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Aeronautical Information Manual

(TC AIM)

MET—METEOROLOGY

OCTOBER 8, 2020

Canada

TRANSPORT CANADA AERONAUTICAL INFORMATION MANUAL (TC AIM)

EXPLANATION OF CHANGES
EFFECTIVE—OCTOBER 8, 2020

NOTES:

1. Editorial and format changes were made throughout the TC AIM where necessary and those that were deemed insignificant in nature were not included in the "Explanation of Changes".
2. Effective March 31, 2016, licence differences with ICAO Annex 1 standards and recommended practices, previously located in LRA 1.8 of the TC AIM, have been removed and can now be found in *AIP Canada (ICAO)* GEN 1.7.

MET

(i) MET 4.11 *Clouds and Weather Chart*
Additional text was added to clarify forecasts of cloud layers.

(ii) MET 4.11 *Clouds and Weather Chart*
Figure 4.4(e)—Multiple Cloud Layers
"AS" was removed from the image since altostratus (AS) is not specified in any chart.

(iii) MET 7.2 *General*
A sentence related to significant weather was added.

(iv) MET 8.3 *Sample Message*
In *(f)(i) Wind gusts*, information on wind gusts was improved by specifying the wind gust averaging period.

(v) MET 12.1 *Mid-Level Charts*
The title of this subpart was renamed.

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MET—METEOROLOGY

1.0 GENERAL INFORMATION

1.1 General

The Minister of Transport is responsible for the development and regulation of aeronautics and the supervision of all matters connected with aeronautics.

The responsibility for the provision of aviation weather services in Canadian airspace, and any other airspace in which Canada accepts the responsibility for the provision of air traffic control (ATC) services, has been designated to NAV CANADA by the Minister of Transport.

NAV CANADA is responsible for a range of aviation weather services, some of which are provided to it under a contractual agreement with Environment and Climate Change Canada (ECCC). These services include most civilian aviation weather forecasts. NAV CANADA is responsible for determining the location and frequency of aviation weather observations and forecasts, and for the dissemination of this information for aviation purposes.

In addition to the aviation weather services provided by NAV CANADA, other aviation service providers may offer weather services in support of operations at local aerodromes that have light traffic, are private, and/or are used primarily in support of private industry, such as mining or other similar operations.

The Department of National Defence (DND) arranges for the provision of aviation weather services at military aerodromes.

1.1.1 Meteorological Responsibility

In accordance with CAR 804.01(1) the majority of standards for aviation weather services are found in: ICAO Annex 3, the *Manual of Standards and Procedures for Aviation Weather Forecasts* (MANAIR), and the *Manual of Surface Weather Observations* (MANOBS). The two manuals can be obtained from ECCC's Web site at <https://www.canada.ca/en/environment-climate-change/services/weather-manuals-documentation.html>, while Annex 3 can be obtained from ICAO. An updated eighth edition of MANOBS took effect in February 2019.

Enquiries relating to the provision of aviation weather services should be addressed to:

NAV CANADA
Aviation Weather Services
77 Metcalfe Street
Ottawa ON K1P 5L6

Tel. (toll-free in North America): 1-800-876-4693
Fax: 613-563-3426
Fax (toll-free in North America): 1-877-663-6656
E-mail: .....service@navcanada.ca

Enquiries relating to regulations and standards for aviation weather services should be addressed to:

Flight Standards (AARTA)
Transport Canada
Ottawa ON K1A 0N8

Tel.:..... 1-800-305-2059
Fax: 613-957-4208
E-mail:...TC.Flights.Standards-Normesdevol.TC@tc.gc.ca

1.1.2 Meteorological Services Available

Aviation weather information is available from NAV CANADA FICs. Telephone numbers and hours of service are listed in the CFS and the CWAS.

1.1.3 Aviation Weather Services

a) *Pilot briefing service*—The pilot briefing service is provided by NAV CANADA FICs to accommodate pilots at the pre-flight planning stage and for information updates while en route. Flight service specialists can access and display a full range of weather charts, imagery (e.g. satellite, lightning and radar) and aeronautical information (such as NOTAM, RSC and CRFI). They are qualified to provide briefings, consultation and advice, and to interpret meteorological information. (See RAC 3.2 for details).

b) *Aviation weather web site (AWWS)*—NAV CANADA's aviation weather web site (AWWS), available at <https://flightplanning.navcanada.ca/>, and collaborative flight planning system, available at <https://plan.navcanada.ca>, offer aviation weather products, NOTAM and the ability to file flight plans. For more information, visit <www.navcanada.ca>. Pilots operating near the border should note that U.S. METAR, SPECI and TAF must be obtained through the Aviation Digital Data Service (ADDS), available at <www.aviationweather.gov/adds/>.

c) *Other pilot weather services*—In accordance with an arrangement with the U.S. National Weather Service, digital upper level wind and temperature forecasts are available to operators in Canada for planning international flights. Digital forecasts are also available to the Gander OAC for planning transatlantic flights. Aviation weather flight documentation is provided, subject to prior notification, as determined by the local weather service outlet in consultation with the operator's local representative. Operators are responsible for notifying NAV CANADA's aviation weather services of new requirements. (See MET 1.1.1 for the address.) Where indicated in the CAP, altimeter settings in weather reports from U.S. aerodromes may be used as a RASS.

1.1.4 Weather Service Information

When planning a flight, pilots can obtain aviation weather and aeronautical information and file a flight plan through a NAV CANADA FIC. (See RAC 3.2 for details).

Radio communication should be established with a FIC on a FISE frequency if in-flight information is required to assist in making a decision or to terminate a flight, or to alter course before adverse weather conditions are encountered.

Pilot requests for initial pilot briefings while airborne are not encouraged because this practice leads to frequency congestion.

1.1.5 Weather Information from Air Traffic Service (ATS)

All aerodromes with operational ATS will provide, on initial contact or as soon as practicable, the current wind and altimeter information unless it is known that the aircraft already has this information. ATS procedures require that wind information be transmitted with landing and take-off clearance only when the wind speed is 15 kt or greater. Wind velocity (direction and speed) data is typically updated every five seconds using a running 2-min average. Variations to the wind speed (gusts) and/or wind direction are based on wind data from the previous 10 min.

