



Australian Government
Bureau of Meteorology

Review of aerodrome forecast services for the aviation industry

Final report



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Draft Released: 18 December 2012

Final Released: 9 September 2014

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Published by the Bureau of Meteorology

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Executive Summary

This review of aerodrome forecast (TAF) services was commenced in 2009 in response to:

- requests from the aviation industry for the Bureau of Meteorology (the Bureau) to review its aviation weather services; and
- as a quality management requirement to meet International Civil Aviation Organization (ICAO) service standards.

The Bureau operates in a dynamic environment; we must constantly adjust our operations to meet the changing demands of governments, business and the community, while continuing to provide core functions that deliver long-term benefits.

The Bureau provides services in accordance with Australian Government legislation and international obligations, including the provision of special aviation weather services. While we receive most of our funding from the Australian Government through appropriation, our Aviation Weather Service recovers the incremental cost incurred in providing specialised aviation weather services from the aviation industry, in accordance with government policy. This occurs through the Meteorological Service Charge (MSC). Most international meteorological aviation services are also funded through a cost recovery mechanism from industry, based on ICAO policy and guidance.

As meteorology has such a significant influence on aviation activities from both a safety and financial perspective, the Bureau closely consults with the aviation industry to ensure that aviation weather products and services meet their requirements. Regular consultation occurs between our Aviation Weather Service and representatives of international, domestic and regional airlines, general aviation, and other industry groups together with the Department of Infrastructure and Regional Development (DOIRD) and related agencies such as the Civil Aviation Safety Authority (CASA), Airservices Australia (Airservices) and the Australian Transport Safety Bureau (ATSB).

We recognise that the needs of government, industry and communities—especially in regional areas—may have changed since many TAF services commenced (up to several decades ago for some locations). Our Aviation Weather Service has been asked by the aviation industry to better align services with funding attribution, respond to changing user requirements and improve the quality of its services.

Additionally, ICAO recently mandated that quality management processes should be part of any service delivery. Recognising this requirement, the Bureau's Aviation Weather Service commenced this specific review into the provision of TAFs across Australia in 2009.

In undertaking this review, we consulted with the aviation industry through regular consultancy meetings, various industry forums and surveys of aerodrome owners and operators, airlines and operators, and pilots.

A draft report was released for public comment on 18 December 2012 seeking additional formal feedback from all stakeholders on the draft report, and in particular the draft recommendations being put forward by the Bureau.

The comment period closed on 31 March 2013. We received 52 submissions from airport owners and operators, airlines, industry bodies, government agencies and members of parliament.

A review committee was established, chaired by the Bureau and comprising representatives of Airservices, CASA and DOIRD, to formally review the issues raised in submissions and revise the draft review report as necessary.

The main outcome of the work of the review committee is an increase in the number of locations where the provision of an MSC-funded TAF service will continue to be provided. This outcome is in recognition of specific operational factors applicable to these locations.

The Bureau will implement a formal three-year review framework (applying a criteria-based approach) to assess the future provision of TAF services.

We will enact an implementation plan based on the final recommendations of the review final report, to commence in September 2014, with service changes planned to occur on the 5 March 2015.

In addition to the formal three-year review process established, TAF services for specific aerodromes can be reviewed on request at any time using the criteria outlined in this report (for example a substantial and sustained increase in aircraft movements).

Summary of Review Outcomes

This report summarises the review undertaken by the Bureau, in consultation with Airservices, CASA and DOIRD, into the provision of TAF services and presents 15 final recommendations.

A major outcome of the review is the establishment of a methodology for determining which aerodromes should receive an MSC-funded TAF service and the level of service required.

This methodology is based on using aerodrome activity levels (i.e. annual aircraft movements and passenger numbers) and the application of International Civil Aviation Organization (ICAO) Standards and Recommended Practices in relation to international airport operations.

The review concludes that non-international designated aerodromes require at least 4000 movements or 10 000 passengers per annum to be considered for a TAF. However, aerodromes meeting these thresholds may not be eligible for an MSC-funded TAF if other TAF services are available within 60 nautical miles, or if the TAF service benefits a single industry or entity, rather than being served by publicly accessible flight operations.

This final report supports the provision of a TAF service even where passenger and aircraft movement activity at an aerodrome are below threshold levels, on the basis of strategic safety aspects, including local climatology (as assessed by the Bureau) and where there are no suitable alternates within a reasonable distance.

Additionally, the Bureau will consider providing a TAF service where an operator wishes to fund such a service on a 'user pays' contractual cost recovery basis (for example for private operations).

The review notes that other weather information is available that can be used by industry in aviation operations at locations where there is not a TAF service. These services include meteorological forecasts such as Area Forecasts, Significant Meteorological Information (SIGMETs), Area QNH and observations such as METARs and Automatic Weather Information Services (AWISs).

The review also defines minimum meteorological observations to support the production and ongoing monitoring of a TAF during its period of validity.

This review determined that the following changes be made to the aviation industry funded services:

- (i) 143 aerodromes' categorisation will remain the same, resulting in continued provision of service for these aerodromes. 61 of these aerodromes will receive additional meteorological observational infrastructure.
- (ii) 50 aerodromes have been re-categorised and the service aligned, which in the majority of cases will see the same or extended hours of the aerodrome forecast service. 15 of these aerodromes will receive additional meteorological observational infrastructure.
- (iii) 53 routine aerodrome forecast services will cease to be provided from MSC funding. If a service is desired, a contractual (cost recovery) service will be considered by the Bureau if it can be provided.

The additional meteorological observational infrastructure in items (i) and (ii) are to be funded by the aviation industry, through the MSC, at an approximate cost of \$6 million.

Specific details on the final recommendations and their implications are provided in Appendix 1 and Section 7 of this report, respectively.

This review will improve the quality of TAF services by ensuring that they are supported by adequate observations, and that forecasting staff have the capacity to monitor the large number of observations and can therefore respond to changes in conditions.

The implementation of the final recommendations in this report will also provide additional capacity for improved quality of aviation weather services and the provision of additional routine and ad hoc services as required by the industry.

1 Aviation Weather Services

1.1 Role

The Bureau of Meteorology's (the Bureau's) Aviation Weather Service enhances the safety, regularity and efficiency of national and international aviation operations through the provision of accurate, timely and relevant forecasts, warnings and information for aerodromes and en-route operations. Aviation weather services are generated and delivered through the:

- Bureau National Operations Centre (BNOC) in Melbourne;
- Regional Forecasting Centres (RFCs) in each State and the Northern Territory;
- Sydney Airport Meteorological Unit (SAMU);
- Meteorological Offices in Cairns and Canberra;
- Volcanic Ash Advisory Centre (VAAC) in Darwin; and
- Meteorological Unit at the Airservices National Operations Centre (NOC) in Canberra (NOCMET).

The Bureau's role in providing services for civil aviation is established through the *Meteorology Act 1955*. Under the Convention for International Civil Aviation (the Chicago Convention) the Bureau is also the designated meteorological authority for Australia and must ensure that meteorological services for civil aviation in Australia are in accordance with the standards and recommended practices set out in Annex 3 to the Convention. In fulfilling this mandate, we work closely with Airservices, which is responsible for air traffic services, and the Civil Aviation Safety Authority (CASA), which is responsible for the safety regulation of civil aviation in Australia.

1.2 Consultation

The Bureau uses a range of national and international stakeholder consultation and coordination processes to ensure ongoing arrangements for improved service provision.

We are actively involved in a variety of committees, working groups and focus groups involving CASA, Airservices, Australian Transport Safety Bureau (ATSB) and the Department of Infrastructure and Regional Development (DOIRD), as well as representatives of international, domestic and regional airlines, general aviation, and other industry groups.

International consultation and coordination occur via such forums as the World Meteorological Organization Commission for Aeronautical Meteorology and working groups, the International Civil Aviation Organization (ICAO) Asia Pacific Air Navigation Planning and Implementation Regional Group, and a number of other ICAO groups.

1.3 Structure

The Bureau's aviation weather service consists of:

- Major Airport Weather Services, overseeing services provided for the major international airports within Australia;
- Regional Aviation Weather Services, overseeing services provided to regional Australia, and in low-levels of airspace (including services to regional aviation, general aviation and sports aviation users);
- Upper Airspace Weather Services, overseeing all upper airspace services including aviation products supplied by the BNOC, Tropical Cyclone Advisory Centres (TCACs) and Volcanic Ash Advisory Centre (VAAC);
- national management, which develops and manages policy, standards, practices and procedures as well as the financial management of aviation weather services; and
- the Meteorological Authority Office, which ensures the aviation weather services for Australia are provided in accordance with ICAO Annex 3 and authorises aviation meteorological service providers under Civil Aviation Regulation 1988, Regulation 120 (CAR120).

1.4 Airservices National Operations Centre (NOC)

The Bureau also has an important role in Airservices' NOC, located in Canberra. The NOC was established to balance air traffic flow, manage capacity at major aerodromes and to provide a central point for information sharing between Air Traffic Control (ATC) units. These provisions are particularly important during exceptional events, including adverse weather conditions.

