International Civil Aviation Organization

Fifteenth Meeting of the FANS Interoperability Team – Asia (FIT–Asia/16)

Bangkok, Thailand, 09 – 11 June 2026

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

DATA LINK PERFORMANCE REPORT FROM SINGAPORE

(Presented by Singapore)

SUMMARY

This paper presents data link performance data for 2025 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, together with the outcomes of such actions, are discussed.

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 2025, where performance did not meet the RSP180 performance criteria.

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

FIR	**WSJC**					
Criteria	**RSP180**					
Period	**Jan-Jun 2025**			**Jul-Dec 2025**		
Color Key Meets Criteria 99.0% - 99.89% Under Criteria	**Message Counts**	**95%** **% < = 90sec**	**99.90%** **% <= 180sec**	**Message Counts**	**95%** **% < = 90sec**	**99.90%** **% <= 180sec**
By Media Type						
SATCOM	139326	94.93%	98.93%	148932	94.99%	99.04%
VHF	637850	99.56%	99.85%	670683	99.52%	99.85%
HF	201	44.63%	69.15%	231	45.02%	70.13%

ALL		777377	98.71%	99.68%	819846	98.68%	99.69%
By Remote Ground Station (RGS) Ground Earth Station (GES)							
Designator	**Type**	(only RGS/GES with message counts >100 recorded)					
H06	HF	172	44.48%	68.33%	146	43.84%	67.47%
IG1	SAT	6863	90.35%	95.98%	8608	90.81%	95.70%
XXP	SAT	3248	92.00%	98.73%	2965	93.66%	99.07%
IGW1	SAT	14881	92.19%	97.57%	19524	93.89%	98.39%
XXI	SAT	7087	92.61%	98.41%	7925	93.62%	98.91%
XXA	SAT	19293	94.70%	98.84%	7876	94.11%	98.99%

2.2 In summary, the ADS-C performance by VHF met the 95% criteria, while SATCOM and HF did not meet the criteria as shown in Table 1. As HF does not meet the performance required by PBCS, Singapore has reminded airline operators to use SATCOM and VHF in WSJC FIR.

2.3 For ADS-C differentiated by RGS/GES, six stations failed to meet the 95% and 99.9% criteria. Similarly, HF, specifically H06, does not meet the performance required by PBCS. For the SATCOM stations, the affected aircraft were likely operating in an area with limited VHF coverage over the South China Sea, and delays presumably occurred during the transition from VHF to SATCOM. CRA Boeing also noted that analysing performance issues based solely on communication media type, such as SATCOM, might not yield effective results.

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 2025, where performance did not meet the RSP180 performance criteria.

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

FIR	**WSJC**					
Criteria	**RSP180**					
Period	**Jan-Jun 2025**			**Jul-Dec 2025**		
Color Key Meets Criteria 99.0% - 99.89% 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)						
APJ/A21N	2850	85.89%	91.71%	4368	87.64%	92.08%
VPC/GA6C	148	89.00%	97.55%	227	88.68%	96.04%
VPC/GLEX	279	89.37%	98.09%	293	99.01%	100%
N18/GL7T	121	90.79%	97.83%	16		
ANA/B78X	111	92.85%	100%	19		
AXM/B78X	142	93.79%	95.56%	7		
V8O/B788	197	93.81%	100%	195	97.18%	100%
NCR/B744	171	94.67%	100%	1032	99.61%	99.98%
GTI/B77L	528	94.79%	98.36%	15		
V8B/B748	6			104	91.97%	94.28%

BBA/GL7T	0			132	92.42%	96.52%
T73/GL5T	149	97.92%	98.64%	105	92.48%	96.37%
TWB/B38M	0			2945	92.67%	97.22%
SAM/B752	0			105	93.09%	99.91%
THY/B77W	85			317	93.22%	93.71%
RPC/GLF5	120	96.49%	99.38%	113	93.25%	99.35%
CPJ/GL7T	83			119	93.54%	99.74%
T7J/GLF4	414	96.01%	99.86%	888	94.43%	99.90%
JF0/B77W	34			117	94.71%	99.22%

2.5 In summary, there were 9 aircraft operator/type which failed the 95% RSP180 criteria during the first half of 2025 and 12 aircraft operator/type which failed the 95% RSP180 criteria during second half of 2025 as shown in Table 2.