At aerodromes with an operational ATIS, the full details of the most recent METAR or SPECI will be included in the recorded message. In rare circumstances, such as during rapidly changing weather conditions, this information will be provided directly by ATS. Where ATIS is not operational, updated current information about weather elements from METAR/SPECI is available on request.

RVR observations are obtained by transmissometers and forward-scatter sensors. Observations representative of the touchdown and, where available, midpoint and roll out visibility, averaged over 1 min and based on the light setting in use, are automatically displayed in digital form in the local ATS unit.

RVR is included in METARs and SPECIs when it is 6 000 ft or less for the runway in use and/or the visibility is 1 SM or less. The RVR is presented in ICAO format and is based on a 10-min average of the maximum runway light setting. Refer to the METAR example in MET 8.3 for further details.

1.1.6 Pilot Reports

1.1.6.1 Pilot Weather Reports (PIREPs)

Pilots are urged to volunteer reports of cloud tops, upper cloud layers, cruising level wind velocity, and other meteorological information which may be significant to safe or comfortable flight conditions. The information is also used by ECCC meteorologists to confirm or amend aviation weather forecasts. PIREPs less than one hour old that contain information about conditions considered to be a hazard to aviation are broadcast immediately to aircraft in the affected area and will be included in subsequent scheduled weather broadcasts. PIREPs are also transmitted under the headings "UACN10" for normal PIREPs and "UACN01" or "UUA" for urgent PIREPs. A suggested format for PIREPs can be found on the back covers of the CFS and the CWAS. More information on PIREPs can be found in MET 2.0.

1.1.6.2 Air Reports (AIREPs)

AIREPs are appended to the routine position reports of some flights as follows:

a) international air carrier aircraft transiting Canadian domestic FIRs north of 60°N and east of 80°W, and north of 55°N and west of 80°W should use the AIREP format and report routine meteorological observations to Gander Radio at each designated reporting point or line;

b) all aircraft operating in the Gander OCA should use the AIREP format and report routine meteorological observations at each designated reporting point or line. The exception is that aircraft cleared on a designated NAT track will give these reports only if the phrase "SEND MET REPORTS" is included in their oceanic clearance.

There are no special requirements for transmitting AIREPs with appended meteorological information other than those specified in ICAO's *Regional Supplementary Procedures* (Doc 7030).

1.1.7 Applicable International Civil Aviation Organization (ICAO) and World Meteorological Organization (WMO) Documents

Whereas ICAO determines the standards and recommended practices with respect to meteorological service for international air navigation, the WMO determines and reports the internationally agreed upon code formats for the reports and forecasts. ICAO and WMO documents applicable to aviation meteorology are as follows:

a) ICAO Annex 3—*Meteorological Service for International Air Navigation*

b) WMO Doc 306—*Manual on Codes*

WMO documents may be ordered directly from the WMO Secretariat in Geneva, Switzerland. ICAO documents may be purchased from ICAO Headquarters in Montréal. The two relevant addresses are listed below:

World Meteorological Organization (WMO)
Sales and Distribution of Publications
7bis, avenue de la Paix
P.O. Box 2300
CH-1211 Geneva 2, Switzerland

Tel.: ..... +41-22-730-8111
Fax.: ..... +41-22-730-8181
Web site: ..... www.wmo.int

International Civil Aviation Organization (ICAO)
Distribution Sales Unit
Suite 305
999 Robert-Bourassa Boulevard
Montréal QC H3C 5H7

Tel.: 514-954-8022
Web site: ..... www.icao.int

Pilots flying outside of North America should consult the differences filed by other member states as outlined in WMO Doc 306 or in the AIP of each country.

1.1.8 Differences from International Civil Aviation Organization (ICAO) Annex 3

CAR 804.01(1)(a) incorporates standards contained in ICAO Annex 3. The current version of Annex 3 includes Amendment 78, which will be superseded by Amendment 79 on November 5, 2020. In accordance with CAR 800.01(2), the incorporation of Annex 3 as a standard "includes the differences notified to ICAO by the Government of Canada in respect of the standards specified in that annex". The full details of these state differences are included in the *AIP Canada (ICAO)*, as published and disseminated by NAV CANADA.

1.1.9 Pilot Responsibility

Pilots must be aware of the requirements of CAR 602.72: "The pilot-in-command of an aircraft shall, before commencing a flight, be familiar with the available weather information that is appropriate to the intended flight."

1.2 Meteorological Observation and Reports

1.2.1 Type and Frequency of Observations

METARs are coded weather observations that are taken every hour on the hour at over 200 aerodromes and other locations in Canada. In addition, SPECIs are issued whenever weather conditions cross specified criteria. For details on how to understand METARs, see MET 8.3. For details on SPECI criteria, see MET 8.4.

The location of transmissometers or forward scatter sensors used to determine RVR is specified on CAP aerodrome charts.

1.2.2 Flight Weather Documentation

Pilots must use the most recent weather information available when flight planning and be aware of scheduled weather information updates. Pilots must also remain vigilant for pertinent unscheduled weather updates or amendments.

Flight weather documentation should include, as appropriate: the relevant GFAs, AIRMETs, SIGMETs, TAFs, METARs, SPECIs, PIREPs, and upper wind and temperature forecasts.

There are two distinct methods of reporting cloud bases. It is vital for the pilot to be able to distinguish and recognize which method of reporting is in use. Heights in METARs and TAFs are always stated as height above ground level. On the other hand, heights in GFAs and PIREPs are normally stated as height above sea level, since terrain heights are variable over the larger area covered. If heights are not ASL in GFAs, this is always highlighted by statements such as "CIGS 2-4 AGL".

1.2.3 Weather Services Definitions in Flight Publications

The terminology used in the CFS and the CAP to describe aviation weather services is as follows:

a) *METAR*—METAR and SPECI weather observations taken by a qualified human observer.

b) *METAR AUTO*—METAR and SPECI weather observations taken by a stand-alone AWOS with noted enhancements (see MET 8.5). AWOS located outside of the CLDN coverage area do not receive lightning data and therefore are unable to report thunderstorm or lightning activity.

