*International Civil Aviation Organization*

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

# DATA LINK PERFORMANCE REPORT FOR MALAYSIA

(Presented by Malaysia)

**SUMMARY**

This paper presents data link performance data for 2024 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 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

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 Flight Information Region (FIR) during 2024, where performance did not meet the RSP180 performance criteria.

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

| FIR | | WMFC | | | | | |
|---|---|---|---|---|---|---|---|
| Criteria | | RSP180 | | | | | |
| Period | | January-June 2024 | | | July-December 2024 | | |
| **Colour Key**<br>Meet Criteria<br>99.0% - 99.89%<br>Under Criteria | | Message Counts | 95% %<=90sec | 99.90% %<=180sec | Message Counts | 95% %<=90sec | 99.90% %<=180sec |
| **By Media Type** | | | | | | | |
| SATCOM | | 188,003 | 98.05% | 99.37% | 139,855 | 98.15% | 99.35% |
| VHF | | 147477 | 99.44% | 99.84% | 113782 | 99.45% | 99.82% |
| HF | | 42 | 55.56% | 77.98% | 53 | 46.23% | 70.17% |
| ALL | | 335,522 | 98.65% | 99.57% | 253,690 | 98.72% | 99.55% |
| **By Remote Ground Station (RGS) Ground Earth Station (GES)** | | | | | | | |
| **Designator** | **Type** | **(only RGS/GES with message counts >100 recorded)** | | | | | |
| APK2 | SAT | 3957 | 96.31% | 99.18% | 2579 | 90.85% | 96.20% |
| IG1 | SAT | | | | 268 | 86.57% | 94.59% |
| IGW1 | SAT | 8821 | 78.31% | 90.00% | 6691 | 81.00% | 91.36% |
| BTJ1 | VHF | 7168 | 98.05% | 99.28% | 5482 | 96.12% | 98.49% |

2.2 Overall, in 2024, Kuala Lumpur FIR met the RSP180 requirement for the 95% criterion and remained within the acceptable range for the 99.9% criterion. This trend holds true when analyzed by media type, except for the HF media type. HF datalink exhibited low usage and is generally acknowledged as not meeting the RSP180 delivery time requirements. Additionally, no specific aircraft consistently utilized the HF datalink.

2.3 During the first half of 2024, only IGW1 failed to meet all criteria.

2.4 In the second half, APK, IG1, IGW1 failed all criteria and BTJ1 failed the 99.9% criteria. From the CSP, there have been no reported issues with ground stations mentioned. The primary cause of latency for SAT media type ground stations is typically linked to the VDL/SAT transition or SAT/SAT transition. Another major cause is the transition delays that are occurring near the FIR boundary where multiple contracts with different FIR which may also have an impact on the performance.

2.5 Non-conformance will be further analysed by examining the performance of individual fleets and the specific aircraft within those fleets.

2.6 Performance of RGS/GES will continue to be monitored.

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

2.7 **Table 2** summarizes overall ADS-C performance per Aircraft Operator/Type for downlinks sent within the Kuala Lumpur FIR during 2024, where performance did not meet the RSP180 performance criteria.

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

| FIR | | WMFC | | | | | |
|---|---|---|---|---|---|---|---|
| Criteria | | RSP180 | | | | | |
| PERIOD | | January-June 2024 | | | July-December 2024 | | |
| **Colour Key** | | | | | | | |
| | Meet Criteria | Message Counts | 95% %<=90sec | 99.90% %<=180sec | Message Counts | 95% %<=90sec | 99.90% %<=180sec |
| | 99.0% - 99.89% | | | | | | |
| | Under Criteria | | | | | | |
| **Operator** | **Type** | **By Aircraft Operator / Type (only message counts >100 recorded)** | | | | | |
| ABD | B744 | | | | 170 | 62.35% | 76.59% |
| AZG | B744 | 497 | 77.01% | 90.41% | 413 | 80.23% | 90.02% |
| CFG | A339 | | | | 159 | 70.02% | 87.67% |
| CLX | B744 | 751 | 90.41% | 94.38% | 533 | 96.84% | 98.02% |
| GIA | B772 | 332 | 88.86% | 99.25% | 318 | 95.42% | 99.12% |
| MAS | B38M | | | | 327 | 84.91% | 90.21% |
| MAS | B738 | 16,997 | 91.89% | 96.89% | 12,297 | 92.33% | 97.44% |
| QTR | B77W | 17,085 | 98.36% | 99.67% | 9,888 | 95.69% | 98.56% |
| RBA | A20N | | | | 127 | 87.01% | 97.80% |
| SIA | B38M | 7,172 | 93.10% | 95.82% | 6,672 | 93.48% | 96.18% |
| T7E | GLF5 | | | | 207 | 98.14% | 98.87% |
| THY | A333 | 369 | 93.65% | 99.17% | 159 | 96.81% | 99.22% |
| VKG | A339 | 146 | 49.83% | 73.56% | | | |
| XAX | A333 | 3,552 | 96.71% | 98.19% | 3,306 | 97.23% | 99.13% |

2.8 In the first half of 2024, AZG B744, CLX B744, MAS B738, SIA B38M, and VKG A339 failed all performance criteria. THY A333 and GIA B772 failed the 95% criteria but recorded acceptable 99% criteria, while XAX A333 failed only the 99% criteria.

