# NZZO Datalink Performance Report WP 14

FIT-Asia/12
Virtual meeting
25-28 July, 2022



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# NZZO ADS-C RSP180 – Media Type, RGS and GES

| FIR | | NZZO | | | | | |
|---|---|---|---|---|---|---|---|
| Criteria | | RSP180 | | | | | |
| Period | | Jan-June 2021 | | | July-December 2021NZZO | | |
| Colour Key<br>Meets Criteria<br>99.0%-99.84%<br>Under Criteria | | Message Counts | 95%<br>% <= 90sec | 99.90%<br>% <= 180sec | Message Counts | 95%<br>% <= 90sec | 99.90%<br>% <= 180sec |
| **By Media Type** | | | | | | | |
| SATCOM | | 121659 | 98.86 | 99.76 | 114031 | 98.98 | 99.82 |
| VHF | | 29708 | 99.83 | 99.96 | 31611 | 99.77 | 99.94 |
| HF | | 71 | 74.64 | 90.14 | 83 | 57.83 | 74.69 |
| ALL | | 151438 | 99.04 | 99.8 | 145725 | 99.13 | 99.83 |
| **By Remote Ground Station (RGS) Ground Earth Station (GES)** | | | | | | | |
| **Designator** | **Type** | (Only RGS/GES with message counts >100 recorded) | | | | | |
| AME2 | SAT | 122 | 91.8 | 99.18 | 535 | 98.31 | 99.81 |
| IG1 | SAT | 728 | 93.54 | 98.48 | 487 | 94.25 | 98.35 |

# NZZO ADS-C RSP180 – Media Type, HF Analysis

| | | | | | | |
|---|---|---|---|---|---|---|
| HF | 71 | 74.64 | 90.14 | 83 | 57.83 | 74.69 |

The use of HF datalink in NZZO is low with few aircraft now using the media. The HFDL performance illustrated is typical. Aircraft are generally using HFDL in a “next on busy” mode with satcom. The occasional flight will dispatch without satcom using HFDL as primary means. We filter these flights when assessing RCP240/RSP180 performance, because HFDL when used as primary means does not meet PBCS RCP240/RSP180 requirements, and the aircraft should not be filing PBCS status in this mode of operation.

# NZZO ADS-C RSP180 – RGS and GES – AME2 Analysis

| ADS-C Performance | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Colour Key<br>Meets Criteria<br>99.0%-99.84%<br>Under Criteria | | Period 1 Jan 2021 - 31 Dec 2021 | | | | | 95% RSP180 Benchmark | 99.9% RSP180 Benchmark |
| Media Type | RGS | Aircraft Type | Operating Company | Tail Number | ATSP | Message Count | RSP <= 90 sec | RSP <= 180 sec |
| Analysis by | | | | | | | | |
| SATCOM All | AME2 | B789 | ANZ | All | NZZO | 20 | 100 | 100 |
| SATCOM All | AME2 | A332 | CTM | All | NZZO | 9 | 100 | 100 |
| SATCOM All | AME2 | A332 | FJI | All | NZZO | 65 | 89.23 | 96.92 |
| SATCOM All | AME2 | A333 | FJI | All | NZZO | 62 | 85.48 | 100 |
| SATCOM All | AME2 | A343 | HFM | All | NZZO | 6 | 100 | 100 |
| SATCOM All | AME2 | B789 | LAN | All | NZZO | 26 | 100 | 100 |
| SATCOM All | AME2 | GLEX | LXJ | All | NZZO | 34 | 100 | 100 |
| SATCOM All | AME2 | B789 | THT | All | NZZO | 435 | 99.31 | 100 |

NZZO is on the southern boundary of AME2 coverage, and the AME2 RGS makes up just 0.3% of our satcom data. An analysis of the aircraft using AME2 in 2021 and the excellent performance from the THT B789 fleet indicates that the observed AME2 performance is an aircraft rather than a RGS issue. Please refer to **paragraphs 2.9 and 2.10** in WP 14 for analysis of the FJI A332 and A333 performance.