The NOC meteorological unit (NOCMET) is an integral part of the NOC. Experienced Bureau meteorologists provide Airservices staff with immediate access to information and advice regarding actual and forecast weather conditions that are likely to impact air traffic flow in the Australian network.

1.5 Quality Management

The Bureau's Aviation Weather Services maintains certification under AS/NZS ISO 9001:2008 Quality Management Standard.

Our quality management system ensures rigorous ongoing independent scrutiny of the management and delivery of aviation weather services, and provides a firm basis for continuous improvement of aviation weather services to meet industry needs.

Our RFCs aviation procedures are compliant with the aviation quality management system as required by ICAO.

A centralised process has been implemented for managing meteorological investigations relating to aircraft accidents and incidents, whereby all requests

received by the Bureau are dealt with in a nationally coordinated and consistent manner.

Meteorological investigations relating to aviation accidents and incidents help to identify any possible deficiencies in, and improvements to, aviation weather services. Consistency in such investigations allows us to identify widespread or common issues with the services more easily, and also facilitates archiving of information for future reference.

1.6 Competency

We have also completed a national aviation competency program, whereby all aviation forecasters and observers have been assessed and deemed competent. Following the initial competency assessments, forecasters will undergo routine assessments annually and major assessments every four to five years.

This competency training and assessment reflects what an aviation meteorologist would be expected to do while exercising due care on the job, and hence provides the foundation for service-focused and operationally relevant training. It also provides a mechanism for benchmarking the required skills and knowledge.

1.7 Meteorological Service Charge

Australian Government policy requires that the Bureau recover the incremental costs incurred in providing specialised services to the aviation industry.

These costs are recovered by Airservices on behalf of the Bureau, via the Meteorological Service Charge (MSC). Due to the incremental cost recovery method and the impact of weather on their operations, the aviation industry maintains a strong involvement in the scoping and approval of services delivered to the industry.

In response to a growing demand for additional aerodrome forecasts (TAFs) that are not warranted under the MSC, the Bureau has also begun providing contractual TAF services. These enable users (typically aerodrome operators) to fund, on a cost recovery basis, additional TAF services. At the time of publishing, the Bureau was providing contractual TAFs for five aerodromes.

2 Aerodrome Forecast (TAF) Review

In 2009, the Bureau began a review into the provision of TAF services on behalf of, and at the request of, the aviation industry. The review was commenced for the following reasons:

- **Changing aviation industry requirements**
There have been significant changes within the aviation industry in recent years, particularly the increase in fly-in fly-out operations to mining sites throughout Australia and changes in the types of aircraft being used by operators. These and other factors have resulted in increased pressure on the Bureau to provide additional aviation weather services.
- **Aviation services are at capacity**
With the current aviation industry funded budget (MSC), the Bureau's aviation service is operating at capacity and is unable to provide additional products and services for industry.
- **No recent review of TAF services**
While the Bureau has remained responsive to the needs of industry through ongoing consultative processes, we recognise that no significant national review of the overall provision of aviation weather services and products has been completed in recent times.
- **Quality management**
To meet ISO certified quality management obligations for continuous improvement, and to fully meet the aviation industry's needs and expectations, the Aviation Weather Service is required to regularly review its products and services.
- **Contained cost and improved quality**
The major MSC-contributing airlines have requested that the Bureau contain the cost of our aviation weather services, better align those services with funding attribution, be more responsive to changes to forecast conditions, and improve the quality of our services.

This review assesses regulatory obligations, explores the needs of all sectors of the aviation industry and makes final recommendations relating to the provision and categorisation of TAFs. Its outcomes include guidelines for the introduction, modification and cancellation of TAFs.

The review defines policies for the provision of a TAF for locations where the TAF service largely benefits a single commercial operator. The review also makes final recommendations relating to physical and technological resources required to provide a quality TAF service, including the minimum observational systems to support TAF production and ongoing monitoring of a TAF throughout its validity.

A draft report was released on 18 December 2012 for industry comment until 31 March 2013. We received 52 submissions in response to the draft report.

A review panel comprising representatives of Airservices, CASA, the Department of Infrastructure and Regional Development (DOIRD) and chaired by the Bureau has reviewed all submissions and, as a consequence, revised the review report in several areas.

2.1 Objectives

The objectives of the review were to:

- establish guidelines and requirements for TAF service changes for an aerodrome, including the introduction, modification and termination of a service;
- establish guidelines for the times of validity of a TAF service;
- establish a process for the regular review of TAF locations and service;
- establish the minimum requirements for observations in order to both issue and maintain a TAF service;
- establish guidelines for the provision and prioritisation of observational infrastructure to support a TAF service;
- establish a quality framework and validation process to ensure the quality and continuous improvement of the TAF service; and
- better align service with funding attribution and user needs, including the establishment of a process for the provision of a TAF on a contractual basis.

2.2 Legislation, regulation and requirements for the provision of TAFs

2.2.1 International regulation and requirements

Under the Convention for International Civil Aviation (the Chicago Convention) the Bureau of Meteorology is the designated Meteorological Authority for Australia and is responsible for ensuring that meteorological services are provided for international civil aviation in Australia (and by extension for all civil aviation through the Civil Aviation Act 1920) in accordance with the standards and practices set out in Annex 3 to the Convention. The Bureau's role in providing services for civil aviation is established through the *Meteorology Act 1955*.

The Bureau provides a range of aviation weather products and services including TAFs. A TAF is a statement of meteorological conditions expected in the airspace within a radius of five nautical miles of the aerodrome reference point for a specific validity period.

ICAO Annex 3 and ICAO Doc 9673 (Air Navigation Plan – Asia & Pacific Regions) set out Australia's requirements for providing a TAF service for Australia's international aerodromes. Annex 3 also contains details relating to the preparation, content and validity period of a TAF, together with information relating to the review, amendment and cancellation of an issued TAF.

2.2.2 National regulations and requirements

Regulation 5.06(1) to the *Air Services Act 1995* provides that:

Airservices may make arrangements with the Director of Meteorology for the provision of meteorological information:

a) in any form or manner; and

b) at any place;

that Airservices considers necessary for the safe regular or efficient operation of aircraft, according to the Chicago Convention.

A current memorandum of understanding (dated July 2009) between the Bureau and Airservices—as the Air Traffic Services provider within the Australian Flight Information Region (FIR)—sets out arrangements for the provision of the Aviation Weather Services and states that:

4.1 The provision of the Aviation Weather Service is based on the following general principles: ...

(b) Provisions contained in Annex 3 to the Chicago Convention, Meteorological Service for International Air Navigation, shall apply to Domestic as well as International Air Navigation. ...

6.1 The practices and procedures that apply to the provision of the Aviation Weather Service are specified in the Bureau's Aeronautical Services Handbook (ASH). The manner in which meteorological services are provided by Airservices for use by the aviation community is described in the Australian Integrated Aeronautical Information Publication (AIP). The ASH and the AIP shall be consistent in content with paras 4.1 (a) and (b) of this.'

The list of Australian international aerodromes and alternates is contained in Airservices AIP GEN 1.2 and in Appendix 2 of this report.

2.2.3 Current provision of TAFs

Currently, the TAF service for Australian international and domestic aerodromes is provided in accordance with the aerodrome category, which is determined by factors such as type and amount of traffic. A list of aerodromes for which the Bureau provides TAF services is contained in the Airservices En-Route Supplement (ERSA) and in the Bureau's ASH.

While the requirement to provide TAFs at international airports is clearly established, the requirement for the TAF provision at non-international airports is less clear.

There is provision under Air Services Regulation 5.06 for Airservices to request a TAF be provided for a particular location, but in practice TAF locations have been determined through consultation between the Bureau and the aviation industry. Airservices has confirmed that it is satisfied with this current practice. Further, the

consultation process contained in this report included detailed input from Airservices.

The provision or non-provision of a TAF by the Bureau, together with its period of validity, can impact on the aviation industry. In the absence of a current TAF for a location, pilots at some locations may be required to carry sufficient fuel for a diversion to a suitable alternate aerodrome. Carrying that extra fuel sometimes comes at an economic and environmental cost, and can result in a reduction in freight or the number of passengers in order to offset the additional weight of the additional fuel.

A number of other important safety and operational considerations are also affected by the provision or non-provision of a TAF at some locations.

However, it should be noted that other weather information is available that can be used by industry in aviation operations at different locations.

2.3 Information sources and considerations

As part of the TAF review, we considered the following:

- international and domestic legislation, regulations and requirements;
- the needs of all sections of the aviation industry—including international, domestic, regional, general aviation and other operators;
- ICAO specifications and the requirements of agencies such as Airservices, CASA and the Australian Defence Force;
- the needs and requirements of Australian regional communities;
- Bureau policies, procedures, budgets and resources;
- all available aircraft movement figures and statistics (to ensure that we captured an accurate representation of aviation movements across Australia);
- current provision of TAFs;
- climatology of locations—including suitable regular, strategic and alternate aerodromes;
- consultation with aviation forecasters;
- international best practice standards and expectations, together with an assessment of current and future trends with respect to aviation forecasting;
- current and future technologies and their impact on the provision and monitoring of a TAF service;
- current and future resource requirements for aviation forecasting in each of the Bureau's regional offices;

- current and future TAF validation and quality management requirements; and
- current and future observational resource requirements.