1H2025

2.6 For VPC/GLEX, AXM/B78X and V8O/B788, no PBCS indicator was filed in their flight plans, so no investigation was conducted.

2.7 For APJ/A21N, poor performance was attributed to three aircraft. A problem report was filed with Boeing CRA and referred to Airbus. Airbus confirmed the delays that were reported. Many of these delays are due to SATCOM unavailability when messages need to be sent to the ground. The root cause of SATCOM unavailability is still being investigated. Singapore has also shared data with Peach Airlines for their investigation.

2.8 For VPC/GA6C, a single airframe was involved and analysed. It was observed that ADS-C messages with transit times exceeding 90 seconds were predominantly located at the fringes of overlaying VHF coverage, near Pulau Tioman. On the other hand, it was observed that four ADS-C messages were transmitted via SATCOM although the aircraft was within VHF coverage.

2.9 For N18/GL7T, three airframes were involved, with all contributing to poor performance (87.45%, 93.55% and 94.48% for the 95% criteria) with 33, 67 and 21 messages respectively. The message count was fewer than 100 over a 6-month period and was therefore deemed to be statistically insignificant.

2.10 For ANA/B78X, two airframes were involved, with one contributing to poor performance (91.81% for the 95% criteria) with 67 messages. Similarly, the message count was fewer than 100 over a 6-month period and was therefore deemed to be statistically insignificant.

2.11 For NCR/B744, eight airframes were involved, with two contributing to poor performance (90.7% and 93.15% for the 95% criteria) with 5 and 32 messages respectively. Similarly, the message count was fewer than 100 over a 6-month period and was therefore deemed to be statistically insignificant.

2.12 For GTI/B77L, four airframes were involved, with three contributing to poor performance (85.68%, 94.47% and 94.92% for the 95% criteria) with 18, 132 and 325 messages. It was observed that most of the ADS-C messages with transit times exceeding 90 seconds were near the fringes of VHF coverage, resulting in VHF-VHF or VHF-SAT transitions.

2H2025

2.13 For APJ/A21N, V8B/B748 and RPC/GLF5, no PBCS indicator was filed in their flight plans, so no investigation was conducted.

2.14 VPC/GA6C involved two airframes contributing to the evaluation, achieving 88.53% and 89.6% compliance against the 95% criteria, with message counts of 189 and 38 respectively. It was observed that ADS-C messages with transit times exceeding 90 seconds were predominantly located at the fringes of overlaying VHF coverage, near Pulau Tioman. On the other hand, it was observed that three ADS-C messages were transmitted via SATCOM although the aircraft was within VHF coverage.

2.15 BBA/GL7T involved three airframes, with one airframe contributing to the evaluation (78.24% for the 95% criteria) with message counts of 17. Similarly, the message count was fewer than 100 over a 6-month period and was therefore deemed to be statistically insignificant.

2.16 T73/GL5T involved three airframes, with one airframe contributing to the evaluation (92.84% for the 95% criteria) with message counts of 105. It was observed that there was a lack of SATCOM use even when the aircraft was outside VHF coverage.

2.17 TWB/B38M involved five airframes, all of which contributed to the evaluation, achieving 93.08%, 90.19%, 94.89%, 91.67%, and 92.84% respectively against the 95% criteria, with corresponding message counts of 766, 484, 479, 186, and 1,030. Two areas were identified where the majority of ADS-C messages with transit times exceeding 90 seconds occurred: one outside VHF coverage, and another within SIN RGS coverage. The latter observation is consistent with issue 3820-RA, where Boeing concluded that aircraft approaching island airports experienced connectivity degradation due to premature handoff from functioning VHF ground stations to weaker destination airport stations. This resulted in failed ADS-C report deliveries and subsequent fallback to SATCOM. The software updates BPV18 and BPV19, which include improved handoff logic and RAT1 timer implementation, are expected to address this issue.