# NZZO ADS-C RSP180 – RGS and GES – IG1 Analysis

| ADS-C Performance | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Colour Key<br>Meets Criteria<br>99.0%-99.84%<br>Under Criteria | | Period 1 Jan 2021 - 31 Dec 2021 | | | | | 95% RSP180 Benchmark | 99.9% RSP180 Benchmark |
| Media Type | RGS | Aircraft Type | Operating Company | Tail Number | ATSP | Message Count | RSP <= 90 sec | RSP <= 180 sec |
| Analysis by | | | | | | | | |
| SATCOM All | IG1 | B748 | CPA | All | NZZO | 19 | 63.15 | 89.47 |
| SATCOM All | IG1 | B77W | CPA | All | NZZO | 363 | 89.8 | 97.52 |
| SATCOM All | IG1 | GL7T | CPJ | All | NZZO | 41 | 95.12 | 97.56 |
| SATCOM All | IG1 | B737 | EDG | All | NZZO | 12 | 100 | 100 |
| SATCOM All | IG1 | CL60 | FLC | All | NZZO | 6 | 100 | 100 |
| SATCOM All | IG1 | B744 | GTI | All | NZZO | 306 | 98.69 | 99.67 |
| SATCOM All | IG1 | FA8X | LUC | All | NZZO | 13 | 100 | 100 |
| SATCOM All | IG1 | B762 | OAE | All | NZZO | 109 | 99.08 | 100 |
| SATCOM All | IG1 | B744 | PAC | All | NZZO | 33 | 100 | 100 |
| SATCOM All | IG1 | A21N | PAL | All | NZZO | 265 | 91.69 | 98.11 |
| SATCOM All | IG1 | E35L | PVT | All | NZZO | 15 | 100 | 100 |
| SATCOM All | IG1 | GLF4 | PVT | All | NZZO | 33 | 93.93 | 96.96 |

We see low Iridium IG1 use in NZZO and it is 1% of our satcom data. An analysis of the aircraft using IG1 and the excellent performance from the GTI B744 and OAE B762 fleet indicates that the observed performance from the IG1 RGS is an aircraft rather than an RGS issue.

# NZZO ADS-C RSP180 – RGS and GES – IG1 Analysis - continued

For the three fleets with more than 100 data points using IG1: the GTI B744 fleet is meeting RSP180 requirements in the 2021 year; an analysis of the PAL A21N fleet performance is in the next section; and the CPA B77W fleet operates through both Iridium and Inmarsat satcom on the fleet which complicates analysis.

The PBCS certified CPA B77W Inmarsat equipped aircraft meet PBCS requirements. CPA stopped filing PBCS FPL equipage on their B77W Iridium equipped aircraft in 2020 while they resolved a reported performance issue with this fleet. The comparative performance observed in 2021 between the Iridium and Inmarsat fleets is illustrated below.

| ADS-C Performance | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Colour Key<br>Meets Criteria<br>99.0%-99.84%<br>Under Criteria | | Period 1 Jan 2021 - 31 Dec 2021 | | | | | 95% RSP180 Benchmark | 99.9% RSP180 Benchmark |
| Media Type | RGS | Aircraft Type | Operating Company | Tail Number | ATSP | Message Count | RSP <= 90 sec | RSP <= 180 sec |
| Analysis by | | | | | | | | |
| All | IG1 | B77W | CPA | All | NZZO | 363 | 89.8 | 97.52 |
| All | XXA | B77W | CPA | All | NZZO | 369 | 96.74 | 99.72 |
| All | XXP | B77W | CPA | All | NZZO | 369 | 98.37 | 100 |

# NZZO ADS-C RSP180 – Aircraft Operator/Type

| FIR | NZZO | | | | | |
|---|---|---|---|---|---|---|
| Criteria | RSP180 | | | | | |
| Period | Jan-June 2021 | | | July-December 2021 | | |
| Colour Key<br>Meets Criteria<br>99.0%-99.84%<br>Under Criteria | Message Counts | 95%<br>% <= 90sec | 99.90%<br>% <= 180sec | Message Counts | 95%<br>% <= 90sec | 99.90%<br>% <= 180sec |
| By Aircraft Operator / Type (Only message counts >100 recorded) | | | | | | |
| ANZ/A20N | 7677 | 96.72 | 98.93 | 2126 | 98.17 | 99.62 |
| CSN/A333 | 195 | 98.97 | 98.97 | - | - | - |
| FJI/A332 | 1211 | 95.62 | 98.43 | 1480 | 95.61 | 98.45 |
| FJI/A333 | 1137 | 93.84 | 98.24 | 1485 | 94.95 | 99.12 |
| PAL/A21N | 154 | 93.51 | 97.40 | 204 | 94.12 | 99.51 |
| TMN/B763 | 3238 | 96.94 | 98.98 | 3641 | 97.01 | 98.30 |

# NZZO ADS-C RSP180 – Aircraft Operator/Type – ANZ A20N

| | Message Counts | %<= 90sec | %<= 180sec | Message Counts | %<= 90sec | %<= 180sec |
|---|---|---|---|---|---|---|
| ANZ/A20N | 7677 | 96.72 | 98.93 | 2126 | 98.17 | 99.62 |

The ANZ A20N degradation is attributed to departing flights in the vicinity of Norfolk Island. These departing flights establish multiple ADS-C contracts with YBBB, NFFF, and NZZO because of the location of Norfolk Island in NZZO which is close to the boundary of both the YBBB and NFFF FIR.