Examples of METAR AUTO stations are the NAV CANADA AWOS and DND AWOS.

c) *LWIS*—An automated weather system which produces an hourly LWIS report containing wind speed and direction; temperature; dew point; and altimeter setting only.

d) *AUTO*—An automated weather system that does not meet requirements to produce a METAR AUTO, SPECI AUTO or LWIS report. These systems can report a variety of observed weather elements. Contact the aerodrome operator for further information on the specifics of the system. Some of these systems may have associated VHF transmissions of their reports as stated in the CAP or CFS.

e) *WxCam*—Indicates that a NAV CANADA aviation weather camera is installed at the site. Still images are transmitted to the NAV CANADA AWWS at 10-min intervals.

f) *Webcam*—Indicates that one or more cameras not belonging to NAV CANADA have been installed at this location. Contact the aerodrome operator for further information on the specifics of the camera system.

g) *ALTIMETER*—Altimeter setting report observed from two aircraft altimeters. The private altimeter setting report is a weather service provided in support of an AU. Contact the aerodrome operator for further information on the service.

h) *WIND*—Human assessment of wind speed and direction. The private wind speed and direction report is a weather service provided in support of an AU. Contact the aerodrome operator for further information on the service.

Observed weather information, observations, and forecasts originating from any non-NAV CANADA weather service, other than DND, are considered a private meteorological service.

Stand-alone METAR AUTO and LWIS reports are available during published hours through normal meteorological information systems. At some sites an automated voice broadcast of the latest observation is available via VHF transmitter. In these cases, the frequency is displayed in the COMM entry of the CFS Aerodrome/Facility Directory (e.g. COMM AWOS 124.7, COMM AUTO 122.025).

The hours of coverage for METAR, METAR AUTO, and LWIS reports are given (e.g. METAR 09-21Z). At sites where coverage is 24 hr/day, the coverage is listed as H24 (e.g. METAR H24, METAR AUTO H24, LWIS H24).

Sites that provide unspecified limited hours of coverage will be listed as ltd hrs (e.g. ALTIMETER ltd hrs). Contact the aerodrome operator for further information on the hours of operation.

1.2.4 Automated Weather Observation Systems (AWOS)

1.2.4.1 Overview

AWOS, LWIS and AUTO refer to automated equipment used as a means to provide an aviation weather service. The services that can be provided by these systems are either full METAR AUTO/SPECI AUTO or some subset thereof. LWIS provides a basic group of four elements and issues an hourly report. Operators of automated weather stations that are used to support instrument flight procedures are required to document the characteristics of their systems and to provide aircraft operators with suitable descriptions, upon request.

AWOS and LWIS operated by NAV CANADA have common performance characteristics across the country. A description of the performance characteristics of these systems can be found in MET 8.5.

The subset of weather elements provided by AUTO may vary from only one element to almost a full METAR AUTO/SPECI AUTO. Any automated system that is not capable of reporting all the elements required to generate METAR AUTO/SPECI AUTO reports and support any associated TAF should be referred to as AUTO or LWIS. Some local service providers may refer to their systems as AWOS, but if they do not support METAR AUTO/SPECI AUTO, then they will be listed as AUTO in the CFS.

NOTE:
The United States uses the term "automated surface observation system" (ASOS) as the equivalent to Canadian AWOS that provide METAR AUTO reports. Typically, usage of the term AWOS in the United States is equivalent to the Canadian LWIS but with several defined levels of observation capabilities. Further details regarding performance characteristics and reporting practices can be found in the FAA's *Aeronautical Information Manual*.

1.2.4.2 Visual Flight Rules (VFR) Weather Stations

Some weather stations are intended exclusively for local use by VFR operators. These stations do not meet the requirements of a usable altimeter setting or of wind reports for IFR procedures. These stations are not permitted at aerodromes that have IAPs and they are not published in the CFS. Pilots making use of these stations do so at their discretion for VFR. If the reports from such stations are being broadcast as an advisory, the frequency will be mentioned in the COMM entry of the CFS Aerodrome/Facility Directory along with an annotation stating that the reports cannot be used for IFR. Pilots should contact the aerodrome operator if they require additional information.

1.2.5 Automatic Aerodrome Routine Meteorological Reports (METAR AUTO) and Limited Weather Information System (LWIS) Reports

1.2.5.1 Automatic Aerodrome Routine Meteorological Reports (METAR AUTO)

METAR AUTO reports are based on NAV CANADA or DND AWOS systems, which are comprised of a set of meteorological sensors, a data processing system, a communications system, and an optional VGSS and VHF transmitter. In addition, weather cameras are installed at most of these locations. METAR AUTO reports may be used to support a TAF at the associated aerodrome.

METAR AUTO reports depend on either a NAV CANADA- or DND-developed system or on a commercial system that complies with TC requirements for aviation use. Pending revisions to the CARs, the current standards for the operation of automatic weather stations for aviation use are contained in a global exemption to CAR 804.01. Full details on this exemption are available on the TC Web site or from TC regional offices.

Observations are distributed in the form of METAR AUTO reports and must be properly coded and supplemented by SPECI AUTO reports when SPECI thresholds are crossed. At a minimum, the following are observed and reported:

a) wind (direction, speed and gusts);

b) altimeter setting (these include multiple sensors as a fail-safe);

c) air temperature;

d) dew point;

e) visibility;

f) cloud height;

g) sky coverage (of detected cloud);

h) precipitation occurrence and type;

i) fog, freezing fog, haze, blowing snow and mist;

j) thunderstorm detection capability; and

k) icing.

In addition, reports may include RVR when required.

For more information on METAR AUTO reports, refer to MET 8.5.

1.2.5.2 Limited Weather Information System (LWIS) Reports

A LWIS comprises automated meteorological sensors, a data processing system, a communication system, and an optional VGSS with a VHF transmitter. The LWIS collects limited meteorological data, produces LWIS reports, and transmits data to ATS facilities on the hour. The LWIS also transmits data updated every minute to the affiliated VGSS and VHF transmitter units.

These systems were developed to meet a defined level of service requirement for NAV CANADA.

Any LWIS used for civil aviation purposes must comply with TC requirements, including siting, maintenance, and quality control, and be equipped with sensors to report, at a minimum, the following:

a) wind (direction, speed, and gusts);

b) altimeter setting (these include multiple sensors as a fail-safe);

c) air temperature; and

d) dew point.

Wind direction is reported in degrees true except for the VGSS, which reports wind direction in degrees magnetic in SDA.

Except for the DND stations in the High Arctic that do not provide dew point information, any automated system that reports fewer elements than the standard four required for an LWIS should be referred to as an AUTO. For more information on LWIS, please refer to MET 8.5.