2.4 Stakeholders

Stakeholders include, but are not limited to:

- international, domestic and regional airlines and pilots;
- regional communities
- other aviation users—including charter operators, general aviation community, corporate aviation, flying training organisations and emergency medical and search and rescue services;
- other airline and industry representative bodies and agencies;
- government departments—e.g. the Department of Environment (including the Bureau), DOIRD, Airservices, CASA, ATSB, Department of Defence; and
- aerodrome owners and/or operators.

3 TAF categorisation

3.1 Background

The Bureau provides a TAF service for Australia's international and domestic aerodromes in accordance with each aerodrome's category. The aerodrome category is determined by considering three factors:

- annual passenger numbers;
- annual movement numbers; and
- ICAO-mandated requirements for international aerodromes.

Since its inception, the Bureau has been focused on customer service; however, this has resulted in a situation where, until recent times, any request for a new or extended TAF was generally implemented, often without considering the full implications on other aviation weather forecast services.

As a result, the Bureau now produces approximately 250 TAFs. This is not an approach that industry believes is efficient and does not provide optimum services.

Increasingly, changes in the aviation environment have led to a situation where small or infrequently used locations continue to receive a TAF service, while some locations with significantly greater passenger numbers or aircraft movements receive no such service.

Furthermore, industry has requested that the Bureau review the locations for which TAF services are provided, with the intent of reducing their number in order to maximise weather watch and service quality for the remaining locations.

3.2 Availability of input data

In order to assess the requirement for the production of a TAF—including the validity times, required observational infrastructure, prioritisation and other industry needs—we undertook a review of different industry user groups. This review included a survey that obtained information about the Bureau's current products and services, the need for changes to products and services, and aircraft movement and passenger numbers within Australia.

Surveys were mailed to aerodrome operators/owners and aircraft operators; online surveys were also made available for completion by individual pilots. A total of 537 surveys were sent to aerodromes and 195 were returned to the Bureau (36 per cent). 936 surveys were sent to aircraft operators and 281 were returned (30 per cent). 386 pilots completed the online survey form.

This information was combined with other data sources such as the Bureau of Infrastructure, Transport and Regional Economics (BITRE), Avdata and

Airservices. In reviewing the data collected, we identified missing, erroneous or anomalous data for many aerodromes.

Airservices also provided the Bureau with access to its Airspace Research Application (ARA), which provides a single, complete dataset of movement and passenger numbers for all aerodromes (including all of those under review) and is used as a decision aid by Airservices. The Bureau adopted the ARA data set as the primary data set for our analysis of passenger and movement numbers as part of the TAF review.

3.3 New TAF categories

Following a review of aircraft movement, passenger numbers, current TAF services and user needs, the criteria for new TAF categories were defined as in Table 1. Table 7 details the final category for each aerodrome.

As the ARA dataset contains some estimated statistics, an aerodrome owner or operator has the opportunity to submit revised data if they deem that the new TAF category does not accurately reflect their actual traffic. Details on the process for submitting revised figures are contained in Appendix 3.

While this initial categorisation will not be the sole factor used to determine whether a TAF is produced in the future, it will provide a sound basis to better align current practice with industry requirements.

Table 1 - New TAF categories

Category	Passengers (annual)	Movements* (annual)
International designated aerodromes ¹ (A)	N/A	N/A
Large (B)	>150 000	>75 000
Medium (C)	50 001 – 150 000	10 001 – 75 000
Small (D)	10 000 – 50 000	4 000 – 10 000

* generally excludes training flights, circuits, touch and go, overshoots and unsuccessful approaches by locally-based aircraft

Recommendation 1

The Bureau shall categorise aerodromes based on the criteria defined in Table 1.

¹International Designated Airports as defined in AIP GEN 1.2

4 Provision of TAFs

4.1 International aerodromes

A TAF will be provided for those aerodromes for which there are ICAO requirements, specifically those locations defined in Aircservices AIP GEN 1.2 and defined as Category A (International) within Table 7 of this review.

4.2 Domestic aerodromes

The provision of TAFs to non-international aerodromes should take into account a range of factors, but should in principle be based on the level of activity in terms of the number of aircraft movements and/or passenger numbers for optimal outcomes.

TAFs shall be provided for those domestic locations categorised in Table 1 as Large (B), Medium (C) or Small (D).

Recognising that the aviation community is dependent on a national network of TAF services to traverse our large country, the review proposes to retain TAF services for a number of additional locations, even though they may not satisfy the activity threshold levels for aircraft movements and passenger numbers to be classified as Category D aerodromes. Such aerodromes may therefore receive a TAF service due to complex local climatology when compared to the surrounding TAF services, or because they offer other operational benefits. Aerodromes that do not meet the Category D thresholds but are deemed to warrant a TAF service for the aforementioned reasons will be re-classified as a Category D and will receive the corresponding level of service.

The benefits of retaining individual TAF services for these additional locations have been assessed by the Bureau in cooperation with Aircservices, CASA and DOIRD. The agencies considered a range of criteria—including the historical climatological complexities, use of the aerodrome, distance to other services and the availability of aerodrome infrastructure such as nav aids and refuelling facilities.

Furthermore, Department of Defence and commercial organisations may have requirements for TAF services regardless of movement and passenger numbers and therefore fund such TAF services.

For this reason, aerodromes may have a sub-classification assigned (Table 2).

Table 2 - TAF sub-categories, representing the reason a TAF service is retained regardless of movement and passenger numbers.

Sub-category	Description
User-funded	Aerodromes used by a single user or industry and funded by this user on a contractual (cost recovery) basis
Military	Aerodromes primarily funded by the Department of Defence
Network	Aerodromes retained to improve the network of TAF services—based on use of aerodrome, distance between services and available infrastructure
Climatological	Aerodromes retained due to complex climatology as assessed by the Bureau

Importantly, the provision of TAFs will also be subject to new minimum observational requirements, as outlined in Section 6, based on ICAO requirements.

There are a number of locations where a TAF is currently produced in close proximity to another TAF, or where passenger numbers and/or movement figures suggest a TAF is warranted in close proximity to another location. Providing multiple TAF services within close proximity is sub-optimal use of observational infrastructure and forecaster focus. Therefore whenever a category C or D TAF is located within 60 nautical miles (approx. 110km) of another TAF, the need for the Category C or D TAF should be reviewed. Typically only one of the TAFs will be maintained—generally the one with the higher passenger or movement numbers. Aircraft flying within the region can therefore use the retained TAF as their alternate aerodrome.

Other factors such as the complexity of the climatology, availability of meteorological observations, aerodrome infrastructure and access to the alternate aerodrome/s will require consideration at some locations. Pilots will still retain access to other meteorological observation and forecasting services such as Area Forecasts, SIGMETs, Area QNH and METAR observations.

Where the provision of a TAF is warranted by the passenger or movement number, but is for an aerodrome that exists primarily for services to an individual industry rather than the general community (e.g. does not offer regular publicly accessible services), such as mine sites, oil rigs or similar locations, a TAF service will only be available on a contractual (cost recovery) basis.

Recommendation 2

TAFs shall be provided for those aerodromes categorised as International (A), Large (B), Medium (C) or Small (D) as defined in Table 1. Aerodromes not meeting Small (D) thresholds and with a sub-classification of Single User, Military, Network and Climatological will be reclassified as Small (D) aerodromes and will receive a corresponding TAF service.

Recommendation 3

Where a category Medium (C) or Small (D) TAF is located within 60 nautical miles of another TAF, the need for each Category C and D TAF should be assessed—with typically only one TAF being maintained. An assessment will be carried out considering complexity of the climatology, availability of meteorological observations, aerodrome infrastructure and access to the alternate aerodromes, to determine the location of the TAF to be provided.

Recommendation 4

At those locations where the provision of a TAF is warranted by the passenger or movement numbers, but is for an aerodrome that exists primarily for services to an individual industry rather than the general community (e.g. does not offer sufficient publicly accessible services), such as mine sites, oil rigs or similar locations, a TAF service shall only be available on a contractual (cost recovery) basis.

Recommendation 5

At those aerodromes where an MSC-funded TAF service is not continued, a TAF service may be offered on a contractual (cost recovery) basis.

4.3 Non-Australian FIR aerodromes

Based on the requirements of ICAO and the *Meteorology Act 1955*, the Bureau is responsible for providing services within the Australian Flight Information Region (FIR) and to Australian External Territory International Airports as defined in Appendix 2.

Any TAF services provided for aerodromes outside of the Australian FIR, and not defined as an Australian External Territory International Airport, shall be reviewed by the Bureau in consultation with stakeholders, and a determination made as to the continued provision of the service for each such aerodrome. For these aerodromes an ICAO approved agreement must be in place between the Bureau of Meteorology and the designated Meteorological Authority for that aerodrome.

