

Title	Demonstrate knowledge of aeronautical meteorology for air traffic services		
Level	5	Credits	12

Purpose	People credited with this unit standard are able to demonstrate knowledge of: the principal properties, structure, and composition of the earth's atmosphere; the methods and properties of heat transfer in the atmosphere and general weather circulations and how it relates to global and regional weather patterns; the principles of atmospheric stability; how clouds are formed and identify different cloud types; how wind is generated in the atmosphere and its effect on aviation; and standard meteorological reports, the abbreviations and terminology used, and types of information available to pilots from air traffic services; and, describe the various meteorological factors that impact on the provision of air traffic services and aircraft performance.
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Classification	Aviation > Air Traffic Services
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Available grade	Achieved
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Guidance Information

- 1 The Civil Aviation Act 1990 and Civil Aviation Rule Part 65 detail the legislative requirements in relation to this unit standard. This unit standard is aligned to the Civil Aviation Act 1990, Civil Aviation Rule Part 65, which reflects International Civil Aviation Organisation (ICAO) Standards and Recommended Practices as adopted by New Zealand. This unit standard is also aligned to the associated Civil Aviation Advisory Circular (AC) 65 series containing the syllabus for Air Traffic Services Personnel Licences and Ratings, and Part 65.103(a)(5)(v) that applies to the Flight Service Operator Licence. Information relating to Civil Aviation Authority of New Zealand (CAA of NZ) Rules can be obtained from the CAA of NZ website on <http://www.caa.govt.nz/>.
- 2 Evidence presented for assessment against this unit standard must be in accordance with standard industry texts.
- 3 *Standard industry texts* include but are not limited to:
State approved documentation,
air traffic services (ATS) provider exposition,
aerodrome emergency plans,
published aviation training manuals or textbooks (including electronic resources).

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of the principal properties, structure and composition of the earth's atmosphere.

Performance criteria

- 1.1 The four main gases which comprise the Earth's atmosphere are identified.
- 1.2 The order and divisions of the Earth's atmosphere are explained.
- Range troposphere, stratosphere, mesosphere, thermosphere, exosphere.
- 1.3 The key elements of the International Standard Atmosphere (ISA) are described and explained.
- Range may include but is not limited to – pressure, surface temperature, lapse rate, units of measurement, altimeter setting, air density, diurnal variation.

Outcome 2

Demonstrate knowledge of the methods and properties of heat transfer in the atmosphere and general weather circulations and how they relate to global and regional weather patterns.

Performance criteria

- 2.1 The different mechanisms by which heat is transferred into and through the atmosphere are identified and explained.
- Range may include but is not limited to – radiation, solar radiation, terrestrial radiation, conduction, convection.
- 2.2 The causes and characteristics of temperature variations in the atmosphere are identified and explained.
- Range may include but is not limited to – diurnal variation, seasonal variation, latitude, topography, cloud cover, density lapse rate, ICAO Standard Rate.
- 2.3 The term 'circulation' is defined and the characteristics of an ideal circulation pattern are identified.
- 2.4 The Coriolis Effect and its resultant influence on weather circulation patterns are explained.

2.5 The main factors which affect general weather circulation are identified.

Range solar heating, distribution of sea and land, earth's rotation.

2.6 The characteristics, formation, and typical location of a jet stream are identified and explained.

Range vertical and lateral extent, wind strength.

Outcome 3

Demonstrate knowledge of the principles of atmospheric stability.

Performance criteria

3.1 The origins of moisture in the atmosphere are explained.

3.2 The processes of condensation and deposition are described.

3.3 Key terms in relation to the principles of atmospheric stability are defined.

Range may include but is not limited to – saturation, dew point, relative humidity, vaporisation.

3.4 The principles of general stability are explained.

Range warm air rises, cools, sinks.

3.5 Trigger mechanisms of forced air ascent are explained.

Range frontal, orographic, convective, mechanical, pyro-cumulus.

3.6 General atmospheric conditions in stable and unstable air are explained.

Range frontal, orographic, convective, mechanical, pyro-cumulus.

3.7 The main types of temperature inversions are explained.

Range radiation, turbulence, subsidence, frontal.

Outcome 4

Demonstrate knowledge of how clouds are formed and identify different cloud types.

Performance criteria

4.1 Atmospheric temperature, moisture and stability and their effect on cloud formation is explained.4.2

lifting agents which cause cloud formation are identified.Range convection, frontal lifting, turbulence.

The four major orographic lifting,

Range may include but is not limited to – stratus, nimbostratus, altostratus, cirrostratus, cumulus, cumulonimbus, altocumulus, cirrocumulus.

Outcome 5

Demonstrate knowledge of how wind is generated in the atmosphere and its effect on aviation.

Performance criteria

5.1 The forces which affect wind generation are identified and explained.

Range pressure gradient, Coriolis effect, friction.

5.2 Diurnal variation of wind is explained

5.3 Converging and diverging wind is explained.

5.4 The relationship between pressure gradient and wind speed and direction, and how it is affected by local conditions is described.

Range sea/land breezes, Katabatic/Anabatic winds, Föhn winds.

Outcome 6

Demonstrate knowledge of standard meteorological reports, the abbreviations and terminology used, and types of information available to pilots from air traffic services.

Performance criteria

6.1 Distinctions between forecasts and meteorological reports are explained.

6.2 Meteorological reports issued for pilots are described by type.

Range may include but is not limited to – aviation routine weather report (METAR), aviation selected special weather report (SPECI), terminal aerodrome forecasts (TAF), aerodrome forecast (AF), area forecast (ARFOR), information concerning en route weather phenomena which may affect the safety of aircraft in flight (SIGMET), flight information service communications broadcast (FISB), automatic terminal information services (ATIS), Take off and Landing Reports.

6.3 The Met information is encoded and decoded.

Range may include but is not limited to – METAR, SPECI, TAF, SIGMET.

Outcome 7

Describe the various meteorological factors that impact on the provision of air traffic services and aircraft performance.

Performance criteria

7.1 Forms of precipitation are explained.

Range may include but is not limited to – drizzle, rain, sleet, hail, snow, showers, dew.

7.2 The characteristics of warm and cold fronts are described.

Range may include but is not limited to – warm, cold, occluded, stationary fronts, characteristic weather and movement, dangers to flying.

7.3 Factors that affect visibility are identified.

Range may include but is not limited to – precipitation, fog (radiation, advection), mist, haze, smoke, sea spray.

7.4 The stages of a thunderstorm are described.

Range growing stage, mature stage, decaying stage.

7.5 The main types of thunderstorms are identified.

Range ordinary cell, multicell cluster, squall lines, supercell thunderstorms.

7.5 The main hazards to aviation created by thunderstorms are identified.

Range may include but is not limited to – microbursts, hail, windshear, lightning.

7.6 The main causes of turbulence are identified.

Range thermal, mechanical, wind shear (vertical and horizontal), wake turbulence.

7.7 The types and properties of icing are identified.

Range may include but is not limited to – hoar frost, clear (glaze ice), rime ice, freezing rain.

Replacement information	This unit standard and unit standard 33167 replaced unit standard 28045.
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Planned review date	31 December 2027
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Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	30 March 2023	N/A

Consent and Moderation Requirements (CMR) reference	0028
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

Comments on this unit standard

Please contact Ringa Hora Services Workforce Development Council qualifications@ringahora.nz if you wish to suggest changes to the content of this unit standard.