2.9 In the second half of 2024, ABD B744, AZG B744, CFG A339, MAS B38M, MAS B738, RBA A20N, and SIA B38M failed all criteria. Additionally, CLX B744, GIA B772, QTR B77W, and T7E GLF5 failed only the 99.9% criterion.

2.10 During this period, MAS, GIA, and VKG did not file for PBCS in their flight plans. Furthermore, apart from MAS B738, SIA B38M and QTR B77W, other operator-aircraft combinations recorded fewer than 600 messages over six months, making the results statistically insignificant.

2.11 The primary causes of these failures include delayed reports during transitions between VHF and SAT media types, particularly along Iridium satellite paths (IGW1). These VDL/SATCOM transition issues are a known challenge in FANS 1/A systems. To address these challenges, the implementation of the ACARS Routing Airborne Timer 1 (RAT1) function by operators is anticipated to enhance PBCS time performance in VHF-to-SATCOM transition areas. Additionally, transition delays near FIR boundaries, involving multiple datalink contracts with different FIRs, may further impact overall performance.

2.12 Performance of the non-conformance aircraft will continue to be monitored.

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

2.13 **Tables 3A and 3B** summarize overall CPDLC performance per Media Type, RGS and GES for messages sent within the Kuala Lumpur FIR during 2024, where performance did not meet the RCP240 performance criteria.

**Table 3A**: Kuala Lumpur FIR CPDLC Performance Latency per Media Type, RGS and GES (January – June 2024)

| FIR | | WMFC | | | | | |
|---|---|---|---|---|---|---|---|
| Criteria | | RCP240 | | | | | |
| Period | | January-June 2024 | | | | | |
| **Colour Key** | | Message Counts | 95% Benchmark | | 99.9% Benchmark | | 95% |
| Meets Criteria | | | ACP %<=180sec | ACTP %<=120sec | ACP %<=210sec | ACTP %<=150sec | PORT %<60sec |
| 99.0% - 99.89% | | | | | | | |
| Under Criteria | | | | | | | |
| **By Media Type** | | | | | | | |
| SATCOM | | 2,182 | 99.08% | 98.79% | 99.48% | 99.11% | 98.08% |
| VHF | | 3,357 | 99.60% | 99.47% | 99.67% | 99.62% | 99.00% |
| HF | | 294 | 86.96% | 88.10% | 91.04% | 93.62% | 81.29% |
| ALL | | 5,833 | 98.75% | 98.63% | 99.14% | 99.11% | 97.75% |
| **By Remote Ground Station (RGS) Ground Earth Station (GES)** | | | | | | | |
| **Designator** | **Type** | **(only RGS/GES with message counts >100 recorded)** | | | | | |
| H06 | HF | 284 | 86.85% | 88.38% | 91.08% | 94.10% | 81.34% |
| XXA | SAT | 149 | 100.00% | 98.28% | 100.00% | 98.98% | 98.66% |

**Table 3B**: Kuala Lumpur FIR CPDLC Performance Latency per Media Type, RGS and GES (July – December 2024)

| FIR | | WMFC | | | | | |
|---|---|---|---|---|---|---|---|
| Criteria | | RCP240 | | | | | |
| Period | | July-December 2024 | | | | | |
| **Colour Key** | | Message Counts | 95% Benchmark | | 99.90% Benchmark | | 95% |
| Meets Criteria | | | ACP %<=180sec | ACTP %<=120sec | ACP %<=210sec | ACTP %<=150sec | PORT %<60sec |
| 99.0% - 99.89% | | | | | | | |
| Under Criteria | | | | | | | |
| **By Media Type** | | **By Media Type** | | | | | |
| SATCOM | | 2,305 | 99.13% | 99.23% | 99.48% | 99.59% | 98.20% |
| VHF | | 3,080 | 99.49% | 99.38% | 99.55% | 99.59% | 98.69% |
| HF | | 198 | 85.19% | 86.57% | 91.01% | 91.41% | 77.27% |
| ALL | | 5,583 | 98.82% | 98.85% | 99.21% | 99.28% | 97.73% |
| **Station (RGS) Ground** | | **By Remote Ground Station (RGS) Ground Earth Station (GES)** | | | | | |
| **Designator** | **Type** | **(only RGS/GES with message counts >100 recorded)** | | | | | |
| H06 | HF | 184 | 85.69% | 88.27% | 91.96% | 92.39% | 77.17% |

2.14 Overall, for 2024, RCP240 performance achieved the 95% benchmark, met the requirement for PORT and within acceptable range for the 99.9% benchmark. Breakdown by media type is also consistent with the overall performance with exception for HF media type. HF datalink registered low usage and was acknowledged in general to not meet RCP240 delivery time requirements. No particular aircraft consistently used HF datalink.