Recommendation 6

All TAF services currently provided for aerodromes outside an Australian Flight Information Region (FIR), except Australian External Territory International Airports, shall be reviewed in consultation with stakeholders, and a determination made as to the continued provision of the service for each such aerodrome. All retained services shall be supported by an ICAO approved agreement between the Bureau and the designated Meteorological Authority for the FIR within which the aerodrome is located.

5 TAF Validity Times

5.1 Validity Time Specifications

ICAO Doc 9673² specifies TAF requirements for international aerodromes. In part it states:

TAF should be issued, at intervals of six hours, with the period of validity beginning at one of the main synoptic hours (00, 06, 12, 18 UTC). The period of validity should be of 24 or 30 hours to meet the requirements indicated in FASID Table MET 1A. The filing time of the TAF bulletins should be one hour before the start of the period of validity.

In November 2008, the Bureau implemented changes to the TAF format to comply with ICAO's specifications. Most of those changes were due to the worldwide introduction of a TAF with a 30 hour validity period, to assist in flight planning for those aerodromes required by long-haul operators. In Australia, a 30 hour TAF is provided for Brisbane, Sydney, Melbourne, Adelaide, Darwin and Perth. However, the new format applies to all Australian TAFs.

Other TAF validity times have previously been determined by the category of aerodrome and the needs of industry.

5.2 Standardisation

The issue and validity times of TAFs should be standardised as defined in Table 3.

Table 3 - Issue and validity times of TAFs

Category	Issue and validity times
International (A)	TAF issued six-hourly, valid for 24 or 30 hours. Commencement times 00, 06, 12, 18 UTC.
Large (B)	TAF issued six-hourly, valid for 12 or 18 hours. Commencement times 00, 06, 12, 18 UTC.
Medium (C)	TAF issued six-hourly, typically valid for 12 hours. Commencement times 02, 08, 14 and/or 20 UTC, except in Western Australia where commencement times are 04, 10, 16 and/or 22 UTC. See Note 1.
Small (D)	TAF issued six- or 12-hourly, valid for up to 12 hours. Commencement times typically 20 and/or 02 UTC, except in Western Australia where commencement times are typically 22 and/or 04 UTC. See Note 1.

Note 1: Times will be adjusted for daylight saving where applicable.

² ICAO Doc 9673 (Air Navigation Plan – Asia & Pacific Regions, Part VI – Meteorology)

The validity period for the Category C & D TAF services and aerodromes with a TAF sub-category of User-Funded or Military will be determined by the National Manager Regional Aviation Weather Services, in consultation with stakeholders. Category D (Small) TAF locations assessed as requiring a 24-hour service will be re-classified as a Category C (Medium) aerodrome and receive a corresponding service.

Adequate aerodrome reports should be available from at least two hours prior to the start of the TAF validity period through to the end of the TAF validity period. The filing time should be within one hour before the start of the period of validity for international TAFs and within two hours for the remaining TAFs. A continuous meteorological watch and amendment service is required for all TAF services throughout the period of validity.

TAFs for other locations will only be provided in a response to emergencies.

Recommendation 7

The issue and validity times of TAFs should be standardised as follows:

Category	Issue and validity times
International (A)	TAF issued six-hourly, valid for 24 or 30 hours. Commencement times 00, 06, 12, 18 UTC.
Large (B)	TAF issued six-hourly, valid for 12 or 18 hours. Commencement times 00, 06, 12, 18 UTC.
Medium (C)	TAF issued six-hourly, typically valid for 12 hours. Commencement times 02, 08, 14 and/or 20 UTC, except in Western Australia where commencement times are 04, 10, 16 and/or 22 UTC. See Note 1.
Small (D)	TAF issued six- or 12-hourly, valid for up to 12 hours. Commencement times typically 20 and/or 02 UTC, except in Western Australia where commencement times are typically 22 and/or 04 UTC. See Note 1.

Note 1: Times will be adjusted for daylight saving where applicable.

6 Observational infrastructure

6.1 Observation requirements

In order to both produce a TAF and then maintain an appropriate meteorological watch during its validity period, a forecaster must be able to access quality data from a range of information sources. This may include forecast modelling tools, satellite imagery, radar imagery, upper air data, lightning detection equipment, and a range of other sources. However, the primary source of information is provided by manual and/or automatic surface observations at the aerodrome.

Several internal Bureau surveys have shown that all of our forecasters consider surface observations and satellite imagery to be an essential component for producing and monitoring a TAF. This is also the case internationally.

Surface observations are made up of a number of elements, of which the measurements relating to surface wind speed and direction, QNH, temperature, dewpoint and precipitation are considered essential. The visibility and cloud base elements are also considered essential by most forecasters.

Although observations of present weather are an ICAO requirement for international aerodromes, present weather sensors currently have a sub-optimal performance. Should the performance of these sensors improve, these observations would be considered highly desirable.

It is widely acknowledged that automated observations provide considerable value, as they provide far more frequent or continuous observations, and are particularly valuable during the hours of darkness. Whilst more frequent observations add considerable value, the reduced interval between observations, typically 1 minute, results in an increased monitoring work load on forecasters.

Manual observations are becoming less prevalent, especially at remote locations, and often do not provide a full 24 hour coverage or a coverage suitable for the production of a TAF. This is particularly relevant when taking into account increasing industry expectations and requirements.

The information elements from an Automatic Weather Station (AWS) can be obtained at differing intervals, and data intervals vary between different sites.

Often elements such as cloud and visibility (C&V) can be obtained as frequently as every minute, while other data are generally sourced every half hour or every hour by the transmission of a routine observation (METAR) or a special observation (SPECI). In the case of a SPECI, the information may be transmitted at more frequent intervals when certain observational thresholds are met. Both METAR and SPECI observations may be provided by either manual or automatic means.

The minimum aerodrome observations considered necessary to provide a new TAF service are an hourly METAR, and SPECIs whenever SPECI criteria occur,

for the period commencing at least two hours before the start of the TAF validity period through to the end of the TAF validity period (Table 4).

The meteorological elements included in METAR and SPECI reports shall be surface wind, temperature, dew point, QNH, visibility, cloud amount, cloud base and precipitation. In addition, present weather is considered highly desirable and can be provided by an automatic sensor and/or by manual input by an authorised observer.

Table 4 - Minimum routine observational frequency requirements for TAF

TAF Category (where TAF Provided)	AWS (Surface Wind, QNH, Temperatures, Precipitation)	C&V data
A (International)	1 min	1 min
B (Large)	10 min	1 min
C (Medium)	30 min	10 min
D (Small)	30 min	30 min

6.2 Overseas minimum aerodrome observational requirements for production of a TAF

Through this review, the Bureau also undertook research to determine the current international practice with respect to observational systems required for TAFs. We found that there are presently no other comparable meteorological services producing a standard ICAO-compliant TAF without observations from an aerodrome.

6.2.1 New Zealand

No TAFs are prepared for locations where observations are not issued. The New Zealand Meteorological Office requires METAR to contain at least wind speed and direction, visibility, cloud and present weather information.

6.2.2 Canada

Two consecutive hourly observations are required for the issuance of a TAF. Generally cloud, visibility and surface wind velocity would be the minimum requirements. Canada provides 'aerodrome advisories', rather than aerodrome forecasts, for locations where observations are not recorded within 3km of the aerodrome. These advisories are in the format of a TAF but contain the text 'ADVISORY OFFSITE' to indicate that local aerodrome observations were not available.

6.2.3 United Kingdom

No TAFs are prepared for locations where observations are not issued. The METAR (including Auto METAR) is required to contain observations of wind speed and direction, visibility and runway visual range (RVR—where appropriate), cloud amount and height, present weather, temperature, dew point and QNH.

When an aerodrome is not open 24 hours, the issue of a TAF will be delayed until at least two consecutive METARs have been received and accepted by the forecaster at the forecast office responsible for its preparation. The METAR will be produced by an accredited observer and separated by an interval of not less than 20 minutes and not more than 1 hour.

However, in the event that an automatic observing system located at the aerodrome regularly issues Auto METARs containing information on wind speed and direction, visibility, cloud amount and height, present weather, pressure, temperature and dew point when the aerodrome is closed, the forecaster will, with agreement of the Civil Aviation Authority Meteorological Authority issue the TAF on the basis of the Auto METAR. Routine observations produced by an accredited observer are required to be issued whilst the aerodrome is operational.

6.2.4 United States of America

The following elements, at a minimum, are required for National Weather Service approval of new TAF locations: wind speed and direction, visibility, weather and obstructions to vision, cloud amount and base, temperature, dew point and QNH. These elements can be obtained from a mix of automatic observation sites and manual observer sites. It should be noted, however, that not all existing TAF services have the full complement of equipment.

6.2.5 France

The minimum meteorological elements used at a TAF location are hourly or half-hourly METAR issuance.

Recommendation 8

The minimum observations required for the provision of a new TAF shall include observations of surface wind speed and direction, QNH, temperature, dew point, precipitation, visibility, cloud amount and cloud base. This information shall be available to the forecaster on at least a half-hourly basis as defined in Table 4.