1.2.6 Automatic (AUTO) Reports

The term AUTO is used to describe all other automated aviation weather reports that have demonstrated compliance with TC requirements and are usable for IFR flight. However, they have a wide variety of performance characteristics and may be referred to locally by different labels, most often as AWOS. Contact the airport operator for more information on the characteristics of local systems.

1.2.7 Weather Services in Support of Approach Unicom (AU)

Weather information is not usable for instrument procedures unless it complies with the requirements of CAR 804 or a related national exemption.

AU is an air-ground communications service that can provide approach and landing information to IFR pilots. The altimeter setting and wind reports provided by an AU are usable in support of an instrument procedure. Pending revisions to the CARs, these services must be provided by qualified persons in accordance with one of the two national exemptions to CAR 804.01(1)(c) that are in effect for these services.

The first national exemption establishes how two aircraft altimeters can be used to observe and report a usable altimeter setting. The second establishes procedures to follow for the human assessment of wind speed and direction, usable for the selection of the most into-wind runway. More details regarding these exemptions can be found on the TC Web site or obtained from a TC regional office.

At a few AU locations, fully automated systems are used to measure atmospheric pressure. This data is used to determine the altimeter setting that is relayed to pilots. In these cases, the reported altimeter setting must comply with the same requirements applied to the altimeter component of METAR AUTO/SPECI AUTO.

Any weather information provided by a UNICOM, as opposed to an AU, is not usable for instrument procedures; alternative uses are entirely at the pilot's discretion.

1.2.8 Runway Visibility Assessment

At aerodromes where RVR is not provided, qualified persons may, in accordance with the runway visibility assessment standards referenced in CAR 804, provide an assessment of runway visibility. Instrument-rated pilots may also provide such assessments in accordance with CAR 602.131.

A runway visibility assessment is valid for only 20 min after it has been established.

1.3 Meteorological Forecasts and Charts

1.3.1 Flight Information Centre (FIC) Hours of Service and Telephone Numbers

All FICs provide 24-hr service. FIC telephone numbers are provided in the CFS. Pilots dialing the common toll-free number 1-866-WXBRIEF (992-7433) will automatically be routed to the FIC serving the area from which the call is being made.

1.3.2 World Area Forecast System (WAFS) Charts

WAFS aviation weather charts are disseminated as required. These include prognostic significant weather charts for the North Pacific, the Caribbean and northern South America, the North Atlantic, Canada and the United States.

1.3.3 Aerodrome Forecasts (TAFs)

TAFs are prepared for approximately 200 aerodromes across Canada. TAFs are limited to aerodromes for which METAR and SPECI reports are available. The forecasts are generally prepared four times daily with periods of validity up to a maximum of 30 hr. See MET 7.0 for more information on TAFs, including where and when they are issued, their periods of validity and decoding instructions.

TAFs are issued in TAF code, with amendments as required.

1.3.4 Aerodrome Advisory Forecasts

Aerodrome advisories are forecasts that are issued in TAF format except that ADVISORY is added immediately after the period of validity group. They are issued in place of a TAF in the following circumstances:

a) *Offsite*—the forecast is based on observations that have been taken off site, more than 1.6 NM from the aerodrome centre, and are not considered to be representative of weather conditions at the aerodrome;

b) *Observation incomplete*—the forecast is based on observations which have regularly missing or incomplete data; or

c) *No specials*—the forecast is based on observations from a station with a limited observing program that does not issue SPECIs.

In each case, after the period of validity group, the advisory forecast will be labelled with the word ADVISORY and the appropriate qualifier (OFFSITE, OBS INCOMPLETE, or NO SPECI).

1.3.5 Coastal Weather

Float plane operators can also obtain coastal marine weather on HF and VHF FM frequencies from some Canadian Coast Guard stations. Frequencies and time of broadcast are contained in two Canadian Coast Guard Publications: *Radio Aids to Marine Navigation (Pacific and Arctic) and Radio Aids to Marine Navigation (Atlantic, St. Lawrence, Great Lakes, Lake Winnipeg and Arctic).* These two publications are published annually and are available on the Canadian Coast Guard Web site.

1.3.6 Graphic Area Forecasts (GFAs) and AIRMET

GFAs are issued as a series of temporally adjusted weather charts for CDA and distributed on a routine or on-request basis. These forecasts are prepared four times daily for seven regions across the country with a validity period of 12 hr and an IFR outlook for a further 12 hr. See MET 4.0 for issue, periods of validity and decoding instructions. Once issued, a SIGMET or AIRMET message automatically amends the current and relevant GFA. A full description of AIRMET can be found in MET 5.0.

1.3.7 Upper Level Wind and Temperature Forecasts (FD)

Alphanumeric upper level wind and temperature forecasts (FDs) are routinely prepared for 142 sites in Canada. FD forecasts are produced by a super-computer model of the atmosphere called a NWP model, which is run twice per day at 00Z and 12Z after collecting and analyzing weather observation data from around the world.

FD forecasts based on the 12Z NWP model run on the fifth day of the month would include the following text in front of the forecast data: "FCST BASED ON 051200 DATA". The text "DATA VALID 060000" in the FD forecast indicates that the temperature and wind velocity data is forecast to be most representative of conditions at 00Z on the sixth day of the month. FD forecast data can be used for several hours before or after the stated valid time. This is indicated by the text "FOR USE" followed by the time range. For example, "FOR USE 21 – 06" means that this particular forecast may be used for a 9-hr period from 21Z to 06Z.

During flight planning, care must be exercised to ensure that the correct FD forecast is selected and the associated "FOR USE" coverage is appropriate for the time of the proposed flight.

Forecasts in digital form of the winds and temperatures aloft (FB), an improvement over FD forecasts, are now available over the phone. FB forecasts are updated four times per day. Over the next couple of years, FB forecasts will gradually replace FD forecasts for most flight planning purposes. Further information is available in the MANAIR, which can be found on ECCC's Web site. Forecasts of upper winds and temperatures are also available in chart form.

1.3.8 Air Traffic Control (ATC) Weather Assistance

ATC will issue information on significant weather and assist pilots in avoiding weather areas when requested. However, for reasons of safety, an IFR flight must not deviate from an assigned course or altitude/flight level without a proper ATC clearance. When weather conditions encountered are so severe that an immediate deviation is determined to be necessary, and time will not permit approval by ATC, the pilot's emergency authority may be exercised. However, when such action is taken, ATC should be advised of the flight alteration as soon as practicable.