2.18 SAM/B752 involved three airframes, with one airframe contributing to the evaluation (91.56% for the 95% criteria) with message counts of 87. Similarly, the message count was fewer than 100 over a 6-month period and was therefore deemed to be statistically insignificant.

2.19 THY/B77W involved twelve airframes, with one airframe contributing to the evaluation (37.51% for the 95% criteria) with message counts of 32. Similarly, the message count was fewer than 100 over a 6-month period and was therefore deemed to be statistically insignificant.

2.20 CPJ/GL7T involved two airframes, with one airframe contributing to the evaluation (92.19% for the 95% criteria) with message counts of 60. Similarly, the message count was fewer than 100 over a 6-month period and was therefore deemed to be statistically insignificant.

2.21 T7J/GLF4 involved one airframe, which contributed to the evaluation, achieving 94.43% against the 95% criteria with a message count of 888. It was observed that most ADSC messages with transit times exceeding 90 seconds occurred either near the fringes of VHF coverage or in an area with no VHF coverage.

2.22 JF0/B77W involved two airframes, with one airframe contributing to the evaluation (91.24% for the 95% criteria) with message counts of 47. Similarly, the message count was fewer than 100 over a 6-month period and was therefore deemed to be statistically insignificant.

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

2.23 **Tables 3A and 3B** summarize overall CPDLC performance per Media Type, RGS and GES for messages sent within the WSJC FIR during 2025, where performance did not meet the RCP240 performance criteria.

Table 3A: WSJC FIR CPDLC Performance Latency per Media Type, RGS and GES – Jan-Jun 2025.

FIR		**WSJC**				
Criteria		**RCP240**				
Period		**Jan-Jun 2025**				
Color Key Meets Criteria 99.0% - 99.89% Under Criteria		**Message Counts**	95% benchmark		99.9% Benchmark	
			ACP	**ACTP**	**ACP**	**ACTP**
			% < = 180sec	**% <= 120sec**	**% < = 210sec**	**% <= 150sec**
By Media Type						
SATCOM		14870	98.53%	98.57%	99.03%	99.10%
VHF		28191	99.68%	99.81%	99.74%	99.86%
HF		4				
ALL		47186	99.23%	99.34%	99.46%	99.58%
By Remote Ground Station (RGS) Ground Earth Station (GES)						
Designator	**Type**	(RGS/GES with message counts >100)				
IG1	SAT	408	78.92%	88.24%	86.27%	91.30%
XXP	SAT	393	96.83%	94.15%	98.52%	96.78%

Table 3B: WSJC FIR CPDLC Performance Latency per Media Type, RGS and GES – Jul-Dec 2025.

FIR	**WSJC**				
Criteria	**RCP240**				
Period	**Jul-Dec 2025**				
Color Key Meets Criteria 99.0% - 99.89% Under Criteria	**Message Counts**	95% benchmark		99.9% Benchmark	
		ACP	**ACTP**	**ACP**	**ACTP**
		% < =180sec	**% <= 120sec**	**% < = 210sec**	**% <= 150sec**
By Media Type					
SATCOM	14880	98.67%	98.70%	99.20%	99.29%
VHF	27007	99.60%	99.81%	99.67%	99.86%
HF	10				
ALL	46032	99.23%	99.37%	99.47%	99.63%
By Remote Ground Station (RGS) Ground Earth Station (GES)					

Designator	Type	(RGS/GES with message counts >100)				
IG1	SAT	367	78.88%	84.20%	86.51%	89.33%
XXP	SAT	232	97.99%	93.97%	98.97%	98.04%

2.24 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 were 4 and 10 messages count for HF in 1H2025 and 2H2025 respectively. Since HF does not meet the performance required by PBCS, Singapore has reminded airline operators to use SATCOM and VHF in WSJC FIR.