Recommendation 9

TAF services will only be provided to aerodromes with adequate meteorological observations. Aerodromes categorised as International (A), Large (B) or Medium (C) shall have observations of surface wind, temperature, dew point, QNH, visibility, cloud base and cloud amount within two years. International (A) aerodromes will also be required to have observations of present weather within two years to meet ICAO requirements.

Recommendation 10

All remaining locations determined to be eligible for the provision of a TAF shall be equipped with an AWS providing surface wind speed and direction, QNH, temperature, dew point and precipitation within two years. These aerodromes will also require observations of visibility, cloud amount and cloud base within five years. The continued provision of a TAF for any location not suitably equipped after the aforementioned periods will be subject to review in consultation with relevant stakeholders.

6.3 Summary of existing observational infrastructure at current TAF locations using current categorisation

Based on the new categorisation of aerodromes, the minimum observational infrastructure required to produce and monitor the list of retained TAFs is summarised below.

- 117 aerodromes meet the minimum required infrastructure.
- 11 aerodromes require ceilometers and 14 require vismeters within two years; a further 55 aerodromes require ceilometers; and 60 aerodromes require vismeters within five years.
- Seven aerodromes require an AWS within two years.
- One international aerodrome requires a present weather sensor within two years.

The additional meteorological observational equipment listed above is to be funded by the aviation industry, through the MSC, at an approximate cost of \$6 million. If all existing TAF services were to be funded by the MSC, the aviation industry would be required to fund the upgrade of equipment at a further 54 locations with an additional cost of more than \$6 million, totalling more than \$12 million.

In addition, the aviation industry would need to fund additional forecasters to adequately monitor the additional observations and additional engineering staff to install and maintain these additional sensors.

Based on the new TAF classifications there is one category A aerodrome that does not report present weather, 13 category B & C aerodromes do not have ceilometers or vismeters, and seven TAF locations do not have an AWS.

These locations would appear to present a higher priority for upgrading or installing observational infrastructure, in the absence of other significant factors, as shown in Table 5. However, ongoing discussion with both internal and external stakeholders, together with updated information, will ultimately determine any future prioritisation.

Table 5 - Priority installations based on new TAF categories

Location	New TAF Category	Required Infrastructure
Barrow Island	B	C&V
Bathurst Island	C	AWS, C&V
Century Mine	C	C&V
Cloncurry	C	C&V
Curtin	C	V
Derby	C	C&V
Gold Coast	A	Present weather
Innisfail	D	AWS, C&V
Maitland	D	AWS, C&V
Moomba	C	C&V
Narrabri	C	C&V
Normanton	C	C&V
Port Augusta	C	V
St Helens	C	C&V
Taree	C	V
Telfer	C	C&V
The Granites	D	AWS, C&V
Warrnambool	C	C&V
Wiluna	D	AWS, C&V
Windorah	D	AWS, C&V
Yuendumu	D	AWS, C&V

6.4 Observational costs associated with providing TAFs

The Bureau has recently seen a significant increase in the leasing costs associated with observational equipment at aerodromes. The Bureau and industry cannot

sustain these costs. Whilst the Bureau has an obligation to provide TAFs for international aerodromes (ICAO Annex 3 and ICAO Doc 9673 - Air Navigation Plan – Asia & Pacific Regions) it does not specifically have an obligation to take observations at aerodromes or to provide TAFs for non-international aerodromes.

Therefore, where the Bureau, in consultation with industry, is unable to negotiate reasonable rent for an aerodrome (based on standard off-aerodrome costs for an automatic weather station), we may need to remove our equipment from the aerodrome and allow the aerodrome to organise its own meteorological observations.

In addition to leasing costs, there are significant costs associated with the purchase and installation of additional equipment defined in the previous sections. The costs of typical equipment installations are contained in Table 6. It should be noted that these represent indicative costs only; some remote sites may cost significantly more. Consequently, installation at a specific site will need to be assessed (and progressed as relevant) on the basis of a site-specific quote.

Table 6 - Typical costs for the purchase and installation of additional equipment

Item	Cost ³
New Installation (AWS, C & V)	\$115K
Addition of C&V	\$75K
Addition of solar array to support C&V where mains power unavailable	\$40K

The actual cost per site to upgrade equipment will be reviewed by the Bureau in consultation with industry prior to any decision to progress with the installation of additional equipment. If the upgrade costs are considered excessive, the provision of service will be reviewed.

Recommendation 11

The Bureau should only provide observations and TAFs for aerodromes where reasonable rent (based on off-aerodrome rents for an AWS) can be obtained.

Recommendation 12

If the cost of installing and maintaining observational equipment for a particular site is considered excessive, the provision of the Bureau's observational service shall be reviewed based upon safety, other benefits (e.g. efficiency) and cost in consultation with the site owner/operator.

³ Typical costs. Actual costs may be much larger and vary significantly depending on a range of factors including the distance to reliable communications and mains power

7 Implications and updates of the TAF review

7.1 Implications of applying the new methodology for TAF categorisation

Airservices, CASA, DOIRD and the Bureau have undertaken a review of where TAF services should be provided, and in particular examined the case for retaining each of the 78 aerodrome locations previously identified for cessation of TAF services.

Following a threshold assessment (movement and passenger numbers), the agencies considered a number of criteria to assess whether the TAF service should be retained and funded via the MSC. These criteria included:

- International obligations regarding the provision of TAF services (e.g. international designated aerodromes in compliance with ICAO requirements); and
- Overall safety and operational impacts of ceasing a TAF service, namely:
 - availability of aerodrome infrastructure such as navigation aids, refuelling facilities (AVGAS and JET A1) and distance to alternate fuel supplies;
 - investment by Commonwealth and State Governments in specific aerodromes and routes;
 - proximity to other TAF services and availability of other meteorological forecasts and services to support flight planning (e.g. area forecasts);
 - complexity of climatology of aerodrome compared to proximity aerodromes; and
 - whether there is a single/exclusive commercial user/beneficiary of the TAF service.

The results of applying the minimum thresholds, and assessment against the criteria identified above, are summarised in Table 7. For aerodromes not meeting minimum thresholds (4000 movement or 10 000 passengers per annum), the assessment column contains the rationale for retention or cessation of the MSC funded TAF service at each location.

The major change from the assessment provided in the draft Review Report is that of the 78 aerodrome locations previously proposed for cessation of TAF services, 23 have now been proposed to be retained following assessment of safety and operational factors as indicated in the following summary table. It should be noted that during the analysis period, two of the 78 aerodromes TAF services were ceased for operational reasons.

Table 7 - Implications of applying new methodology for TAF categorisation

Location	ICAO ID	State	Current TAF category (See Note 1)	New TAF category (See Note 1)	Meets observing req's (See Note 2)	Rationale (See Note 3)
Adelaide	YPAD	SA	A	A	Y	I
Albany	YABA	WA	B	C	Y	
Albury	YMAY	NSW	B	B	Y	
Alice Springs	YBAS	NT	A	A	Y	I
Amberley	YAMB	QLD	B	B	Y	M
Archerfield	YBAF	QLD	B	B	Y	
Argyle	YARG	WA	D	D	Y	
Armidale	YARM	NSW	B	C	Y	
Avalon	YMAV	VIC	A	A	Y	I
Ayers Rock	YAYE	NT	B	B	Y	
Bairnsdale	YBNS	VIC	D	D	Y	
Balgo Hill	YBGO	WA	D	***	-CV	T
Ballarat	YBLT	VIC	D	C	Y	
Ballera	YLLE	QLD	D	D	-CV	
Ballina	YBNA	NSW	B	B	Y	
Bankstown	YSBK	NSW	B	B	Y	
Barcaldine	YBAR	QLD	D	***	-AWS CV	P
Barrow Island	YBWX	WA	D	B	-CV	
Bathurst	YBTH	NSW	C	C	Y	
Bathurst Island	YBTI	NT	D	C	-AWS CV	
Bayu Undan	YBYU	EXT	D	***	-CV	U
Bendigo	YBDG	VIC	D	C	Y	
Birdsville	YBDV	QLD	D	D	-CV	
Blackall	YBCK	QLD	D	***	-CV	T
Borrooloola	YBRL	NT	D	***	-CV	T
Boulia	YBOU	QLD	D	***	-AWS CV	T
Bourke	YBKE	NSW	D	D	-CV	
Brisbane	YBBN	QLD	A	A	Y	I
Broken Hill	YBHI	NSW	B	C	Y	
Broome	YBRM	WA	A	A	Y	I
Bundaberg	YBUD	QLD	B	B	Y	
Burketown	YBKT	QLD	D	D	-CV	
Busselton	YBLN	WA	D	D	-CV	
Cairns	YBCS	QLD	A	A	Y	I
Camden	YSCN	NSW	B	B	Y	

