 2022.

FIR	KUALA LUMPUR FIR					
Criteria	RCP240					
Period	Jul - Dec 2022					
Colour Key: Meets Criteria / 99.0%-99.84% / Under Criteria	Message Counts	95% benchmark		99.9% Benchmark		95%
		ACP	ACTP	ACP	ACTP	PORT
		% < =180sec	% <= 120sec	% < = 210sec	% <= 150sec	%<60secs
By Media Type						
SATCOM	33,996	99.02%	99.18%	99.39%	99.50%	96.74%
VHF	40,119	99.35%	99.65%	99.51%	99.73%	97.49%
HF	380	92.54%	89.74%	94.13%	93.00%	84.47%
ALL	74,495	99.17%	99.38%	99.43%	99.59%	97.08%
By Remote Ground Station (RGS) Ground Earth Station (GES)						
Designator / **Type**	(RGS/GES with message counts >100)					
AOR1 SAT	4,999	99.69%	99.86%	99.79%	99.98%	98.08%
APK1 SAT	17,256	99.04%	99.24%	99.41%	99.49%	96.65%
APK2 SAT	5,117	98.96%	98.98%	99.37%	99.41%	96.62%
IGW1 SAT	1,020	93.76%	95.27%	96.29%	97.57%	87.65%
XXA SAT	5,346	99.42%	99.26%	99.57%	99.53%	98.05%
BTJ1 VHF	2610	98.93%	99.52%	99.35%	99.69%	96.09%
HDY VHF	2331	99.39%	99.37%	99.56%	99.42%	97.04%
HDYV VHF	1551	99.46%	100.00%	99.65%	100.00%	97.03%
HKT VHF	11665	99.03%	99.30%	99.23%	99.47%	97.01%
KBV VHF	926	99.66%	99.89%	99.72%	100.00%	97.30%
KUL1 VHF	347	99.32%	99.02%	99.56%	99.36%	98.41%
KUL2 VHF	621	99.57%	100.00%	99.62%	100.00%	97.98%
KULA VHF	1541	99.37%	100.00%	99.41%	100.00%	98.84%
LGK1 VHF	310	98.82%	99.61%	99.36%	100.00%	97.34%
SIN VHF	671	98.54%	98.54%	98.72%	98.57%	97.69%
SINV VHF	1130	99.62%	99.80%	99.69%	99.84%	99.56%
SZB VHF	637	99.51%	100.00%	99.60%	100.00%	98.99%
SZB1 VHF	2635	99.46%	100.00%	99.61%	100.00%	99.01%
USM VHF	911	99.58%	99.79%	99.63%	99.81%	98.68%
H06 HF	276	93.08%	91.67%	95.18%	94.63%	87.31%

Table 3B: Kuala Lumpur FIR CPDLC Performance Latency per per Media Type, RGS and GES – Jul-Dec 2022.

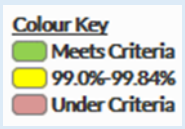
2.11 Significant increase of message counts in the second half compared to the first. HF media type with low number of messages counts relatively to other media type, failed all the criteria for both halves. In summary, performance for RCP240 for both halves showing similar pattern, meeting the ACP and PORT criteria, but fell marginally below for the ACTP's. SAT media type IGW1 and VHF media type SIN standout for failing some if not all the criteria.

2.12 Based on the 2022 outcome, Malaysia continuously monitor the RCP240 performance Q1 2023 shows the performance meet the 95% criterion for VHF media type for SIN ground station, while failed for all criteria for SAT media type for IGW1 ground station.

2.13 Malaysia is continuously monitoring the performance of media type for RCP240. Observation during Q1 of 2023, IGW1 SAT media type still failed below the criteria and SIN VHF media type marginally improved for ACTP 99.9% benchmark.

Kuala Lumpur FIR CPDLC RCP240 Performance – Aircraft Operator/Type

2.14 **Tables 4A and 4B** summarize overall CPDLC performance per Aircraft Operator/Type for messages sent within the KUALA LUMPUR FIR during 2022, where performance did not meet the RCP240 performance criteria.