2.25 For CPDLC differentiated by RGS/GES, IG1 failed the 95% ACP and ACTP criteria and XXP failed the 95% ACTP criteria. There were several stations that did not meet the 99.9% criteria (refer to WSJC data link performance report submitted). Singapore will continue to monitor the performance for RGS/GES. Similar to ADS-C RSP180, CRA Boeing indicated that analysing performance issues based solely on communication media type, such as SATCOM, might not yield effective results.

WSJC FIR CPDLC RCP240 Performance – Aircraft Operator/Type

2.26 **Tables 4A and 4B** summarize overall CPDLC performance per Aircraft Operator/Type for messages sent within the WSJC FIR during 2025, where performance did not meet the RCP240 performance criteria.

Table 4A: WSJC FIR CPDLC Performance Latency per Aircraft Operator/Type – Jan-Jun 2025

FIR	**WSJC**					
Criteria	**RCP240**					
Period	**Jan-Jun 2025**					
Color Key Meets Criteria 99.0% - 99.89% 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)						
APJ/A21N	253	65.61%	78.26%	76.28%	84.73%	54.15%
RMY/B762	334	94.12%	98.65%	95.18%	99.14%	85.33%

Table 4B: WSJC FIR CPDLC Performance Latency per Aircraft Operator/Type – Jan-Jun 2025

FIR	**WSJC**					
Criteria	**RCP240**					
Period	**Jul-Dec 2025**					
	Message Counts	95% benchmark		99.9% Benchmark		95%
		ACP	**ACTP**	**ACP**	**ACTP**	**PORT**

Color Key Meets Criteria 99.0% - 99.89% Under Criteria		% < = 180sec	% <= 120sec	% < = 210sec	% <= 150sec	%<60secs
By Aircraft Operator / Type (only message counts >100 recorded)						
APJ/A21N	292	70.03%	78.42%	78.94%	85.86%	62.67%
RMY/B762	204	90.99%	99.63%	92.28%	100%	79.90%

2.27 In summary, there were two aircraft operator/types which failed the 95% and 99.9% RCP240 criteria during both first half of 2025 and second half of 2025 as shown in Table 4B.

2.28 For APJ/A21N, large PORT was observed in both the first and second halves of 2025. In 1H2025, 8 messages utilised HF for uplink and/or downlink. All 46 messages that used VHF for both uplink and downlink met the 95% ACP requirement, while the remaining messages utilised SATCOM for uplink and/or downlink and did not meet the 95% ACP requirement. In 2H2025, 13 messages utilised HF for uplink and/or downlink. A total of 101 messages used VHF for both uplink and downlink, achieving 93.67% performance, which marginally failed to meet the 95% ACP requirement. The remaining messages utilised SATCOM for uplink and/or downlink and did not meet the 95% ACP requirement. These observations are consistent with the issue reported to Boeing CRA and subsequently referred to Airbus, where Airbus confirmed that many of the delays were attributable to SATCOM unavailability at the time of message transmission to the ground.

2.29 For RMY/B762, large PORT was observed in both first and second halves of 2025. However, no PBCS indicator was filed in their flight plans, so no investigation was conducted.

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 There were two outages experienced in 2025. The first incident occurred on 17 November 2025 at 0142 UTC when both CPDLC and ADS-C systems became inoperative, necessitating the suspension of CPDLC and PBCS operations. Collins found that the CAAS FANS messages sent by the ATC Gateway to the Global Message Processor were not delivered due to message queuing issues. Collins AOC restarted Type B switch to clear the queue, and services were restored at 0207 UTC. We reinstated the use of CPDLC and performance-based separation at 0225 UTC.

3.3 The second incident took place on 8 December 2025 at 13:36 UTC, when both CPDLC and ADS-C systems failed, leading to suspended operations. Collins traced the issue to unserviceable nodes for Singapore and Tokyo AMQS at 13:33 UTC. Services were restored by 13:59 UTC and operations resumed at 14:04 UTC. The failure was caused by a misconfigured router, brought online by a customer during an AviNet Airport rollout without Collins' coordination, resulting in a routing loop and service disruption.

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.

— END —