For aircraft departing Norfolk Island to the North when the aircraft connects with NZZO on the ground it is automatically address forwarded to NFFF and YBBB who immediately enable ADS-C contracts.

The multiple contract establishment and the handshaking required by address forwarding seems to swamp the system.

The aircraft use Iridium satcom media because the Norfolk Island VHF RGS has been withdrawn from service.

We identified that with the Norfolk Island departures excluded, ANZ A20N fleet performance in the remainder of the FIR was meeting RSP180 performance requirements (99.23% <=90 sec/100.00% <=180 sec).

A problem report was raised in November 2020 when the issue was first identified and was updated each month. The fleet stopped operating on YSNF sectors in March 2021. ATC were advised of the deterioration below PBCS requirements in the vicinity of YSNF and PBCS operations continued in the remainder of the NZZO FIR during the period.

# NZZO ADS-C RSP180 – Aircraft Operator/Type – CSN A333

| | Message Counts | %<= 90sec | %<= 180sec | Message Counts | %<= 90sec | %<= 180sec |
|---|---|---|---|---|---|---|
| CSN/A333 | 195 | 98.97 | 98.97 | | | |

The CSN A333 fleet only operated in NZZO in June and December 2021. With the small dataset available for evaluation and with the fleet meeting RSP180 95% normal operating requirements no action was taken on the deterioration observed at the 99.90% 180 second performance requirement.

# NZZO ADS-C RSP180 – Aircraft Operator/Type – FJI A332

| | Message Counts | %<= 90sec | %<= 180sec | Message Counts | %<= 90sec | %<= 180sec |
|---|---|---|---|---|---|---|
| FJI/A332 | 1211 | 95.62 | 98.43 | 1480 | 95.61 | 98.45 |

The FJI A332 fleet had ongoing performance issues through 2021 with PBCS non-compliance reports filed with PARMO in January and February and the CRA problem report that was raised in 2020 updated.

We worked directly with Fiji Airways technical staff and appraised them of the monthly performance results as they worked on the issue through 2021.

The latency delays observed were associated with excessive switching between the AME1, AME2, APK1, and APK2 satellite RGS. This issue was resolved and the consolidated performance from the FJI A332 fleet for the period December 2021 to February 2022 is illustrated below.

| Operator | Aircraft Type | Tail No | ADS-C downlink Message counts | ASP <= 90 sec | ASP <= 180 sec | CPDLC Transaction Counts (WILCO received) | ACP <= 180 sec | ACP <= 210 sec |
|---|---|---|---|---|---|---|---|---|
| FJI | A332 | DQFJT | 342 | 97.95% | 100.00% | 5 | 100.00% | 100.00% |
| FJI | A332 | DQFJU | 298 | 97.32% | 100.00% | 4 | 100.00% | 100.00% |
| FJI | A332 | DQFJV | 134 | 99.25% | 100.00% | 2 | 100.00% | 100.00% |

# NZZO ADS-C RSP180 – Aircraft Operator/Type – FJI A333

| | Message Counts | %<= 90sec | %<= 180sec | Message Counts | %<= 90sec | %<= 180sec |
|---|---|---|---|---|---|---|
| FJI/A333 | 1137 | 93.84 | 98.24 | 1485 | 94.95 | 99.12 |

The FJI A333 aircraft had ongoing issues through 2020 and a CRA problem report was raised and a PBCS non-compliance report filed with PARMO in 2020.

Fiji Airways stopped filing PBCS status for the aircraft during 2020.

While the 2021 performance is below RSP180 requirements it meets RSP400 requirements for non-PBCS data link operations. In February 2021, the aircraft performance observed for RSP400 was 99.81% at the 95% 300 second benchmark and 100% at the 99.9% 400 second benchmark.

# NZZO ADS-C RSP180 – Aircraft Operator/Type – PAL A21N

| | Message Counts | %<= 90sec | %<= 180sec | Message Counts | %<= 90sec | %<= 180sec |
|---|---|---|---|---|---|---|
| PAL/A21N | 154 | 93.51 | 97.40 | 204 | 94.12 | 99.51 |

The PAL A20N fleet operates across the Tasman Sea to New Zealand which is a short sector of one hour.

