

Automation of aerodrome observations (METAR/SPECI)

Reference material

Weather observations at Australian aerodromes

The Bureau of Meteorology (Bureau) currently has over 700 automatic weather stations (AWS) in the Australian observing network. Approximately 250 Australian aerodromes and other aviation locations are fully automated. The Bureau is continuing to improve observations at aerodromes through the enhancement of observing algorithms and adoption of improved observing technologies. These improvements will directly benefit Australia's aviation industry.

The Automation of Capital City Airports (ACCA) Project is progressing towards fully automated observations at all Australian aerodromes by 2027. The users of aviation weather products and services will see a gradual increase in the hours of automated aerodrome meteorological reports (AUTO METAR/SPECI) at capital city airports.

Background

In 2019, the Bureau successfully implemented improved automated observation algorithms for Cairns (YBCS), Canberra (YSCB) and Gold Coast (YBCG) airports. Following this initial roll-out, the improved algorithms were progressively implemented nationally across all aerodromes throughout 2020 and 2021.

Manual observations currently supplement automated observations at the following aerodromes:



Automatic weather station at Kununurra, Western Australia.
Credit: JJ O'Donnell



Present weather sensor at Norfolk Island. Credit: JJ O'Donnell

- Adelaide (YPAD)
- Brisbane (YBBN)
- Darwin (YPDN)
- Hobart (YMHB)
- Melbourne (YMML)
- Norfolk Island (YSNF)
- Perth (YPPH)
- Sydney (YSSY)
- Townsville (YBTL)
- Williamtown (YWLM)

Characteristics of weather observations at Australian aerodromes

Historically, all observations in Australia, including those from key aerodromes, were taken by a human observer. Over time, the Bureau has transitioned most of its observing sites to an AWS. Basic AWS measurements include:

- temperature
- humidity (reported as dew-point temperature)
- wind speed and direction (including gust)
- air pressure
- rainfall

At most Australian aerodromes, AWSs have advanced meteorological sensors and algorithms. These automated systems provide accurate, highly reliable, real-time continuous measurement of horizontal visibility, cloud and present weather phenomena, including Thunderstorm. Currently, the automated observations do not report towering Cumulus (TCU) or Cumulonimbus (CB) associated with Thunderstorms or report smoke (FU) associated with a reduction in visibility.

An AWS estimates cloud and visibility information over a large volume of airspace by using an advanced Sky Condition Algorithm (SCA) that constructs a picture of the sky and surrounds, centred on the AWS. The algorithm achieves this by averaging and weighting observations from these advanced sensors over a period of time, 30 minutes for cloud observations and 10 minutes for visibility.

The main difference between a manual and automated observation is that a manual observer can provide additional meteorological information in and around the vicinity of the aerodrome, whereas automated observations are typically a point observation (at or above the AWS). In comparison, human observations can have limited hours of operation and can be sensitive to human subjectivity. As the AWS is a point source, there may be instances when automated cloud and visibility reports are not completely representative of actual conditions at the aerodrome.

Benefits of AUTO METAR/SPECI

- Provides an accurate, highly reliable, real-time, and continuous measurement of meteorological parameters using advanced algorithms
- Increased data availability and reliability through the installation of modern and fit-for-purpose automated observation systems and supporting infrastructure (i.e., aviation weather cameras, additional AWS and/or sensors)
- Improved data consistency through the application of uniform measurement standards and methods across the national observations network
- Improved real-time lightning detection and reporting

Example of METAR/SPECI

The abbreviation AUTO will be included when the METAR/SPECI report contains fully automated observations. These reports can be recognised by the inclusion of the abbreviation AUTO following the date/time group.

```
METAR YBRK 120630Z AUTO 15006KT 9999
-SHRA SCT033 SCT051 BKN060 24/14 Q1012 RMK
RF00.0/000.0
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When a METAR/SPECI is produced with human input, AUTO will not be present in the message.

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METAR YBBN 120630Z 08010KT 9999 FEW032
SCT250 BKN290 26/18 Q1013 RMK RF00.0/000.0
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Further improvements to Bureau's observations infrastructure

Over the next few years, the Bureau will focus on installing new technologies, such as aviation weather cameras and Centralised Automated Weather Information Service (C-AWIS), upgrading end of life equipment, and installing secondary equipment at capital city airports. This work will ensure the Bureau delivers more secure, reliable, and resilient weather observations for the Australian aviation industry.

Manual observations continue to supplement automated observations at capital city aerodromes while the Bureau fully transitions to complete automation by 2027.

Once all locations are automated, the performance of instrumentation and software will be consistent, and the Bureau's focus will be that of continual improvement of algorithms and adoption of improved technology to support the aviation industry in Australia.

Further information

For further information, refer to:

- *METAR/SPECI* brochure for METAR/SPECI format and de-coding information www.bom.gov.au/aviation/data/education/metar-speci.pdf
- *Automation of aerodrome observations (METAR/SPECI) – frequently asked questions* document available at: www.bom.gov.au/aviation/data/education/Automationofaerodromeobservations-METAR-SPECI-FAQ.pdf
- *Ceilometers and visibility meters* <http://www.bom.gov.au/aviation/data/education/ceilometer-visibility.pdf>

Further aviation educational resources produced by the Bureau of Meteorology can be found at www.bom.gov.au/aviation/knowledge-centre.

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