



Sixth Meeting of the Pacific Meteorological Council (PMC-6)

Sustaining Weather, Climate, Water and Ocean Services for a Resilient Blue Pacific

14-16 August 2023, Sofitel Hotel, Denarau, Fiji

Agenda item 9.2: Performance Monitoring of Pacific Aviation OPMET Data

Purpose of the paper:

1. To inform the Meeting of the operational meteorological (OPMET) monitoring activities of the Meteorological Information Exchange Working Group (MET/IE WG), which reports to the Meteorology Sub-Group (MET SG) of the International Civil Aviation Organization (ICAO) Asia and Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG).
2. To highlight the current and expected future challenges facing ICAO Contracting States including the Pacific Island States in the provision of OPMET data, and the need for greater support in this work.
3. To seek the Meeting's guidance and decision to assist Pacific Island States to address and improve the provision of OPMET data.

Background:

1. The current Amendment 80 to Annex 3 *Meteorological Service for International Air Navigation* requires that each ICAO Contracting State must designate a meteorological authority¹, who must provide – or arrange for provision of – meteorological information (Chapter 2, clause 2.1.4 and 2.1.5) as required in the regional air navigation plan (ANP). This may include arrangements with another State to provide meteorological information on its behalf.
2. The TAFs (aerodrome forecasts) and METARs (aerodrome observations) required for international air navigation in the ICAO APAC region are available in the ICAO APAC ANP Volume II Table MET II-2, including information on which National Meteorological and Hydrological Services (NMHSs) provides the data. The ANP is regularly updated and available here: <https://www.icao.int/APAC/Pages/APAC-eANP.aspx>
3. The information in Table MET II-2 should reflect the current service provisions in the ICAO APAC region (including specifying which organisations provide it), however it is noted that this is not always up to date. States are encouraged to check the information in the ANP and update its contents (in coordination with the national Civil Aviation Authority (CAA)), as necessary, using the Proposal for Amendment form on the ANP website, or providing information to a MET SG meeting, or to a meeting of one of its working groups.
4. The ICAO APAC MET/IE WG is tasked to undertake an annual review of OPMET data performance – specifically METARs and TAFs provided for international air navigation, as included in Table MET II-2.

¹ Note, the proposed Amendment 81 to Annex 3 proposes a functional separation of meteorological authority and meteorological service provider.

5. METARs and TAFs should be provided in accordance with ICAO Annex 3 and disseminated through the Regional OPMET exchange (ROBEX) scheme by the local Regional OPMET Centre (ROC) to the five APAC Regional OPMET Data Banks (RODBs) – located in Bangkok, Brisbane, Tokyo, Singapore, Nadi.
6. RODB Bangkok undertakes the performance monitoring activity, using a web-based 'Performance Indices Analyser' to compute OPMET Performance Indices (PIs) of incoming OPMET data derived from five RODBs during January of each year.
7. The PIs calculated for each monitoring period are the Compliance Index, the Availability Index and the Regularity Index, defined as follows:
Availability: at least one report has been received from the aerodrome during the 24-hour period, 1.0 represents perfect availability.
Compliance: percentage of expected reports received for ROBEX bulletins during the monitoring period, 1.0 represents perfect compliance.
Regularity: consistency in the number of reports provided for aerodrome, 1.0 represents perfect regularity.
8. The practical difference between these measures for TAFs or METARs is not significant and so in this paper, the *compliance* statistics are considered.
9. The meeting should note that the *accuracy* of the METARs and TAFs, along with the *formatting* are not assessed as part of this exercise. This means that while TAFs may be assessed as having high PI scores, it does not mean that it is necessarily an accurate forecast, or that it – or METARs – are in "compliance" with Annex 3 requirements. It simply means that the TAFs or METARs are available, delivered on time and is not 'NIL'.
10. The results of the performance monitoring are presented to the meeting of the ICAO APAC MET/IE WG held (normally) in March each year and informs the activities of the ICAO APAC ANP Meteorological Services Working Group (MET/S WG) on identifying potential new air navigation deficiencies in the meteorology field.
11. Of particular focus by the ICAO APAC MET/S WG are any aerodrome PIs that are recorded as having an availability or compliance score of less than 0.9.
12. The ICAO APAC MET/IE WG are currently considering ways to improve the utility of the PI scores and make them more meaningful, including monitoring data provision for individual aerodromes, and considering whether automated assessment of the IWXXM² format of the TAFs and METARs can be used to assess whether they are in Annex 3 compliant format.

