



ICAO

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 SINGAPORE**

(Presented by Singapore)

**SUMMARY**

This paper presents data link performance data for 2022 for the Singapore FIR (WSJC), and information on actions taken to identify and rectify the causes of performance issues

**1. INTRODUCTION**




1.1 **Tables 1 to 4B** 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**

WSJC 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 WSJC FIR during 2022, where performance did not meet the RSP180 performance criteria.

FIR	WSJC					
Criteria	RSP180					
Period	Jan-Jun 2022			Jul-Dec 2022		
<b>Colour Key</b> Meets Criteria 99.0%-99.84% Under Criteria	Message Counts	95%	99.90%	Message Counts	95%	99.90%
		% <= 90sec	% <= 180sec		% <= 90sec	% <= 180sec
<b>By Media Type</b>						
SATCOM	15487	95.54%	99.23%	19642	94.95%	99.03%
VHF	393225	99.33%	99.89%	588907	99.26%	99.87%
HF	76	74.21%	92.17%	106	72.26%	92.17%
ALL	408788	99.18%	99.87%	608655	99.12%	99.84%
<b>By Remote Ground Station (RGS) Ground Earth Station (GES)</b>						

FIR		WSJC					
Criteria		RSP180					
Period		Jan-Jun 2022			Jul-Dec 2022		
<b>Colour Key</b>  Meets Criteria  99.0%-99.84%  Under Criteria	<b>Message Counts</b>	95%	99.90%	<b>Message Counts</b>	95%	99.90%	
		% <= 90sec	% <= 180sec		% <= 90sec	% <= 180sec	
Designator	Type	(only RGS/GES with message counts >100 recorded)					
IG1	SAT	1217	90.88%	98.12%	1604	91.83%	98.53%
IGW1	SAT	5652	92.41%	98.60%	11683	93.53%	98.66%




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

2.2 In summary, the ADS-C performance by SATCOM and VHF were able to meet the 95% criteria but SATCOM failed marginally for the 99.9% criteria, and HF had failed the criteria as shown in Table 1. The assessment for ADS-C performance by HF was not statistically significant due to the low number of data points, Singapore had reminded the airline operators to use SATCOM and VHF in WSJC FIR.

2.3 For ADS-C differentiated by RGS/GES, 2 stations had failed to meet 95% and 99.9% criteria. Singapore have filed problem reports with the CRA. The investigation showed that the affected aircraft were operating in area with limited VHF coverage over the South China Sea, and the delay might be due to the transition from VHF to SATCOM. It was also noted that other ANSPs reported good ADS-C performance on the affected aircraft within their FIR.

WSJC FIR ADS-C RSP180 Performance – Aircraft Operator/Type

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

FIR		WSJC					
Criteria		RSP180					
Period		Jan-Jun 2022			Jul-Dec 2022		
<b>Colour Key</b>  Meets Criteria  99.0%-99.84%  Under Criteria	<b>Message Counts</b>	95%	99.90%	<b>Message Counts</b>	95%	99.90%	
		% <= 90sec	% <= 180sec		% <= 90sec	% <= 180sec	
By Aircraft Operator / Type (only message counts >100 recorded)							
N51/GLF5	6			116	94.18%	98.08%	
TAG/G280	152	100.00%	100.00%	113	94.91%	98.02%	

**Table 2:** WSJC FIR ADS-C Downlink Latency per Aircraft Operator/Type

2.5 In summary, there were 2 aircraft operator/type which failed the 95% and 99% RSP180 criteria during the 2nd half of 2022 as shown in Table 2.

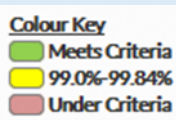
2.6 Out of the 4 airframes under N51/GLF5, it was noted that the poor performance was mainly contributed to a single airframe (92.92% for the 95% criteria) with a message count being less than 50 over a 6-month period which may not be statistically significant.

2.7 For TAG/G280, there were 8 airframes involved and it was noted that the poor performance was mainly contributed to a single airframe (93.38% for the 95% criteria) with message counts of about 140 over a 12-month period which may not be statistically significant.

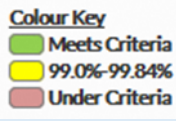
2.8 Singapore had filed problem report with CRA and will continue to monitor the 2 aircraft operator/type performance, should the operator/type fail the 3-month moving average for the RSP180 criteria, Singapore will follow-up with the aircraft operator through respective EMAs and file problem report with the CRA.

WSJC FIR CPDLC RCP240 Performance – Media Type, RGS and GES

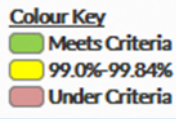
2.9 **Tables 3A and 3B** summarize overall CPDLC performance per Media Type, RGS and GES for messages sent within the WSJC FIR during 2022, where performance did not meet the RCP240 performance criteria.