When a pilot requests clearance for a route deviation or for an ATC radar vector and ATC operational boundaries have to be crossed,the controller must evaluate the air traffic situation in the affected area and coordinate with other controllers before replying to the request.

It should be remembered that the controller's primary function is to provide safe separation between aircraft. Any additional service, such as weather avoidance assistance, can only be provided to the extent that it does not detract from the primary function. Also note that the separation workload for the controller generally increases when weather disrupts the usual flow of traffic. ATC radar limitations and frequency congestion are also a factor in limiting the controller's capability to provide additional services.

It is important, therefore, that the request for a deviation or radar vector be forwarded to ATC as far in advance as possible. Delay in submitting it may delay or even preclude ATC approval or require that additional restrictions be placed on the clearance. Pilots should respond to a weather advisory by requesting: a deviation off course and stating the estimated number of miles and the direction of the requested deviation; a new route to avoid the affected area; a change of altitude; or radar vectors around the affected areas.

The following information should be given to ATC as early as possible when requesting clearance to detour around weather activity:

a) proposed route and extent of detour (direction and distance);

b) flight conditions (IMC or VMC); and

c) whether or not the aircraft is equipped with a functioning cockpit weather radar.

The assistance that might be given by ATC will depend upon the weather information available to controllers. Owing to the often transitory nature of severe weather situations, the controller's weather information may be of only limited value if based on weather observed on radar only. Frequent updates by pilots, giving specific information as to the area affected, altitudes, intensity and nature of the severe weather, are of considerable value. Such PIREPs receive immediate and widespread dissemination to aircrew, dispatchers and aviation forecasters.

1.3.9 Supplementary Information

1.3.9.1 Weather Radar

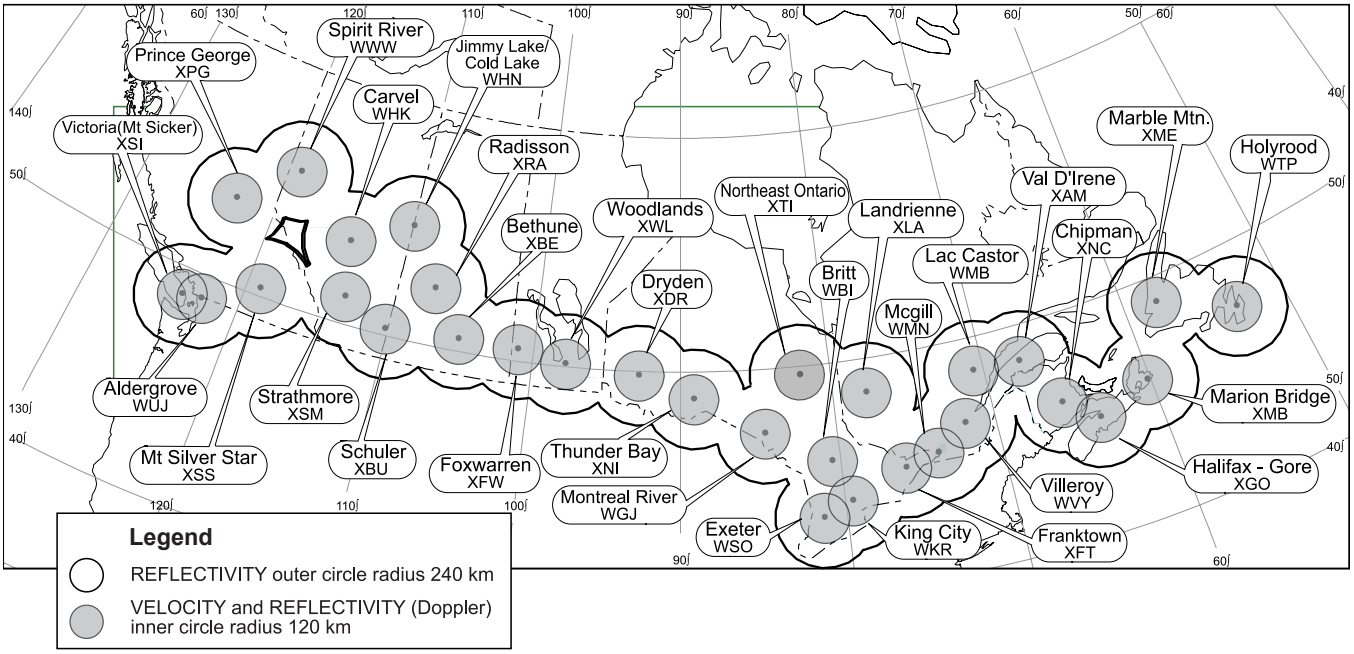
Weather radars typically present a display of precipitation within 150 NM of the facility site; storms of considerable height and intensity can be seen at greater ranges. However, it should be noted that these radars cannot detect turbulence. The turbulence associated with a very heavy rate of rainfall will generally be significantly more severe than that associated with light rainfall.

ECCC and DND operate a series of weather radars across Canada that provide frequent reports of precipitation echo tops and precipitation reflectivity. Radar images are updated approximately every 10 min for individual radars. A colour composite radar product, which depicts either echo tops or precipitation reflectivity, is also available on NAV CANADA's Aviation Weather Web Site (AWWS), from the Flight planning section at <www.navcanada.ca/EN/products-and-services/Pages/flight-planning.aspx>. Over the next few years, the weather radar network will be improved to offer better images and updates every 6 minutes. During the upgrades, radars will be unavailable and information from neighbouring radars will need to be used.

Detailed and real time information from the CLDN is available to the FICs and ACCs, which are both able to provide verbal descriptions to pilots.

1.3.9.2 ECCC/DND Weather Radar Network

Figure 1.1—ECCC/DND Weather Radar Network



1.4 In-Flight Meteorological Information (VOLMET)

In-flight meteorological information (VOLMET) is meteorological information for aircraft in flight, particularly over the high seas. VOLMET contains aerodrome routine meteorological reports (METARs) and aerodrome forecasts (TAFs) for selected aerodromes and may be provided either by data link (D-VOLMET) or by voice broadcasts on designated frequencies, normally high frequency (HF).

Information on the content, issue times and transmitter frequencies for North Atlantic (NAT) VOLMET broadcasts is given in the *Canada Flight Supplement* (CFS), Section D, Radio Navigation and Communications.