With only 2-3 flights a month insufficient data points are available to indicate any non-performance issues in our monthly PBCS analysis.

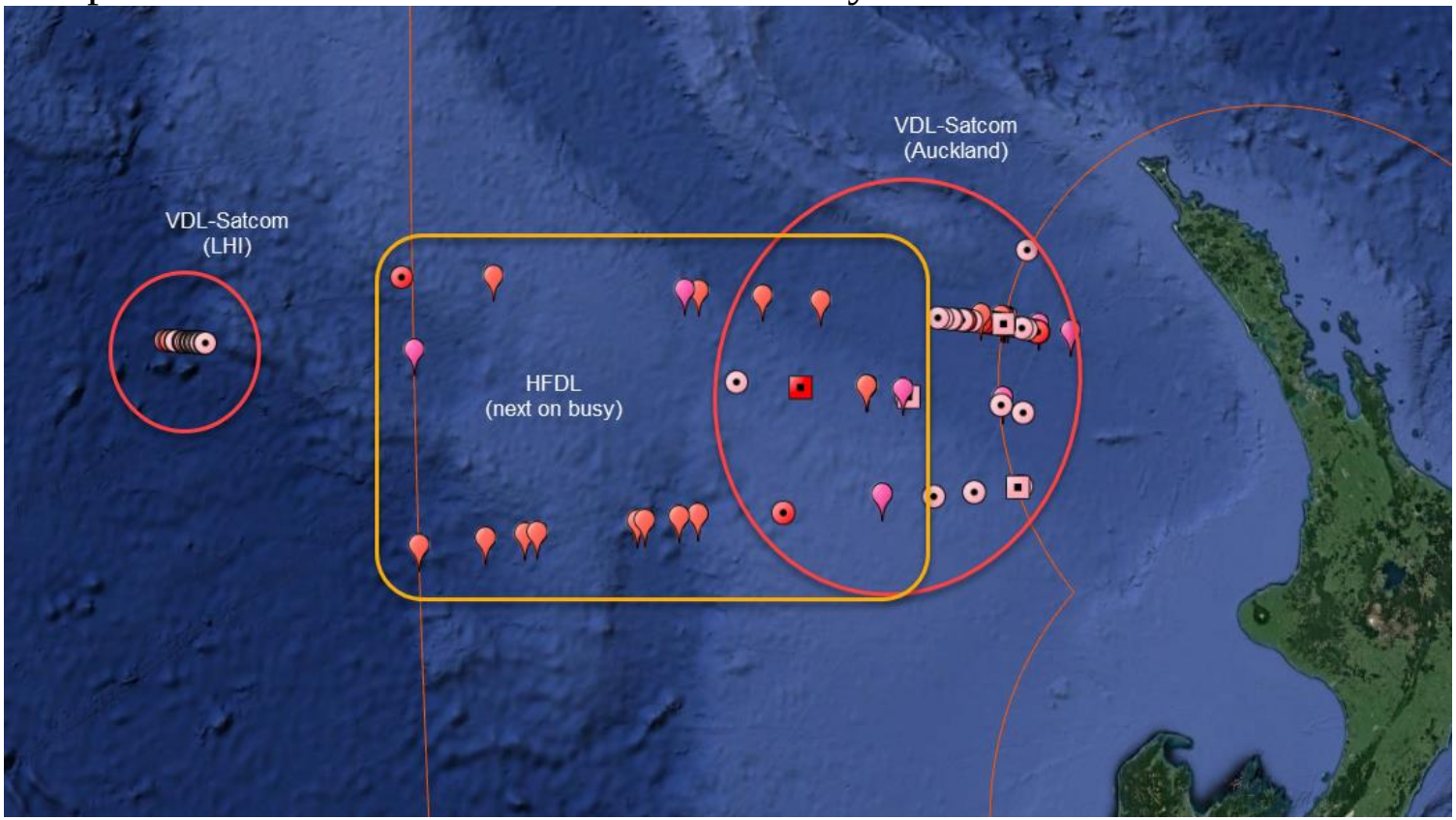
The monthly PBCS analysis uses the current months dataset and the dataset for the last three months in accordance with GOLD guidance. No performance evaluation was completed for this fleet because the minimum 100 data points were not available. Performance observed from the three-monthly datasets is illustrated below.