Pacific Meteorology OPMET Data Performance:

1. Five years of OPMET data compliance statistics for Pacific Island States located in the APAC region is provided in Attachment A to this paper.
2. There remain challenges for some Pacific Island States with the 'compliance' PIs. A variety of reasons have been identified in the past, including:
 - 1) Reduced METARs provision – only providing METARs for given period each day, when Table MET II-2 indicates 'full' (24hr per day) availability;
 - 2) Formatting issues meaning the METARs or TAFs could not be ingested by the ROC compiling the METARs or TAFs bulletins (e.g; typos, missing an element of METARs, incorrect formatting of TAFs);
 - 3) Late provision of METARs or TAFs, meaning it is not able to be included in the bulletin;

² The ICAO Meteorological Information Exchange Model (IWXXM) is the XML format for meteorological information required under Annex 3 and the APAC Air Navigation Plan. Currently most of the IWXXM formatted METAR and TAF from Pacific States are generated via text to IWXXM translation through an agreement with ROC Wellington.

- 4) Automatic weather stations unavailable due to technical issues; and
 - 5) Problems with getting METARs or TAFs disseminated to the ROCs – for example, not using the Aeronautic Fix Services (AFS), or sending information in a PDF document which cannot be ingested.
3. The impact of COVID-19 lockdowns has had an impact on METARs availability, when there were significant reductions in the availability of Pacific OPMET, due to fewer flights operating and so reduced METARs were made available.
 4. Without the provision of regular METARs, TAFs must be cancelled due to the ICAO requirement to keep those TAFs under continuous review. This results in airlines needing to carry extra fuel due to not being able to use those aerodromes in planning their flight route (so needing to fly a longer route to be within emergency landing distance of other aerodromes).
 5. It's important to acknowledge that there has been significant improvement in the provision of meteorological information from some Pacific States such as Nauru, showing increased METAR provision scores each year. However, challenges clearly remain, and are often technology related – such as the lack of:
 - 1) Adequate communication systems (access to Aeronautical Fixed Telecommunication Network (AFTN) or Aeronautical Messaging Handling System (AMHS) connections);
 - 2) Adequate technology to highlight to meteorological observers or forecasters when there is an error in formatting or missing data (resulting in rejection by ROC systems and/or failed IWXXM translation); and
 - 3) Fully equipped automatic weather stations to ensure continuous delivery of observations when the meteorological observer is off duty.
 6. Challenges also occur with meteorological staff training and competency, ensuring that they meet the WMO and ICAO requirements. Verification of TAFs is also an important aspect, allowing quality assurance of information and the ability to identify any aspects of the forecast to work on improving.

Challenges:

1. It is anticipated that a new aerodrome observation will be introduced into Annex 3 from late 2026 – requiring higher resolution meteorological data and more frequent issuance. It will be provided in IWXXM format only (no 'human readable' version will be provided) and will require fully automated meteorological observations to be enabled (the information is likely to be required to be provided multiple times each hour).
2. Multiple projects are underway to improve meteorological observing equipment at Pacific Island States' aerodromes – it is important that consideration is also given (where possible) to inclusion of aviation-specific instrumentation such as ceilometers and visibility sensors, along with suitable communication infrastructure to disseminate the data.
3. Challenges also remain in ensuring that when TAFs are provided on behalf of other States, the provision is supported by suitable Service Level Agreements (SLAs) or Memorandums of Understanding (MoUs) or equivalents.
4. The implementation of backup arrangements for the provision of TAFs is also a concern for NMHSs across the Pacific – with recent natural disasters in the Pacific highlighting the fragility of data connections, let alone the safety of staff.
5. Underpinning these challenges is the need for secure and sufficient financial resourcing to ensure the challenges – both current and future can be met.

Recommendations

The Meeting is invited to:

1. **Note** the improvements in provision of OPMET data by the Pacific Island States over the last five years.
2. **Note** the challenges remain in ensuring METARs and TAFs are provided regularly and in Annex 3 compliant format.
3. **Request** assistance for Pacific Island States in future-proofing their observation systems to ensure the ability to meet future ICAO requirements.
4. **Request** assistance for Pacific Islands States, who have TAFs issued on their behalf without formal arrangements in place, in developing agreements with the issuing State.
5. **Request** assistance for Pacific Islands States in capacity development and competency assessment activities.
6. **Request** assistance for Pacific Islands States who are providing TAFs and need help to set up suitable verification systems.
7. **Encourage** Pacific Island States' NMHSs to check the information in the ICAO APAC ANP and coordinate with national Civil Aviation Authorities (CAAs) to update its contents using the Proposal for Amendment form on the ICAO APAC ANP website.

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Attachment A – Pacific OPMET Performance Statistics (AOP aerodromes only)

Note – the threshold for highlighting performance indices for further investigation changed from 0.5 to 0.9 in 2021. Values less than 0.5 have been highlighted to indicate an improving trend.