2.0 PILOT WEATHER REPORTS (PIREPs)

2.1 General

A pilot weather report (PIREP) is a report pertaining to current weather conditions encountered by aircraft in flight. A PIREP is extremely useful to other pilots, forecasters, dispatchers and weather briefers as it provides up-to-the-minute weather information to supplement what is received from meteorological observing stations. In addition, a PIREP is an invaluable data source for aviation meteorologists because it either confirms an existing forecast or highlights the requirement for an amendment. A PIREP may also be the only information available regarding areas between reporting stations, particularly those areas whose topography may produce localized weather phenomena (e.g. hills or expanses of water). Urgent PIREPs are issued for atmospheric conditions that are an immediate hazard for all aviation users.

Pilots are encouraged to file brief reports of weather conditions when giving position reports, especially reports of any significant atmospheric phenomena. They are also encouraged to report conditions that differ significantly from those that were forecast. PIREPs that contain critical information on low clouds, reduced visibility, icing, and convective activities such as wind shear, squall line, turbulence, thunderstorms and cumulonimbus clouds are especially useful. PIREPs of hazardous conditions may trigger the issuance of significant meteorological information (SIGMET).

For timely distribution, PIREPs should be filed with a flight information centre (FIC) via an en route frequency or a toll-free call to a FIC after landing. PIREPs received by flight service personnel are immediately disseminated on meteorological communications circuits and provided to other air traffic service (ATS) units and the Canadian Meteorological Aviation Centres (CMAC).

Controllers, flight service specialists and community aerodrome radio station (CARS) observer/communicators (O/Cs) may request reports from pilots regarding specific weather conditions or weather conditions encountered during en route, climb-out or approach phases.

The *Canada Flight Supplement* (CFS) contains the toll-free FIC telephone numbers in the Flight Planning entry of each listed aerodrome. The recommended contents of a PIREP are listed

in the Planning section and on the exterior back cover of the CFS (hard copy).

2.1.1 Pilot Weather Report (PIREP) Example

Example:

UACN10 CYXU 032133 YZ UA /OV YXU 090010 /TM 2120 /FL080 /TP PA31 /SK 020BKN040 110OVC /TA -12 /WV 030045 /TB MDT BLO 040 /IC LGT RIME 020-040 /RM NIL TURB CYYZ-CYHM

Table 2.1—PIREP Example

PIREP EXAMPLE	DECODED EXAMPLE
UACN10	*Message Type*: Regular PIREP. Urgent PIREPs are encoded as UACN01 or UUA.
CYXU	*Issuing office*: London FIC.
032133	*Date/Time of Issue*: 3rd day of the month, at 2133Z.
YZ	*FIR*: Toronto. If the PIREP extends into an adjacent FIR, both FIRs will be indicated.
UA /OV YXU 090010	*Location*: London VOR 090˚ radial, 10 NM. PIREP location will be reported with reference to a NAVAID, airport or geographic coordinates (latitude/ longitude).
/TM 2120	*Time of PIREP*: 2120Z
/FL080	*Altitude*: 8 000 ft ASL. Altitude may also be reported as "DURD" (during descent), "DURC" (during climb) or "UNKN" (unknown).
/TP PA31	*Aircraft Type*: Piper Navajo (PA31).
/SK 020BKN 040 110OVC	*Sky Cover*: First layer of cloud based at 2 000 ft with tops at 4 000 ft ASL. Second layer of cloud based at 11 000 ft ASL.
/TA -12	*Air Temperature*: -12°C.
/WV 030045	*Wind Velocity*: Wind direction 030° true, wind speed 45 kt. Wind direction reported by pilots in degrees magnetic will subsequently be converted to degrees true for inclusion in PIREP.
/TB MDT BLO 040	*Turbulence*: Moderate turbulence below 4 000 ft ASL.
/IC LGT RIME 020-040	*Icing*: Light rime icing (in cloud) between 2 000 ft ASL and 4 000 ft ASL.
/RM NIL TURB CYYZ-CYHM	*Remarks*: No turbulence encountered between Toronto and Hamilton.

NOTE:
Supplementary information for any of the PIREP fields may be included in the remarks (RM) section of the PIREP.

2.2 Clear Air Turbulence (CAT)

2.2.1 General

CAT remains a problem for flight operations, particularly above 15 000 ft. The best information available on this phenomenon is still obtained from PIREPs, since a CAT forecast is generalized and covers large areas. All pilots encountering CAT conditions are requested to urgently report the time, location, flight level and intensity (light, moderate, severe, or extreme) of the phenomena to the facility with which they are maintaining radio contact. (See the Turbulence Reporting Criteria Table, MET 2.2.2) A more complete description of CAT and recommended pilot actions can be found in AIR 2.10.

2.2.2 Turbulence Reporting Criteria

Table 2.2—Turbulence Reporting Criteria

INTENSITY	AIRCRAFT REACTION	REACTION INSIDE AIRCRAFT
LIGHT	Turbulence that momentarily causes slight, erratic changes in altitude and/or attitude (pitch, roll, yaw). Report as "light turbulence". OR Turbulence that causes slight, rapid and somewhat rhythmic bumpiness without appreciable changes in altitude or attitude. Report as "light chop".	Occupants may feel a slight strain against seat belts or shoulder straps. Unsecured objects may be displaced slightly. Food service may be conducted and little or no difficulty is encountered in walking.
MODERATE	Turbulence that is similar to light turbulence but of greater intensity. Changes in altitude and/or attitude occur but the aircraft remains in positive control at all times. It usually causes variations in indicated airspeed. Report as "moderate turbulence". OR Turbulence that is similar to light chop but of greater intensity. It causes rapid bumps or jolts without appreciable changes in aircraft altitude or attitude. Report as "moderate chop".	Occupants feel definite strains against seat belts or shoulder straps. Unsecured objects are dislodged. Food service and walking are difficult.
SEVERE	Turbulence that causes large, abrupt changes in altitude and/or attitude. It usually causes large variations in indicated airspeed. Aircraft may be momentarily out of control. Report as "severe turbulence".	Occupants are forced violently against seat belts or shoulder straps. Unsecured objects are tossed about. Food service and walking impossible.

The terms "occasional", "intermittent" and "continuous" are used to describe reported turbulence. Turbulence is considered occasional when it occurs less than 1/3 of the time, intermittent when it occurs 1/3 to 2/3 of the time and continuous when it occurs more than 2/3 of the time.