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Location	ICAO ID	State	Current TAF category	New TAF category	Meets observing req's	Rationale
Canberra	YSCB	NSW	A	A	Y	I
Carnarvon	YCAR	WA	C	D	Y	
Ceduna	YCDU	SA	C	D	Y	
Century Mine	YCNV	QLD	D	C	-CV	
Cessnock	YCNK	NSW	D	***	-CV	P
Charleville	YBCV	QLD	C	C	Y	
Charters Towers	YCHT	QLD	***	***	-AWS CV	T
Christmas Island	YPXM	EXT	A	A	Y	I
Clermont	YCMT	QLD	D	D	-CV	
Cleve	YCEE	SA	D	***	-CV	T
Cloncurry	YCCY	QLD	D	C	-CV	
Cobar	YCBA	NSW	D	D	-CV	
Cocos (Keeling) Island	YPCC	EXT	A	A	Y	I
Coen	YCOE	QLD	D	D	-CV	
Coffs Harbour	YCFS	NSW	A	A	Y	I
Condobolin	YCDO	NSW	D	***	-CV	T
Cooper Pedy	YCBP	SA	C	D	-V	
Cooktown	YCKN	QLD	C	D	Y	
Cooma	YCOM	NSW	C	C	Y	N
Coonabarabran	YCBB	NSW	D	D	-CV	N
Coonamble	YCNM	NSW	D	***	-CV	T
Cootamundra	YCTM	NSW	D	***	-AWS CV	T
Corowa	YCOR	NSW	D	***	-AWS CV	P
Cowra	YCWR	NSW	D	***	-CV	T
Cunderdin	YCUN	WA	D	D	-CV	N
Cunnamulla	YCMU	QLD	D	***	-AWS CV	T
Curtin	YCIN	WA	B	B	-V	M
Darwin	YPDN	NT	A	A	Y	I
Deniliquin	YDLQ	NSW	D	***	-CV	T
Derby	YDBY	WA	D	C	-CV	
Devonport	YDPO	TAS	B	C	Y	
Dubbo	YSDU	NSW	B	B	Y	
East Sale	YMES	VIC	B	B	Y	M
Edinburgh	YPED	SA	B	B	Y	M
Elcho Island	YELD	NT	C	D	-CV	
Emerald	YEML	QLD	B	B	Y	

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Ernabella	YERN	SA	D	D	-CV	N
Esperance	YESP	WA	C	C	Y	
Essendon	YMEN	VIC	B	B	Y	
Fitzroy Crossing	YFTZ	WA	D	D	-CV	N
Flinders Island	YFLI	TAS	C	C	Y	
Forbes	YFBS	NSW	D	***	-CV	T
Forrest	YFRT	WA	D	D	-CV	N
Gayndah	YGAY	QLD	D	***	-CV	T
Georgetown (Qld)	YGTN	QLD	D	D	-CV	N
Geraldton	YGEL	WA	B	B	Y	
Giles	YGLS	NT	D	D	-CV	N
Gladstone	YGLA	QLD	B	B	Y	
Glen Innes	YGLI	NSW	D	D	-CV	N
Gold Coast	YBCG	QLD	A	A	-P	I
Goondiwindi	YGDI	QLD	D	***	-AWS CV	T
Goulburn	YGLB	NSW	D	D	-V	V
Gove	YPGV	NT	B	C	Y	
Grafton	YGFN	NSW	D	D	Y	
Griffith	YGTH	NSW	B	C	Y	
Groote Eylandt	YGTE	NT	C	C		
Gunnedah	YGDH	NSW	D	***	-CV	T
Halls Creek	YHLC	WA	D	D	-CV	
Hamilton	YHML	VIC	D	C	Y	
Hamilton Island	YBHM	QLD	B	B		
Hay	YHAY	NSW	D	***	-CV	T
Hervey Bay	YHBA	QLD	B	B	Y	
Hobart	YMHB	TAS	A	A	Y	I
Hooker Creek	YHOO	NT	D	D	-CV	N
Horn Island	YHID	QLD	A	A	Y	I
Horsham	YHSM	VIC	D	D	-V	
Hughenden	YHUG	QLD	D	D	-CV	
Innisfail	YIFL	QLD	D	D	-AWS CV	N
Inverell	YIVL	NSW	D	***	-AWS CV	T
Ivanhoe	YIVO	NSW	D	D	-CV	N
Jabiru	YJAB	NT	D	D	-CV	
Jandakot	YPJT	WA	B	B	Y	

Location	ICAO ID	State	Current TAF category	New TAF category	Meets observing req's	Rationale
Julia Creek	YJLC	QLD	D	D	-CV	N
Kalgoorlie	YPKG	WA	A	A	Y	I
Karratha	YPKA	WA	B	B	Y	
Kempsey	YKMP	NSW	D	***	-CV	T
Kingaroy	YKRY	QLD	D	***	-CV	T
King Island	YKII	TAS	C	C	Y	
Kingscote	YKSC	SA	B	C	Y	
Kintore (Wulungurru)	YKNT	NT	D	***	-CV	T
Kowanyama	YKOW	QLD	D	D	-V	
Kununurra	YPKU	WA	B	C	Y	
Latrobe Valley	YLTV	VIC	D	C	Y	
Launceston	YMLT	TAS	A	A	Y	I
Laverton	YLTN	WA	D	***	-CV	P
Learmonth	YPLM	WA	A	A	Y	I
Leigh Creek	YLEC	SA	D	D	-CV	N
Leinster	YLST	WA	D	C	Y	
Leonora	YLEO	WA	D	C	Y	
Lismore	YLIS	NSW	B	C	Y	
Lockhart River	YLHR	QLD	D	D	-V	
Longreach	YLRE	QLD	C	C	Y	
Lord Howe Island	YLHI	NSW	A	A	Y	I
Mackay	YBMK	QLD	B	B	Y	
Maitland (NSW)	YMND	NSW	D	D	-AWS CV	
Mallacoota	YMCO	VIC	D	***	-CV	T
Mangalore	YMNG	VIC	D	D	Y	
Maningrida	YMGD	NT	C	C	Y	
Mareeba	YMBA	QLD	D	D	-CV	
Maryborough (Qld)	YMYB	QLD	C	D	Y	
McArthur River Mine	YMHU	NT	D	D	Y	
Meekatharra	YMEK	WA	D	C	Y	
Melbourne	YMML	VIC	A	A	Y	I
Merimbula	YMER	NSW	B	C	Y	
Mildura	YMIA	VIC	B	B	Y	
Milingimbi	YMGB	NT	D	***	-CV	T
Moomba	YOOM	SA	D	C	-CV	
Moorabbin	YMMB	VIC	B	B	Y	

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Moranbah	YMRB	QLD	C	C	Y	
Moree	YMOR	NSW	C	C	Y	
Mornington Island	YMTI	QLD	D	D	-CV	
Moruya	YMRY	NSW	C	C	Y	
Mount Gambier	YMTG	SA	B	C	Y	
Mount Hotham	YHOT	VIC	D	D	-C	N
Mount Isa	YBMA	QLD	B	B	Y	
Mount Keith	YMNE	WA	D	***	-AWS CV	P
Mount Magnet	YMOG	WA	D	D	-CV	
Mudgee	YMDG	NSW	D	D	-V	
Murray Bridge	YMBD	SA	D	D	-CV	N
Murrin-Murrin	YMMI	WA	D	***	-AWS CV	P
Naracoorte	YNRC	SA	D	***	-CV	T
Narrabri	YNBR	NSW	C	C	-CV	
Narrandera	YNAR	NSW	C	D	-CV	
Newman	YNWN	WA	B	B	Y	
Ngukurr	YNGU	NT	D	D	-CV	
Nhill	YNHL	VIC	D	***	-CV	T
Norfolk Island	YSNF	EXT	A	A	Y	I
Normanton	YNTN	QLD	D	D	-CV	
Norseman	YNSM	WA	D	***	-CV	T
Northern Endeavour	YNEN	EXT	D	***	Y	U
North Rankin	YXNR	EXT	D	***	-AWS CV	U
Nowra	YSNW	NSW	B	B	Y	M
Nyngan	YNYN	NSW	D	***	-AWS CV	T
Oakey	YBOK	QLD	B	B	Y	M
Olympic Dam	YOLD	SA	C	C	Y	
Onslow	YOLW	WA	D	D	-CV	
Oodnadatta	YOOD	SA	D	***	-CV	T
Orange	YORG	NSW	B	C	Y	
Paraburdoo	YPBO	WA	B	B	Y	
Parafield	YPPF	SA	B	B	Y	
Parkes	YPKS	NSW	C	D	-CV	
Pearce	YPEA	WA	B	B	Y	M
Perth	YPPH	WA	A	A	Y	I
Point Cook	YMPC	VIC	D	***	-AWS CV	P