| Dates | Operator | Aircraft Type | Tail No | ADS-C downlink Message counts | ASP <= 90 sec | ASP <= 180 sec | CPDLC Transaction Counts (WILCO received) | ACP <= 180 sec | ACP <= 210 sec |
|---|---|---|---|---|---|---|---|---|---|
| 202011-01 | PAL | A21N | RPC9935 | 66 | 95.45% | 96.97% | 1 | 100.00% | 100.00% |
| 202012-02 | PAL | A21N | RPC9933 | 32 | 93.75% | 100.00% | 4 | 100.00% | 100.00% |
| 202012-02 | PAL | A21N | RPC9935 | 66 | 95.45% | 96.97% | 1 | 100.00% | 100.00% |
| 202101-03 | PAL | A21N | RPC9933 | 63 | 92.06% | 98.41% | 4 | 100.00% | 100.00% |
| 202101-03 | PAL | A21N | RPC9935 | 34 | 91.18% | 94.12% | 0 | - | - |
| 202102-04 | PAL | A21N | RPC9933 | 63 | 92.06% | 98.41% | 4 | 100.00% | 100.00% |
| 202103-05 | PAL | A21N | RPC9933 | 31 | 90.32% | 96.77% | 0 | - | - |
| 202103-05 | PAL | A21N | RPC9934 | 18 | 94.44% | 100.00% | 0 | - | - |
| 202104-06 | PAL | A21N | RPC9934 | 18 | 94.44% | 100.00% | 0 | - | - |
| 202104-06 | PAL | A21N | RPC9936 | 39 | 97.44% | 97.44% | 0 | - | - |
| 202105-07 | PAL | A21N | RPC9934 | 18 | 94.44% | 100.00% | 0 | - | - |
| 202105-07 | PAL | A21N | RPC9936 | 72 | 97.22% | 98.61% | 0 | - | - |
| 202106-08 | PAL | A21N | RPC9934 | 36 | 94.44% | 100.00% | 1 | 100.00% | 100.00% |
| 202106-08 | PAL | A21N | RPC9936 | 72 | 97.22% | 98.61% | 0 | - | - |
| 202107-09 | PAL | A21N | RPC9934 | 36 | 94.44% | 100.00% | 1 | 100.00% | 100.00% |
| 202107-09 | PAL | A21N | RPC9936 | 62 | 98.39% | 100.00% | 1 | 100.00% | 100.00% |
| 202108-10 | PAL | A21N | RPC9934 | 36 | 94.44% | 100.00% | 1 | 100.00% | 100.00% |
| 202108-10 | PAL | A21N | RPC9935 | 29 | 75.86% | 96.55% | 0 | - | - |
| 202108-10 | PAL | A21N | RPC9936 | 29 | 100.00% | 100.00% | 1 | 100.00% | 100.00% |
| 202109-11 | PAL | A21N | RPC9933 | 27 | 100.00% | 100.00% | 0 | - | - |
| 202109-11 | PAL | A21N | RPC9935 | 29 | 75.86% | 96.55% | 0 | - | - |
| 202110-12 | PAL | A21N | RPC9933 | 77 | 97.40% | 100.00% | 0 | - | - |
| 202110-12 | PAL | A21N | RPC9935 | 29 | 75.86% | 96.55% | 0 | - | - |

# NZZO ADS-C RSP180 – Aircraft Operator/Type – TMN B763

| | Message Counts | %<= 90sec | %<= 180sec | Message Counts | %<= 90sec | %<= 180sec |
|---|---|---|---|---|---|---|
| TMN/B763 | 3238 | 96.94 | 98.98 | 3641 | 97.01 | 98.30 |

The aircraft is not PBCS certified. The performance degradation observed is due to two reasons: first the aircraft uses HFDL in a "next on busy" mode with satcom; and second, latency delays caused by VHF Satcom transition issues when departing New Zealand airspace and in the Tasman Sea in the vicinity of Lord Howe Island.




Paddle = HF
Circle = Satcom
Square = VHF

Pink = 90"-180"
Red = >180"

# NZZO CPDLC RCP240 – Media Type, RGS and GES

| FIR | | NZZO | | | | |
|---|---|---|---|---|---|---|
| Criteria | | RCP240 | | | | |
| Period | | Jan - Jun 2021 | | | | |
| Colour Key<br>Meets Criteria<br>99.0%-99.84%<br>Under Criteria | Message Counts | 95% benchmark | | 99.9% Benchmark | | 95% |
| | | ACP | ACTP | ACP | ACTP | PORT |
| | | % < = 180sec | % <= 120sec | % < = 210sec | % <= 150sec | %<60secs |
| **By Media Type** | | | | | | |
| SATCOM | 3073 | 99.73 | 99.90 | 99.86 | 99.93 | 99.25 |
| VHF | 349 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| HF | 9 | 100.00 | 88.88 | 100.00 | 88.88 | 100.00 |
| ALL | 3431 | 99.76 | 99.88 | 99.88 | 99.91 | 99.32 |
| **By Remote Ground Station (RGS) Ground Earth Station (GES)** | | | | | | |
| **Designator** | **Type** | (RGS/GES with message counts >100) | | | | |
| All RGS/GES with message counts >100 meet RCP240 requirements | | | | | | |