2.15 Only XXA during the first half failed the ACTP 99.9% criteria. However, with approximately 150 message counts over a six-month period, this may not be statistically significant.

2.16 The performance of the RGS/GES will continue to be monitored.

Kuala Lumpur FIR CPDLC RCP240 Performance – Aircraft Operator/Type

2.17 **Tables 4A and 4B** summarize overall CPDLC performance per Aircraft Operator/Type for messages sent within the Kuala Lumpur FIR during 2024, where performance did not meet the RCP240 performance criteria.

**Table 4A**: Kuala Lumpur FIR CPDLC Performance Latency per Aircraft Operator/Type (January – June 2024)

| FIR | | WMFC | | | | | |
|---|---|---|---|---|---|---|---|
| Criteria | | RCP240 | | | | | |
| PERIOD | | January-June 2024 | | | | | |
| **Colour Key**<br>Meets Criteria<br>99.0% - 99.89%<br>Under Criteria | | Message Counts | 95% Benchmark | | 99.9% Benchmark | | 95% |
| | | | ACP %<=180sec | ACTP %<=120sec | ACP %<=210sec | ACTP %<=150sec | PORT %<60sec |
| | | **By Aircraft Operator / Type** | | | | | |
| **DESIGNATOR** | **TYPE** | **(only Aircraft Operator / Type with message counts >100 recorded)** | | | | | |
| MAS | B738 | 106 | 93.53% | 91.85% | 95.54% | 93.72% | 94.62% |
| SIA | A359 | 1,409 | 97.35% | 96.98% | 98.14% | 98.03% | 95.74% |
| SIA | A388 | 309 | 97.28% | 97.63% | 97.50% | 99.23% | 96.44% |
| SIA | B38M | 150 | 98.00% | 99.47% | 98.43% | 99.60% | 96.67% |
| THY | A359 | 103 | 100.00% | 98.52% | 100.00% | 98.92% | 100.00% |

**Table 4B**: Kuala Lumpur FIR CPDLC Performance Latency per Aircraft Operator/Type (July – December 2024)

| FIR | | WMFC | | | | | |
|---|---|---|---|---|---|---|---|
| Criteria | | RCP240 | | | | | |
| PERIOD | | July-December 2024 | | | | | |
| **Colour Key**<br>Meets Criteria<br>99.0% - 99.89%<br>Under Criteria | | Message Counts | 95% Benchmark | | 99.9% Benchmark | | 95% |
| | | | ACP %<=180sec | ACTP %<=120sec | ACP %<=210sec | ACTP %<=150sec | PORT %60sec |
| | | **By Aircraft Operator / Type** | | | | | |
| **DESIGNATOR** | **TYPE** | **(only Aircraft Operator / Type with message counts >100 recorded)** | | | | | |
| MAS | B738 | 134 | 91.79% | 93.12% | 94.09% | 96.68% | 92.66% |
| SIA | A359 | 1,076 | 97.00% | 97.19% | 97.92% | 97.92% | 95.68% |
| SIA | A388 | 276 | 97.49% | 97.67% | 98.43% | 98.76% | 94.57% |
| SIA | B38M | 163 | 96.88% | 98.21% | 98.33% | 98.49% | 96.52% |
| SIA | B78X | 174 | 97.74% | 97.55% | 97.91% | 98.28% | 96.67% |

2.18 For the first half of 2024, only MAS B738 failed all the performance criteria, while SIA A359 failed both the ACP and ACTP 99.9% benchmarks. SIA A388 and SIA B38M failed only the ACP 99.9% benchmark, whereas THY A359 failed solely the ACTP 99.9% benchmark.

2.19 In the second half of 2024, MAS B738 continued to fail all criteria, while SIA A359, B38M, B78X, and A388 failed the 99.9% benchmark, with A388 additionally failing the PORT criteria.

2.20 Across both periods, apart from SIA A359, all the mentioned operator-aircraft combinations recorded a low number of messages over six months, which may render the results statistically insignificant. Furthermore, MAS B738 does not file for PBCS in its flight plans.

2.21 Analysis of SIA A359 revealed that delayed CPDLC transactions primarily occurred via VHF (86%) and HF (14%) media, with half of these delays attributed to high pilot operational response time (PORT).

2.22 Performance of the non-conformance aircraft will continue to be monitored.

Additional Information

2.23 Performance-based separation (50 NM and 30 NM) has not yet been implemented in the Kuala Lumpur FIR. Currently, PBCS performance data is being used to help operators address performance issues in preparation for its implementation. In the meantime, non-PBCS aircraft in the Kuala Lumpur FIR can still participate in the 50 NM separation using distance-based separation. However, for the 30 NM separation, operators will need to comply with PBCS requirements once it is implemented.

2.24 Malaysia is planning to finalize the appointment of CRA for Kuala Lumpur FIR in preparation for permanent implementation of performance-based separation, planned in 2026.

## 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.

– END –