FIR	**Kuala Lumpur FIR**					
Criteria	**RCP240**					
Period	**Jan - Jun 2022**					
	**Message Counts**	95% benchmark		99.9% Benchmark		95%
		ACP	**ACTP**	**ACP**	**ACTP**	**PORT**
		% < = 180sec	**% <= 120sec**	**% < = 210sec**	**% <= 150sec**	**%<60secs**
By Aircraft Operator / Type (only message counts >100 recorded)						
AFR/A359	182	97.55%	97.41%	98.12%	98.85%	91.48%
AFR/B789	503	98.53%	97.96%	98.82%	98.88%	93.54%
AZG/B748	313	99.13%	99.96%	99.45%	100.00 %	93.61%
FDX/B77L	509	97.91%	96.92%	98.62%	97.47%	94.89%
GFA/B789	302	98.54%	100.00%	99.65%	100.00 %	90.73%
KLM/B772	122	100.00%	100.00%	100.00 %	100.00 %	94.99%
MAS/B738	710	97.04%	98.59%	97.99%	99.60%	89.86%
QTR/A333	267	97.22%	97.65%	98.22%	98.66%	95.13%
QTR/B77W	1,366	97.58%	98.72%	98.24%	99.63%	94.14%
SIA/A359	7,769	93.54%	93.62%	95.03%	95.91%	88.76%
SIA/A388	1,495	94.43%	95.14%	96.03%	96.82%	88.76%
SIA/B38M	1,198	97.63%	99.60%	98.70%	99.85%	92.82%
SIA/B744	1,023	97.26%	97.48%	97.52%	97.80%	96.43%
SIA/B78X	1,569	97.10%	96.54%	97.71%	97.59%	93.75%
SVA/B77W	323	95.24%	97.52%	96.22%	99.71%	88.85%
SVA/B789	889	98.09%	99.48%	99.09%	99.80%	92.80%
SVA/B78X	595	98.40%	99.60%	98.87%	100.00 %	94.12%
THY/A333	149	98.95%	98.85%	99.18%	99.33%	94.30%
THY/B77L	424	96.17%	96.05%	97.70%	96.93%	91.98%
THY/B77W	2,909	97.04%	97.15%	97.90%	98.59%	93.37%

FIR	Kuala Lumpur FIR					
Criteria	RCP240					
Period	Jan - Jun 2022					
Colour Key Meets Criteria 99.0%-99.84% Under Criteria	Message Counts	95% benchmark		99.9% Benchmark		95%
		ACP	ACTP	ACP	ACTP	PORT
		% < = 180sec	% <= 120sec	% < = 210sec	% <= 150sec	%<60secs
By Aircraft Operator / Type (only message counts >100 recorded)						
VJT/GLEX	147	96.99%	100.00%	98.01%	100.00 %	95.28%

Table 4A: Kuala Lumpur FIR CPDLC Performance Latency per Aircraft Operator/Type – Jan-Jun 2022

FIR	Kuala Lumpur FIR					
Criteria	RCP240					
Period	Jul - Dec 2022					
Colour Key Meets Criteria 99.0%-99.84% Under Criteria	Message Counts	95% benchmark		99.9% Benchmark		95%
		ACP	ACTP	ACP	ACTP	PORT
		% < = 180sec	% <= 120sec	% < = 210sec	% <= 150sec	%<60secs
By Aircraft Operator / Type (only message counts >100 recorded)						
ABD/B744	186	97.54%	98.33%	97.79%	98.93%	94.62%
AFR/A359	855	96.53%	97.25%	97.64%	98.34%	88.77%
AFR/B77W	629	99.28%	99.51%	99.64%	99.64%	96.03%
AIC/B788	979	99.61%	99.49%	99.64%	99.63%	98.22%
AZG/B744	137	97.66%	99.34%	100.00%	99.77%	91.97%
AZG/B748	237	97.59%	99.61%	97.85%	100.00%	95.81%
BAW/B77W	356	99.20%	99.00%	99.78%	99.74%	97.30%
BAW/B789	854	99.73%	99.16%	99.90%	99.69%	98.54%
CLX/B744	450	98.48%	98.58%	99.10%	98.91%	96.89%
CLX/B748	1,058	99.75%	100.00%	99.83%	100.00%	97.26%
ETD/B77W	103	100.00%	99.58%	100.00%	99.83%	100.00%
ETD/B789	2,581	99.49%	99.71%	99.67%	99.89%	97.48%
ETD/B78X	875	99.50%	99.78%	99.73%	99.80%	96.71%
FDX/B77L	499	99.28%	99.20%	99.62%	99.36%	96.49%
FIN/A359	1,427	99.55%	99.85%	99.69%	99.96%	98.18%
KLM/B772	377	99.29%	99.50%	99.46%	99.79%	96.92%
KLM/B77W	1,085	99.42%	99.94%	99.84%	100.00%	95.30%
MAS/A332	2,428	99.57%	99.91%	99.75%	100.00%	97.36%
MAS/A359	2,908	99.69%	98.79%	99.82%	99.17%	98.80%