For most Pacific States, the Regional OPMET Centre is either located in Nadi or Brisbane. ROC Nadi and Brisbane collect the METARs and TAFs from the issuing centres and compile these into bulletins, to send to the five APAC RODBS. The columns below indicate the WMO header of those bulletins to which the aerodrome OPMET belongs, the ROC responsible, then the best (or 'max value') reception statistics from each of the five RODBs.

Issuing office	Product
Port Moresby	METAR and TAF
Nadi	METAR and TAF
Honiara	METAR and TAF
Port Vila	METAR and TAF
Nauru	METAR
Tonga	METAR
Niue	METAR
New Caledonia	METAR

METAR Performance Monitoring Statistics				
Year	Aerodrome	Bulletin	ROC	Max value
2023	AYVN - Vanimo	SANG31	Brisbane	0
	AGGH - Honiara	SANG31	Brisbane	0.85
	ANYN - Nauru	SANG31	Brisbane	0.58
	AYPY – Port Moresby	SANG31	Brisbane	0.87
	NFTF – Fua'amotu	SAPS31	Nadi	0.84
	NFTV – Vava'u	SAPS31	Nadi	0.68
	NIUE – Niue	SAPS31	Nadi	0.89
	NVSS – Santo	SAPS31	Nadi	0.57
2022	NVTV – Port Vila	SAPS31	Nadi	0.72
	AYVN – Vanimo	SANG31	Brisbane	1*
	ANYN - Nauru	SANG31	Brisbane	0.48
	AYPY – Port Moresby	SANG31	Brisbane	0.7
	NFTF – Fua'amotu	SAPS31	Nadi	0.63**
	NFTV – Vava'u	SAPS31	Nadi	0.47**
2021	NVSS – Santo	SAPS31	Nadi	0.6
	AYVN – Vanimo	SANG31	Brisbane	0
	ANYN - Nauru	SANG31	Brisbane	0.4
	AYPY – Port Moresby	SANG31	Brisbane	0.03
	NFTV – Vava'u	SAPS31	Nadi	0.74
2020	NVSS – Santo	SAPS31	Nadi	0.63
	AYVN – Vanimo	SANG31	Brisbane	0
	ANYN - Nauru	SANG31	Brisbane	0.36
2019	NSFA – Faleolo	SAPS31	Nadi	0.33
	ANYN – Nauru	SANG31	Brisbane	0
	AYVN - Vanimo	SANG31	Brisbane	0
	NVSS – Santo	SAPS31	Nadi	0.03
	NVTV - Port Vila	SAPS31	Nadi	0.13
	NLWW – Wallis	SAPS31	Nadi	0.44

*2022 AYVN statistics had '0' for regularly and availability, but '1' for compliance – this is expected to be a misleading report.

**2022 Tonga statistics were influenced by Hunga Tonga-Hunga Ha'apai events.

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TAF Performance Monitoring Statistics				
Year	Aerodrome	Bulletin	ROC	Max value
2023	AYVN - Vanimo	FTNG31	Brisbane	0
	ANYN - Nauru	FTNG31	Brisbane	0.52
	AYPY - Port Moresby	FTNG31	Brisbane	0.5
	AGGH - Honiara	FTNG31	Brisbane	0.87
	NIUE - Niue	FTPS31	Nadi	0.74
	NVSS - Santo	FTPS31	Nadi	0.66
	NVVV - Port Vila	FTPS31	Nadi	0.68
2022	AYVN - Vanimo	FTNG31	Brisbane	0
	ANYN - Nauru	FTNG31	Brisbane	0.42
	AYPY - Port Moresby	FTNG31	Brisbane	0.62
	NIUE - Niue	FTPS31	Nadi	0.7
	NFTV - Vava'u	FTPS31	Nadi	0.7*
	NFTF - Fua'amotu	FTPS31	Nadi	0.79*
2021	AYVN - Vanimo	FTNG31	Brisbane	0
	ANYN - Nauru	FTNG31	Brisbane	0.33
	AYPY - Port Moresby	FTNG31	Brisbane	0.65
	NIUE - Niue	FTPS31	Nadi	0.41
2020	AYVN - Vanimo	FTNG31	Brisbane	0
	ANYN - Nauru	FTNG31	Brisbane	0.15
2019	AYVN - Vanimo	FTNG31	Brisbane	0
	ANYN - Nauru	FTNG31	Brisbane	0.14

**2022 Tonga statistics were influenced by Hunga Tonga-Hunga Ha'apai events (if METAR not available, TAF must be cancelled).

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