Review of aerodrome forecast (TAF) services for the aviation industry

Final report

Location	ICAO ID	State	Current TAF category	New TAF category	Meets observing req's	Rationale
Port Augusta	YPAG	SA	D	C	-V	
Port Hedland	YPPD	WA	A	A	Y	I
Port Keats	YPKT	NT	D	D	-CV	
Port Lincoln	YPLC	SA	B	B	Y	
Port Macquarie	YPMQ	NSW	B	B	Y	
Portland	YPOD	VIC	C	D	Y	
Proserpine	YBPN	QLD	B	B	Y	
Quilpie	YQLP	QLD	***	***	-AWS CV	T
Renmark	YREN	SA	D	D	-CV	N
Richmond (NSW)	YSRI	NSW	A	A	Y	M
Richmond (Qld)	YRMD	QLD	D	D	-CV	N
Rockhampton	YBRK	QLD	A	A	Y	I
Roma	YROM	QLD	C	C	Y	
Rottneest Island	YRTI	WA	D	D	-CV	N
Scone	YSCO	NSW	D	D	-CV	N
Shark Bay	YSHK	WA	D	D	-CV	N
Shepparton	YSHT	VIC	D	D	-CV	
Smithton	YSMI	TAS	D	***	-CV	T
Smith Point	YSMP	NT	D	***	-AWS CV	T
Snake Bay	YSNB	NT	D	***	-AWS CV	P
South Goulburn Island	YGBI	NT	D	***	-CV	T
Southern Cross	YSCR	WA	D	D	-CV	
St George	YSGE	QLD	D	D	-CV	N
St Helens	YSTH	TAS	D	C	-CV	N
Strahan	YSRN	TAS	D	C	Y	N
Sunshine Coast	YBSU	QLD	B	B	Y	
Swan Hill	YSWH	VIC	D	D	-CV	
Sydney	YSSY	NSW	A	A	Y	I
Tamworth	YSTW	NSW	B	B	Y	
Tanami	YTMN	NT	D	***	-AWS CV	T
Tarcoola	YTAR	SA	D	***	-CV	T
Taree	YTRE	NSW	C	C	-V	
Telfer	YTEF	WA	D	C	-CV	
Temora	YTEM	NSW	D	***	-CV	T
Tennant Creek	YTNK	NT	D	C	Y	
Thangool	YTNG	QLD	C	D	Y	

Location	ICAO ID	State	Current TAF category	New TAF category	Meets observing req's	Rationale
Thargomindah	YTGM	QLD	D	D	-CV	N
The Granites	YTGT	NT	D	D	-AWS CV	
The Monument	YTMO	QLD	D	D	-CV	
Tibooburra	YTIB	NSW	D	***	-CV	T
Tindal	YPTN	NT	A	A	Y	I
Toowoomba	YTWB	QLD	D	C	Y	
Townsville	YBTL	QLD	A	A	Y	I
Trepell	YTEE	QLD	D	C		
Troughton Island	YTTI	NT	D	***	-CV	T
Truscott (Mungalu)	YTST	NT	D	C	Y	
Victoria River Downs	YVRD	NT	D	***	-CV	T
Wagga Wagga	YSWG	NSW	B	B	Y	
Walgett	YWLG	NSW	D	D	Y	
Wangaratta	YWGT	VIC	D	D	-CV	
Warburton	YWBR	NT	D	D	-CV	N
Warrnambool	YWBL	VIC	D	C	-CV	
Wave Hill	YWAV	NT	D	***	-AWS CV	T
Weipa	YBWP	QLD	B	C	Y	
West Sale	YWSL	VIC	D	***	-AWS CV	P
West Wyalong	YWWL	NSW	D	***	-CV	T
Whyalla	YWHA	SA	B	C	Y	
Wilcannia	YWCA	NSW	D	***	-CV	T
Williamtown	YWLM	NSW	A	A	Y	I
Wiluna	YWLU	WA	D	D	-AWS CV	P
Windorah	YWDH	QLD	D	D	-AWS CV	N
Winton	YWTN	QLD	D	D	-CV	N
Wollongong	YWOL	NSW	D	C	Y	
Woomera	YPWR	SA	B	B	Y	M
Wudinna	YWUD	SA	D	***	-CV	T
Wyndham	YWYM	WA	D	***	-CV	T
Wynyard	YWYY	TAS	B	C	Y	
Young	YYNG	NSW	D	D	-CV	N
Yuendumu	YYND	NT	D	D	-AWS CV	N

Note 1:

Current TAF category marked with *** indicate where TAF services were ceased after the draft TAF Review report was released for operational reasons.

New TAF category marked with *** indicate where TAF services are recommended to be ceased.

Note 2:

Meets observing equipment (only displayed for retained TAF sites):

- Y:** Currently includes AWS with ceilometer and visibility meter
- AWS CV:** Currently has no AWS, ceilometer or visibility meter
- CV:** Currently has AWS, but no ceilometer or visibility meter
- P:** Requires additional present weather sensor(s)

Note 3:

Rationale for retention of cessation of TAF service:

- I (International):** Maintained as a Designated International Airport
- T (Threshold):** Service ceased as neither the annual passenger or movement numbers met required thresholds. TAF service will only be offered on a contractual basis
- M (Military):** Maintained for Defence or dual (civil – military) use
- N (Network):** Maintained as significant/ strategic TAF location in national network (contributes to improve the efficiency of the network of TAF services)
- P (Proximity):** Service ceased due to other TAF services within close proximity. TAF service will only be offered on a contractual basis
- U (User-funded):** TAF service will be offered on a user-funded contractual basis due to exclusive user/ beneficiary arrangements

7.1.1 Impact of cessation of TAF service

The operation of services into an aerodrome is not dependent on the availability of a TAF for that location. Moreover, there are many aerodromes across Australia that operate without a TAF. Flights to destinations without a TAF are required to carry sufficient fuel to allow them to divert to a suitable alternate (with a TAF), unless the destination aerodrome does not have a prescribed instrument approach procedure, in which case the minimum requirement is a flight plan based upon the appropriate Area Forecast⁴.

Pilots will retain access to other meteorological forecasts such as Area Forecasts, SIGMETs, Area QNH and observations such as METARs and Automatic Weather Information Services (AWISs).

7.2 Updates to the TAF review

As part of our quality management processes the Bureau intends to routinely review our services. We will undertake a full review of TAF services every three years. These reviews will be conducted in consultation with industry and other

⁴ AIP Enroute (ENR) 1.10, 1-.2.1

government agencies. We will also undertake a post-implementation review one year after the implementation of the TAF review recommendations.

Recommendation 13

Any proposed changes to the categorisation and service for individual aerodromes should be provided to industry at the next scheduled Bureau of Meteorology/Industry Consultative meeting, depending on the level of comment and analysis required. This shall not limit the Bureau from making any temporary arrangements it assesses as necessary following consultation with relevant stakeholders.

Recommendation 14

A full review of TAF categorisation, based on updated information (e.g. aerodrome passenger and movement data, routes, policies) shall be initiated three years after the implementation of the last review.

Recommendation 15

A post-implementation review of any changes made as a result of the Bureau's TAF review shall be conducted one year after the implementation of the TAF review recommendations.

Appendix 1 – Final recommendations

Recommendation 1:

The Bureau shall categorise aerodromes based upon the following criteria:

Category	Passengers (annual)	Movements* (annual)
International designated aerodromes ⁵ (A)	N/A	N/A
Large (B)	>150 000	>75 000
Medium (C)	50 001 – 150 000	10 001 – 75 000
Small (D)	10 000 – 50 000	4000 – 10 000

* generally excludes training flights, circuits, touch and go, overshoots and unsuccessful approaches by locally-based aircraft

Recommendation 2:

TAFs shall be provided for those aerodromes categorised as International (A), Large (B), Medium (C) or Small (D). Aerodromes not meeting Small (D) thresholds and with a sub-classification of Single User, Military, Network and Climatological will be reclassified as Small (D) aerodromes and will receive a corresponding TAF service.

Sub-category	Description
User-funded	Aerodromes used by a single user or industry and funded by this user on a contractual (cost recovery) basis
Military	Aerodromes primarily funded by the Department of Defence
Network	Aerodromes retained to improve the network of TAF services, based on use of aerodrome, distance between services and available infrastructure
Climatological	Aerodromes retained due to complex climatology as assessed by the Bureau

⁵ International Designated Airports as defined in AIP GEN 1.2 and summarised in Appendix 2

Recommendation 3:

Where a category Medium (C) or Small (D) TAF is located within 60 nautical miles of another TAF, the need for each Category C and D TAF should be assessed—with typically only one TAF being maintained. An assessment will be carried out considering complexity of the climatology, availability of meteorological observations, aerodrome infrastructure and access to alternate aerodromes, to determine the location of the TAF to be provided.

Recommendation 4:

At those locations where the provision of a TAF is warranted by the passenger or movement numbers, but is for an aerodrome that exists primarily for services to an individual industry rather than the general community (e.g. does not offer sufficient regular publicly accessible services), such as mine sites, oil rigs or similar locations, a TAF service shall only be available on a contractual (cost recovery) basis.

Recommendation 5:

At those aerodromes where an MSC-funded TAF service is not continued, a TAF service may be offered on a contractual (cost recovery) basis.