# NZZO CPDLC RCP240 – Media Type, RGS and GES

| FIR | | NZZO | | | | |
|---|---|---|---|---|---|---|
| Criteria | | RCP240 | | | | |
| Period | | Jul - Dec 2021 | | | | |
| Colour Key<br>Meets Criteria<br>99.0%-99.84%<br>Under Criteria | Message Counts | 95% Benchmark | | 99.9% Benchmark | | 95% |
| | | ACP | ACTP | ACP | ACTP | PORT |
| | | % < =180sec | % <= 120sec | % < = 210sec | % <= 150sec | %<=60secs |
| **By Media Type** | | | | | | |
| SATCOM | 2752 | 99.78 | 99.89 | 99.92 | 99.92 | 99.41 |
| VHF | 463 | 100.00 | 100.00 | 100.00 | 100.00 | 99.78 |
| HF | 7 | 85.71 | 85.71 | 85.71 | 100.00 | 85.71 |
| ALL | 3222 | 99.78 | 99.87 | 99.90 | 99.93 | 99.44 |
| **By Remote Ground Station (RGS) Ground Earth Station (GES)** | | | | | | |
| **Designator** | **Type** | (RGS/GES with message counts >100) | | | | |
| All RGS/GES with message counts >100 meet RCP240 requirements | | | | | | |

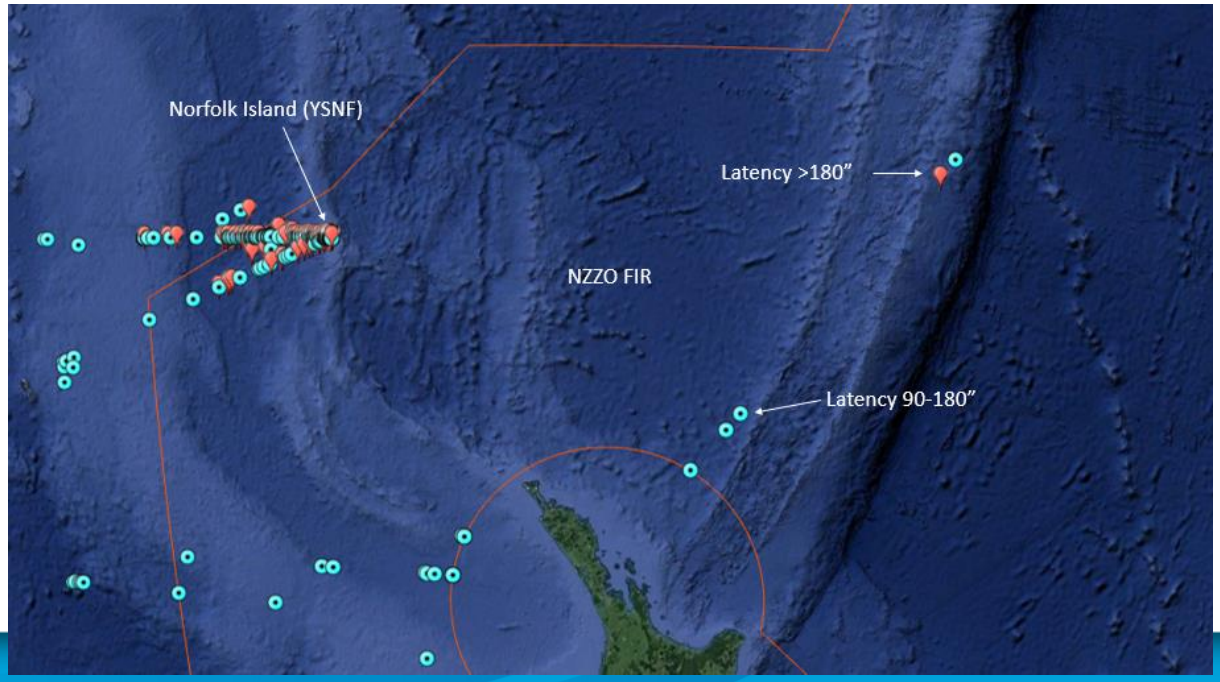
# NZZO CPDLC RCP240 – Aircraft Operator/Type

CPDLC performance per Aircraft Operator/Type with message counts greater than 100 within the NZZO FIR during 2021 all meet the RCP240 performance criteria.