Pilots should report location(s), time (UTC), intensity, whether in or near clouds, altitude, type of aircraft and, when applicable, the duration of turbulence. Duration may be based on time between two locations or over a single location. All locations should be readily identifiable.

Examples:

1. Over REGINA 1232Z, moderate turbulence, in cloud FL310, B737.
2. From 50 NM EAST of WINNIPEG to 30 NM WEST of BRANDON 1210 to 1250Z occasional moderate chop, FL330, AIRBUS 320.

High-level turbulence (normally above 15 000 ft ASL) not associated with cumuliform clouds, including thunderstorms, should be reported as CAT preceded by the appropriate intensity or chop type.

2.3 Wind Shear (WS)

Intense down drafts, typically associated with thunderstorms, produce strong vertical and horizontal wind shear (WS) components that are a hazard to aircraft in the approach, landing, or take-off phase of flight (see AIR 2.8). Since ground-based instruments that measure WS have not been installed at Canadian aerodromes, the presence of such conditions can normally be deduced only from pilot weather reports (PIREPs). Aircraft equipped with Reactive Wind Shear Systems (RWSs) can provide pilots with guidance to conduct a WS escape manoeuvre. Aircraft with Predictive Wind Shear Systems (PWSs) may allow pilots to avoid or minimize effects of WS (see RAC 6.1).

Aircrews capable of reporting the wind and altitude, both above and below the shear layer, from flight management systems (FMSs) are requested to do so. Pilots without this equipment should report WS by stating the loss or gain of airspeed and the altitude at which it was encountered. Pilots unable to report WS in terms of this specific information should do so in terms of its general effect on the aircraft.

2.4 Airframe Icing

Report icing to air traffic service (ATS) and, if operating instrument flight rules (IFR), request a new routing or altitude if icing will be a hazard. Provide the aircraft identification, type, location, time (Coordinated Universal Time [UTC]), intensity of icing, type, altitude or flight level, and indicated airspeed. See the suggested format on the back cover of the *Canada Flight Supplement* (CFS).

The following describes icing and how to report icing conditions:

Table 2.3—Icing Intensity

INTENSITY	ICE ACCUMULATION
Trace	Ice becomes perceptible. The rate of accumulation is slightly greater than the rate of sublimation. It is not hazardous, even though de-icing or anti-icing equipment is not used, unless encountered for an extended period of time (over 1 hr).
Light	The rate of accumulation may create a problem if flight is prolonged in this environment (over 1 hr).
Moderate	The rate of accumulation is such that even short encounters become potentially hazardous, and use of de-icing or anti-icing equipment or diversion is necessary.
Severe	The rate of accumulation is such that de-icing or anti-icing equipment fails to reduce or control the hazard. Immediate diversion is necessary.

Table 2.4—Icing Types

Icing Types	
Rime ice	Rough, milky, opaque ice formed by the instantaneous freezing of small supercooled water droplets.
Clear ice	Glossy, clear, or translucent ice formed by the relatively slow freezing of large supercooled water droplets.
Mixed ice	Both rime and clear icing occurring at the same time.

2.5 Volcanic Ash

Flight operations in volcanic ash are hazardous (see AIR 2.6). Pilots may be the first line of volcanic eruption detection in more remote areas. Pilots may be able to provide valuable information about the spread of volcanic ash from an eruption; ash can rapidly rise to altitudes above 60 000 ft and exist at hazardous concentrations up to 1 000 NM from the source. Volcanic ash is not detectable on radar. If an eruption or ash cloud is detected, an urgent pilot weather report (PIREP) should be filed with the nearest air traffic service (ATS) unit.

A volcanic ash forecast chart is produced when required (see MET 13.0).

2.6 Pilot Estimation of Surface Wind

Surface wind direction and speed is information critical to effective pilot decision-making for takeoff and landing. Where neither wind measuring equipment nor a wind direction indicator (see AGA 5.9) is available, the wind direction and speed can be estimated by observing smoke, dust, flags or wind lines on bodies of water.

Pilots on the ground may estimate wind speed and direction by using anything that is free to be moved by the influence of the wind. The descriptions in the Beaufort Wind Scale found in Table 2.5 have been found to be particularly useful and are widely used.

Wind direction can also be estimated accurately by simply facing the wind. Such estimates should only be provided to the nearest eight points (i.e. north, northeast, east) of the compass. The best estimate is obtained by standing in an open area clear of obstructions. Should this not be possible, estimation errors may be so significant that pilots using the information should exercise caution. The direction and speed of low-lying clouds can be an indicator of surface winds but should also be used with caution because of the possibility of wind shear near the surface.

Pilots who relay reports of winds based on estimation should ensure that the intended user of the information is aware that it is based on estimation so that appropriate precautions can be taken.

Table 2.5—Beaufort Wind Scale

Descriptive Term	Beaufort Force	Speed Range (kt)	Average (kt)	Specification for estimating wind over land	Specification for estimating wind over sea (probable wave height in metres*)
Calm	0	Less than 1	—	Smoke rises vertically.	Sea is like a mirror (0).
Light Air	1	1–3	2	Direction of wind shown by smoke.	Ripples with the appearance of scales are formed, but without foam crest (0.1).
Light Breeze	2	4–6	5	Wind felt on face; leaves rustle; ordinary vane moved by wind.	Small wavelets, still short but more pronounced; crests have a glassy appearance and do not break (0.2 to 0.3).
Gentle Breeze	3	7–10	9	Leaves and small twigs in constant motion; wind extends light flag.	Large wavelets; crests begin to break; foam of glassy appearance; perhaps scattered white horses (0.6 to 1).
Moderate Breeze	4	11–16	14	Raises dust and loose paper; small branches are moved.	Small waves becoming longer; fairly frequent white horses (1 to 1.5).
Fresh Breeze	5	17–21	19	Small trees in leaf begin to sway; crested wavelets form on inland waters.	Moderate waves, taking a more pronounced long form; many white horses are formed, chance of some spray (2 to 2.5).
Strong Breeze	6	22–27	25	Large branches in motion; whistling heard in telephone wires; umbrellas used with difficulty.	Large waves begin to form; the white foam crests are more extensive everywhere, probably some spray (3 to 4).
Near Gale	7	28–33	31	Whole trees in motion; inconvenience felt in walking against wind.	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind (4 to 5.5).
Gale	8	34–40	37	Breaks twigs off trees; generally impedes progress.	Moderately high waves of greater length; edges of crests begin to break into the spindrift; the foam is blown in well-marked streaks along the direction of the wind (5.5 to 7.5).
Strong Gale	9	41–47	44	Slight structural damage occurs to roofing shingles, TV antennae, etc.	High waves; dense streaks of foam along the direction of the wind; crests of waves begin to topple, tumble and roll over; spray may affect visibility (7 to 10).
Storm	10	48–55	52	Seldom experienced inland; trees uprooted; considerable structural damage.	Very high waves with long, overhanging crests; the resulting foam, in great patches, is blown in dense white streaks along the direction of the wind; on the whole, the surface of the sea takes on a white appearance; the tumbling of the sea becomes heavy and shock-like; visibility affected (9 to 12.5).
Violent Storm	11	56–63	60	Very rarely experienced; accompanied by widespread damage.	Exceptionally high waves (small- and medium-sized ships might be lost to the view behind the waves); the sea is completely covered with long white patches of foam lying along the direction of the wind; everywhere the edges of the wave crests are blown into froth; visibility affected (11.5 to 16).
Hurricane	12	Above 63			The air is filled with foam and spray; sea completely white with driving spray; visibility seriously affected (16+).