Recommendation 6:

All TAF services currently provided for aerodromes outside an Australian Flight Information Region (FIR), except Australian External Territory International Airports, shall be reviewed in consultation with stakeholders, and a determination made as to the continued provision of the service for each such aerodrome. All retained services shall be supported by an ICAO approved agreement between the Bureau and the designated Meteorological Authority for the FIR within which the aerodrome is located.

Recommendation 7:

The issue and validity times of TAFs should be standardised as follows:

Category	Issue and validity times
International (A)	TAF issued six-hourly, valid for 24 or 30 hours. Commencement times 00, 06, 12, 18 UTC.
Large (B)	TAF issued six-hourly, valid for 12 or 18 hours. Commencement times 00, 06, 12, 18 UTC.
Medium (C)	TAF issued six-hourly, typically valid for 12 hour. Commencement times 02, 08, 14 and/or 20 UTC, except in Western Australia where commencement times are 04, 10, 16 and/or 22 UTC. See Note 1.
Small (D)	TAF issued six- or 12-hourly, valid for up to 12 hours. Commencement times typically 20 and/or 02 UTC, except in Western Australia where commencement times are typically 22UTC and/or 04 UTC. See Note 1.

Note 1: Times will be adjusted for daylight saving **where applicable**.

Recommendation 8:

The minimum observations required for the provision of a new TAF shall include observations of surface wind speed and direction, QNH, temperature, dew point, precipitation, visibility, cloud amount and cloud base. This information shall be available to the forecaster on at a least half- hourly basis as defined in Table 4.

Recommendation 9:

TAF services will only be provided to aerodromes with adequate meteorological observations. Aerodromes categorised as International (A), Large (B) or Medium (C) shall have observations of surface wind, temperature, dew point, QNH, visibility, cloud base and cloud amount within two years. International (A) aerodromes will also be required to have observations of present weather within two years to meet ICAO requirements.

Recommendation 10:

All remaining locations determined to be eligible for the provision of a TAF shall be equipped with an AWS providing surface wind speed and direction, QNH, temperature, dew point and precipitation within two years. These aerodromes will also require observations of visibility, cloud amount and cloud base within five years. The continued provision of a TAF for any location not suitably equipped after the aforementioned periods will be subject to review in consultation with relevant stakeholders.

Recommendation 11:

The Bureau should only provide observations and TAFs for aerodromes where reasonable rent (based on off-aerodrome rents for an AWS) can be obtained.

Recommendation 12:

If the cost of installing and maintaining observational equipment for a particular site is considered excessive, the provision of the Bureau's observational service shall be reviewed based upon safety, other benefits (e.g. efficiency) and cost in consultation with the site owner/operator.

Recommendation 13:

Any proposed changes to the categorisation and service for individual aerodromes should be provided to industry at the next scheduled Bureau of Meteorology/Industry Consultative meeting, depending on the level of comment and analysis required. This shall not limit the Bureau from making any temporary arrangements it assesses as necessary following consultation with relevant stakeholders.

Recommendation 14:

A full review of TAF categorisation, based on updated information (e.g. aerodrome passenger and movement data, routes, policies) shall be initiated three years after the implementation of the last review.

Recommendation 15:

A post-implementation review of any changes made as a result of the Bureau's TAF review shall be conducted one year after the implementation of the TAF review recommendations.

Appendix 2 – Designated international airports

Designated international airports—Australia⁶

2.1 Major International Airports

2.1.1 ‘Major International Airport’ means an airport of entry and departure for international air traffic where all formalities incident to Customs, Immigration, Health, and similar procedures are carried out.

... [Adelaide, Brisbane, Cairns, Darwin, Melbourne, Perth, Sydney]...

2.2 Restricted Use International Airports

2.2.1 ‘Restricted Use International Airport’ means an airport of entry and departure at which the formalities incident to Customs, Immigration, Health, and similar procedures are made available on a restricted basis, to flights with prior approval only.

...[Avalon, Broome, Canberra, Coffs Harbour, Gold Coast, Hobart, Learmonth, Lord Howe Island, Port Hedland, Townsville, Williamstown/Newcastle]...

2.3 Alternate Airports to International Airports

2.3.1 ‘Alternate Airport’ means an airport specified in the flight plan to which a flight may proceed when it becomes inadvisable to land at the airport of intended landing (see also AIP GEN 1.3 Section 6.).

...[Alice Springs, Avalon, Canberra, Coffs Harbour, Gold Coast, Kalgoorlie, Launceston, Learmonth, Port Hedland, Rockhampton, Tindal, Townsville]...

2.4 International Non-Scheduled Flight Airports

2.4.1 ‘International Non-Scheduled Flight Airport’ means an airport at which approval may be granted, provided the prescribed prior notice is given, for international non-scheduled flights only. No other form of international operation is permitted:

... [Horn Island]...

2.5.1 ‘External Territory International Airport’ means an airport of entry and departure for international air traffic located upon an Australian External Territory, where all formalities incident to Immigration, Health and Territory Customs, and similar procedures are available. Australian external territory international airports are as follows:

... [Norfolk Island, Christmas Island, Cocos (Keeling) Island]...

⁶ Airservices Aeronautical Information Package (AIP) Book, 28 June 2012, GEN 1.2 Entry, Transit and Departure of Aircraft

Appendix 3 – Submission of revised aerodrome details

This form is to be used by an aerodrome owner to provide revised movement and passenger statistics to the Bureau of Meteorology. This data will be used by the Bureau of Meteorology to determine whether the aerodrome is entitled to receive a TAF free of charge, i.e. funded by the Meteorological Service Charge (MSC), based on the criteria defined in the TAF review. The Bureau will also offer contractual (cost recovery) TAF services to those aerodromes not meeting the criteria. Such contractual services will incur service charges.

Given the intended use of this submitted data, it is essential that aerodrome owners provide accurate information. Should the Bureau determine that an aerodrome has submitted erroneous data that resulted in the provision of a TAF service at no direct charge, the aerodrome will be required to pay the Bureau all costs incurred to provide this TAF and observational service.

Operators are required to provide accurate information that reflects annual movement numbers and annual passenger numbers for the aerodrome. It is requested that information be provided from the previous financial year. If data for this period are unavailable, please provide the most suitable data, indicating the period covered and how the data were collected.

The following form is to be completed by the aerodrome's Chief Financial Officer or Chief Executive Officer and submitted to:

National Manager Regional Aviation Weather Services
Weather and Ocean Services Policy Branch
Bureau of Meteorology,
GPO Box 1289
MELBOURNE, VIC 3001
Email: sral@bom.gov.au

Submission of revised aerodrome figures

Airport details:

Aerodrome name:

Aerodrome ICAO code:

Data:

Intra-aerodrome movement numbers (per annum):

Passenger numbers (per annum):

Metadata:

Are these data for the previous calendar period 1 July – 30 June?

Yes No

If no, for what period were the data collected?

Are the data actual recorded details or estimated?

Actual Estimated

If estimated, provide specific details of how details were calculated
(overleaf if required)

Authorisation:

I certify that the above information is true and correct.

Name of completing officer:

Title:

(Note—only details from CFO or CEO will be accepted)

Signature:

Date:

Appendix 4 – Glossary of terms, abbreviations and acronyms

AIRAC Aeronautical Information and Regulation and Control

ASH Aeronautical Services Handbook

ATC Air Traffic Control

ATSB Australian Transport Safety Bureau

BNOC Bureau's National Operational Centre

CAA Civil Aviation Authority

CAR120 Civil Aviation Regulation 1988, Regulation 120

CASA Civil Aviation Safety Authority

C&V Ceilometer and Visibility meter

DEW POINT The temperature to which air must be cooled, at constant pressure and water vapour content, in order for saturation to occur. If the air is cooled further, some of the water vapour will condense to liquid.

DOIRD Department of Infrastructure and Regional Development

ERSA En-Route Supplement

FIR Flight Information Region

ICAO International Civil Aviation Organization

MA Meteorological Authority

METAR Meteorological report from an aerodrome at a routine time (half-hourly) when conditions are better than specified thresholds—this is the primary format in aeronautical meteorology for reports of surface meteorological information at an aerodrome

MSC Meteorological Service Charge

NOC National Operations Centre

NOCMET Meteorological Unit at the Airservices National Operations Centre (NOC)

QNH A brevity code for barometric pressure adjusted to sea level

PA Per Annum

PRECIPITATION In meteorology, any product of the condensation of atmospheric water vapour that falls under gravity (e.g. rain, hail, snow)

RFC Regional Forecasting Centre

RELATIVE HUMIDITY The ratio of the vapour pressure to the saturation vapour pressure with respect to water. Also known as the ratio of the existing amount of water vapour to that which could be held by a parcel of air. It is usually expressed as a percentage.

SAMU Sydney Airport Meteorological Unit

SIGMET Significant Meteorological Information

SPECI A special report of surface meteorological information at an aerodrome, only issued when specific criteria are met—has the same format as a METAR, except for the name

TAF Aerodrome Forecast

UNIVERSAL TIME COORDINATED (UTC) The primary time standard by which the world regulates clocks and time—signified in aviation forecasts and reports by the letter Z

VAAC Volcanic Ash Advisory Centre

WMO World Meteorological Organization