# Additional Information

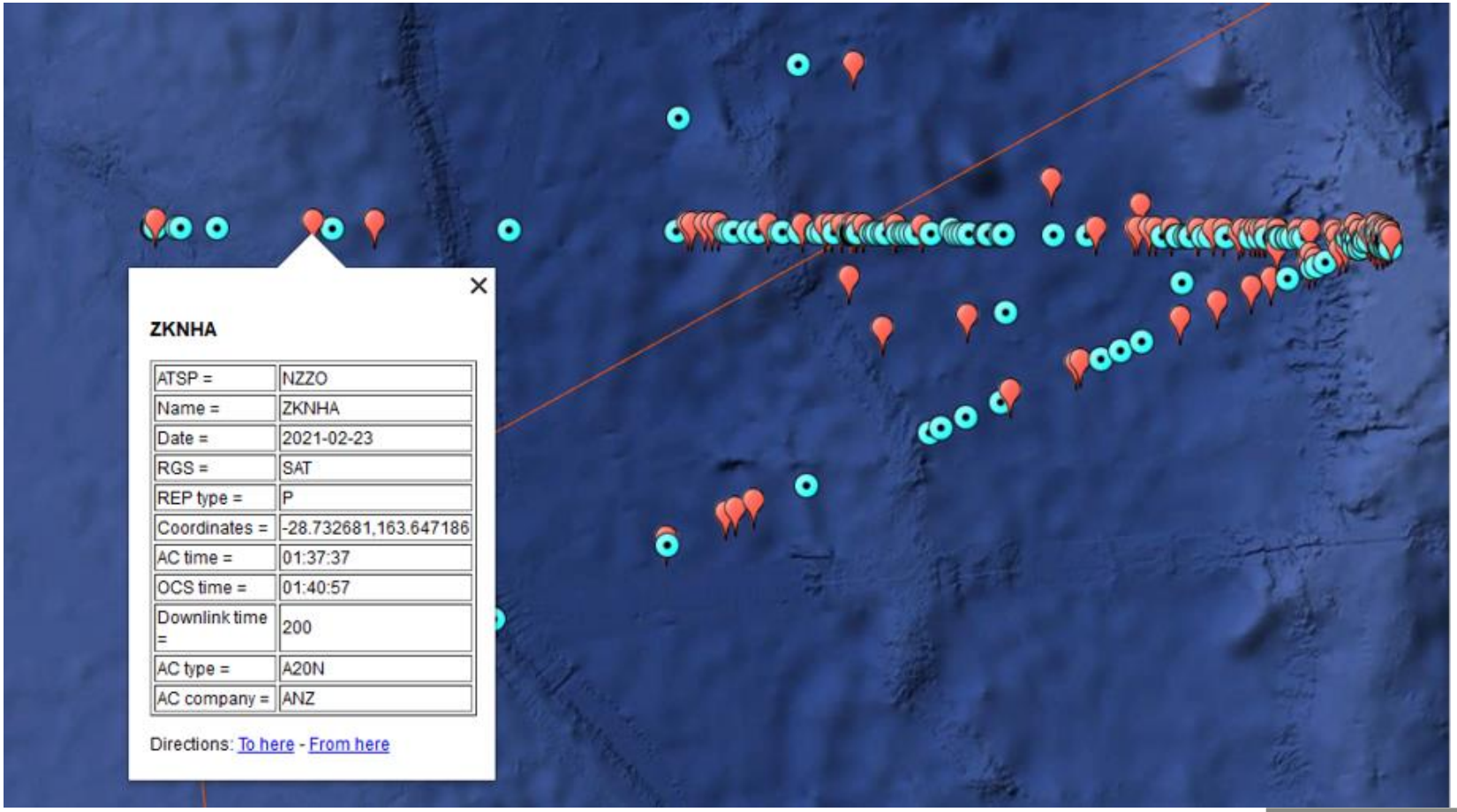
Airways finds that the ability to display the latency observed with each ADS-C data point on Google Earth is useful when investigating performance problems. A recent development with out online PBCS analysis tool enables the creation of Google Earth formatted files that display selected ADS-C data points from our on-line database or from imported .csv files.