FIR	Kuala Lumpur FIR					
Criteria	RCP240					
Period	Jul - Dec 2022					
Colour Key Meets Criteria 99.0%-99.84% Under Criteria	Message Counts	95% benchmark		99.9% Benchmark		95%
		ACP	ACTP	ACP	ACTP	PORT
		% < = 180sec	% <= 120sec	% < = 210sec	% <= 150sec	%<60secs
By Aircraft Operator / Type (only message counts >100 recorded)						
MAS/B738	1,980	95.96%	98.18%	97.64%	99.17%	88.69%
OMA/A333	455	98.00%	100.00%	98.59%	100.00%	98.59%
QFA/A388	823	99.41%	100.00%	99.60%	100.00%	95.02%
QTR/A332	169	98.25%	100.00%	99.57%	100.00%	91.63%
QTR/A333	148	95.20%	97.54%	97.22%	100.00%	92.91%
QTR/A359	1,718	99.37%	99.40%	99.63%	99.51%	99.07%
QTR/B744	361	98.20%	100.00%	98.74%	100.00%	94.50%
QTR/B77L	599	99.09%	99.99%	99.49%	100.00%	96.27%
QTRB77W	1,911	98.78%	99.22%	99.17%	99.69%	96.18%
SIA/A359	9,428	94.31%	95.07%	95.82%	96.85%	89.82%
SIA/A388	2,554	94.52%	95.42%	95.97%	97.34%	89.98%
SIA/B38M	1,700	97.12%	98.85%	97.86%	99.03%	92.65%
SIA/B744	1,078	98.53%	98.33%	98.98%	99.04%	97.22%
SIA/B77W	4,012	99.62%	99.51%	99.76%	99.74%	98.28%
SIA/B78X	2,087	97.08%	97.17%	97.99%	98.30%	94.54%
SVA/B789	952	98.63%	99.84%	99.37%	99.93%	96.01%
SVA/B78X	1,179	99.32%	99.83%	99.62%	99.95%	95.00%
SWR/B77W	1,190	99.09%	98.92%	99.15%	98.97%	97.23%
TGW/B788	1,141	99.52%	99.68%	99.78%	99.82%	98.11%
THY/A333	165	99.59%	99.80%	99.78%	100.00%	93.54%
THY/B77L	431	98.53%	99.68%	99.08%	98.81%	94.04%
THY/B77W	3,701	98.77%	99.19%	99.43%	99.41%	95.46%
UAE/B77L	657	99.32%	99.92%	99.45%	99.99%	97.07%
UAE/B77W	9,238	99.44%	99.55%	99.58%	99.68%	97.41%
VJT/GLEX	132	95.00%	97.90%	95.52%	98.07%	92.88%
XAX/A333	311	98.98%	99.69%	99.67%	99.74%	98.07%

Table 4B: Kuala Lumpur FIR CPDLC Performance Latency per Aircraft Operator/Type – Jul-Dec 2022

2.15 High large pilot operational response time (PORT) affect the RCP240 performance. For the Jan-Jun period, recorded 18 aircraft operator/type which failed the PORT criteria meanwhile 14 aircraft operator/type for the Jul-Dec.

2.16 Based on the analysis, the delayed CPDLC transactions are mainly caused by high large pilot operational response time (PORT). Nonetheless, during the period spanning from 2022 to Q1 of 2023, Malaysia did encounter interruptions in data link connectivity attributable to issues with the ATM system, which might have adversely impacted communication latency performance.

2.17 To ensure compliance with all criteria, Malaysia is actively engaged in ongoing monitoring of the ATM system's performance. This effort aims to identify the root cause of the data link connectivity interruptions and to determine an appropriate solution for resolving the issue.

2.18 In an effort to enhance performance, Malaysia will communicate with airline operators, particularly the major users of Kuala Lumpur FIR, to encourage improvements and reduce pilot operational response time (PORT).

2.19 Malaysia open to receive advice and recommendation, sharing experience from the other states and airlines operators for any potential resolution from the meeting.

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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