FIR		WSJC					
Criteria		RCP240					
Period		Jan-Jun 2022					
	Message Counts	95% Benchmark		99.9% Benchmark			
		ACP	ACTP	ACP	ACTP		
		% <= 180sec	% <= 120sec	% <= 210sec	% <= 150sec		
By Media Type							
SATCOM	1305	98.02%	98.33%	98.87%	99.07%		
VHF	27514	99.05%	99.13%	99.26%	99.36%		
HF	0						
ALL	28819	99.00%	99.10%	99.24%	99.34%		
By Remote Ground Station (RGS) Ground Earth Station (GES) <sup>1</sup>							
Designator	Type	(RGS/GES with message counts >100)					

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

FIR		WSJC					
Criteria		RCP240					
Period		Jul-Dec 2022					
	Message Counts	95% Benchmark		99.9% Benchmark			
		ACP	ACTP	ACP	ACTP		
		% <= 180sec	% <= 120sec	% <= 210sec	% <= 150sec		
By Media Type							
SATCOM	2181	98.40%	98.30%	99.15%	99.11%		

<sup>1</sup> Only RGS and GES that failed the 95% criteria is tabulated in this table.

FIR		WSJC				
Criteria		RCP240				
Period		Jul-Dec 2022				
	Message Counts	95% Benchmark		99.9% Benchmark		
		ACP	ACTP	ACP	ACTP	
		% < =180sec	% < =120sec	% < =210sec	% < =150sec	
VHF	47272	99.10%	99.22%	99.33%	99.40%	
HF	0					
ALL	49453	99.07%	99.18%	99.32%	99.39%	
<b>By Remote Ground Station (RGS) Ground Earth Station (GES)<sup>2</sup></b>						
<b>Designator</b>	<b>Type</b>	<b>Designator</b>	<b>Type</b>	(RGS/GES with message counts >100)		

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

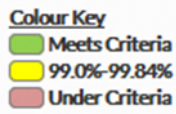
2.10 In summary, the CPDLC performance by SATCOM and VHF were able to meet the 95% criterion but failed marginally for 99.9% criterion as shown in Table 3A and 3B. There is no message count for HF in 2022, and Singapore had reminded the airline operators to use SATCOM and VHF in WSJC FIR.

2.11 For CPDLC differentiated by RGS/GES, no station had failed the 95% criteria but there were several stations that did not meet the 99.9% criteria (not shown in table 3A and 3B, for stations that failed the 99.9% criteria refer to WSJC data link performance report submitted). Singapore will continue to monitor the performance for RGS/GES.

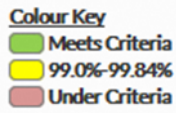
WSJC FIR CPDLC RCP240 Performance – Aircraft Operator/Type

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

<sup>2</sup> Only RGS and GES that failed the 95% criteria is tabulated in this table.

FIR	WSJC					
Criteria	RCP240					
Period	Jan-Jun 2022					
	Message Counts	95% Benchmark		99.9% Benchmark		95%
		ACP	ACTP	ACP	ACTP	PORT
		% <= 180sec	% <= 120sec	% <= 210sec	% <= 150sec	% < 60s ecs
<b>By Aircraft Operator / Type (only message counts &gt;100 recorded)</b>						
SIA/B38M	315	88.13%	89.52%	91.57%	91.34%	88.20%

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

FIR	WSJC					
Criteria	RCP240					
Period	Jul-Dec 2022					
	Message Counts	95% Benchmark		99.9% Benchmark		95%
		ACP	ACTP	ACP	ACTP	PORT
		% <= 180sec	% <= 120sec	% <= 210sec	% <= 150sec	% < 60s ecs
<b>By Aircraft Operator / Type (only message counts &gt;100 recorded)</b>						
SIA/B38M	613	87.72%	87.75%	88.51%	88.69%	87.16%

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

2.13 In summary, there was 1 aircraft operator/type which failed the 95% and 99% RCP240 criteria during 2022 as shown in Table 4B.

2.14 Out of the 128 airframes under SIA/B38M, it was noted that the poor performance was mainly contributed to a single airframe (90.28% for the 95% criteria) with a total message count of 114 over a 12-month period and 18 other airframes that failed the criteria with low message count of less than 100 which may not be statistically significant. The remaining 109 airframes had passed the criteria.

2.15 Singapore had filed problem report with CRA and will continue to monitor the performance of SIA/B38M, should the operator/type fail the 3-month moving average for RCP240 criteria, Singapore will follow-up with the aircraft operator through respective EMAs and file problem report with the CRA.

### 3. Additional information

#### Survey of status of current and planned implementation of performance-based separation

3.1 Singapore has submitted the survey of the status of current and planned implementation of performance-based separation based on the revised template and submission dates.

Datalink outages

3.2 Singapore experienced datalink outages between 17 to 19 April. Upon reports by controllers of the issues communicating with aircraft through CPDLC, application of performance-based separation that required RCP240 was then suspended. The issues experienced were further confirmed after receipt of notification by ARINC on 19 April of Inmarsat network service outage since 16 April 2257 UTC. Application of performance-based separation resumed after notification by ARINC on 20 April that the Inmarsat services were restored and datalink connection with aircraft was observed to have stabilized.

**4. ACTION BY THE MEETING**

4.1 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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