An example of a Google Earth display helping identify a performance problem is illustrated below. This is a Google Earth display of the delayed reports described above observed from ANZ A20N aircraft in early 2021.



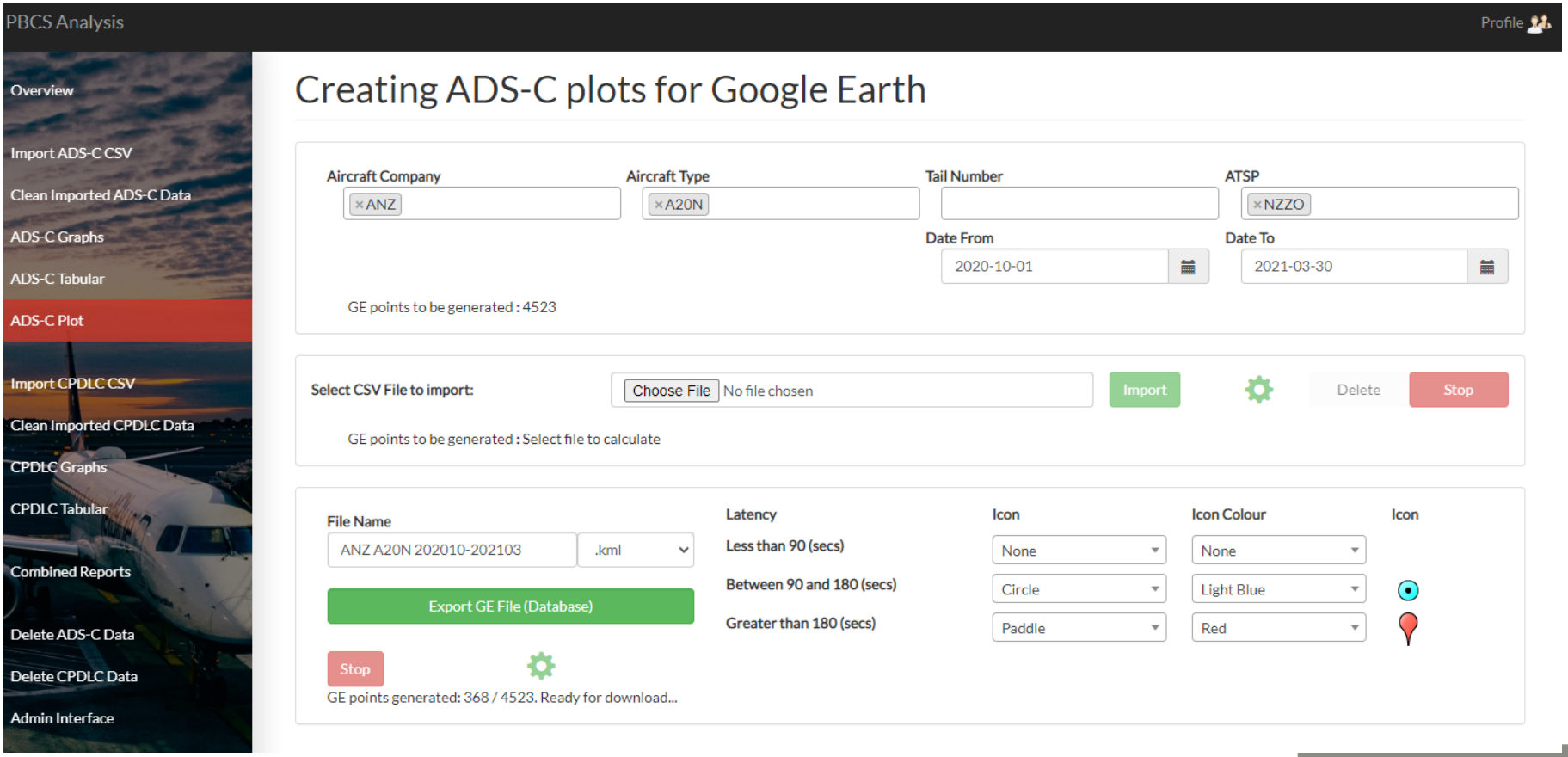
# Additional Information

A more detailed display of the delays observed around Norfolk Island is illustrated below. This also shows the information that can be displayed for each data point accessible by a mouse click on the data point.



# Additional Information

The interface used to create the Google Earth files from the database or imported .csv files is illustrated below. The interface allows the user to select data points from the database or import a .csv file in GOLD format. The user then names the Google Earth file and selects the required icons and colours for each of three latency ranges (<90", 90-180", >180") that can be displayed.



# Action by the Meeting

The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matters as appropriate.