* Wave height is representative of conditions well away from shore and in deep water when winds of that strength have persisted for an extended period of time. The wave height figure does not give the maximum wave height nor does it take into account the effects of swell, air temperature or currents.

3.0 CANADIAN WEATHER INFORMATION

3.1 Aviation Forecasts and Charts

Table 3.1—Aviation Forecasts and Charts

ITEM AND TYPE DESIGNATOR	TIME ISSUED	VALIDITY PERIODS	APPLICABLE LEVEL	REMARKS
GFA	Approximately 30 min before the beginning of the forecast period	0000Z, 0600Z, 1200Z, 1800Z. Each new set of GFA charts replaces the preceding one.	At or below 24 000 ft	Graphically depicts forecast weather elements affecting flight at a specific time over a particular area.
TAF	Approximately 20 min before the beginning of the validity period	Forecasts are generally issued every 6 hr with validity periods up to a maximum of 30 hr. Issue and update periods may vary—check the CFS. Next issue time is stated at the end of each TAF.	Surface (includes clouds at levels that can be seen from the surface)	The TAF is the forecaster's best judgment of the most probable weather conditions expected to occur at an aerodrome, together with their most probable time of occurrence. It is designed to meet the pre-flight and in-flight requirements of flight operations. TAFs are intended to relate to weather conditions for flight operations within 5 NM of the centre of the runway complex, depending on local terrain.
Amended Forecast	Forecasts will be amended when significant changes in ceiling or visibility occur, or when freezing precipitation begins, or is expected to occur, although it was not previously predicted. Amendments are also issued for significant changes in wind or present weather.			
SIGMET (WSCN, WCCN, WVCN)	A message issued by a MWO to advise pilots of the occurrence or expected occurrence of specified weather phenomena, which may affect the safety of aircraft operations, and the development of those phenomena in time and space.			
Upper Level Wind and Temperature Forecast (FD)	0330Z* 0330Z* 0330Z* 1530Z** 1530Z** 1530Z**	0500Z–0900Z 0900Z–1800Z 1800Z–0500Z 1700Z–2100Z 2100Z–0600Z 0600Z–1700Z	3 000 ft 6 000 ft 9 000 ft 12 000 ft 18 000 ft	Predicts upper winds and temperatures in numerical form at standard levels for a given time period and location.
	0200Z 0200Z 0200Z 1400Z 1400Z 1400Z	0500Z–0900Z 0900Z–1800Z 1800Z–0500Z 1700Z–2100Z 2100Z–0600Z 0600Z–1700Z	24 000 ft 30 000 ft 34 000 ft 39 000 ft 45 000 ft 53 000 ft	Upper level wind and temperature forecasts are issued by WAFCs.
Upper Level Forecast Chart —PROG	12 hr before valid time	0000Z 0600Z 1200Z 1800Z	FL 240 FL 340 FL 390 FL 450	Depicts forecast wind and temperatures for the chart level.
Significant Weather Forecast Chart —PROG	12 hr before valid time	0000Z 0600Z 1200Z 1800Z	FL 100–FL 240 FL 250–FL 630	Charts are for a specific flight level range. They indicate surface positions of lows and highs and any significant weather, such as thunderstorms, turbulence and mountain waves, applicable to the chart.

* Based on upper atmosphere observations taken at 000Z.
** Based on upper atmosphere observations taken at 1200Z.

Table 3.2—Upper Level Wind and Temperature Forecasts Issued as FB

OBSERVATION TIME (UTC)	APPROXIMATE ISSUE TIME (UTC)	VALID TIME (UTC)	PERIOD OF USE (UTC)
0000	0320	0600	0200–0900
0000	0330	1200	0900–1800
0000	0330	0000	1800–0600
0600	0920	1200	0800–1500
0600	0930	1800	1500–0000
0600	0930	0600	0000–1200
1200	1520	1800	1400–2100
1200	1530	0000	2100–0600
1200	1530	1200	0600–1800
1800	2120	0000	2000–0300
1800	2130	0600	0300–1200
1800	2130	1800	1200–0000

3.2 Aviation Weather Reports

Table 3.3—Aviation Weather Reports

ITEM AND TYPE DESIGNATOR	TIME OBSERVED	REMARKS
METAR	Every hour on the hour	Describes actual weather at a specific location and at a specific time as observed from the ground. SPECIs are issued when required. METARs are not available 24 hr a day at all aerodromes; see CFS for observation program schedule.
PIREP/URGENT PIREP (UA/UUA)	As reported	Observations of actual conditions reported by pilots during flight.
Volcanic Ash Report (FV)	As required	Describes in graphical format the current and expected ash cloud dispersion and densities at various flight levels.

3.3 Weather Charts

The international practice is to label the levels in upper level weather charts in hectopascals (hPa) rather than millibars (mb) and this will be increasingly adopted in Canada. Note, however, that 1 mb equals 1 hPa.

Table 3.4—Weather Charts

ITEM AND TYPE DESIGNATOR	TIME OBSERVED	TIME ISSUED	REMARKS
Surface Weather Chart	0000Z 0600Z 1200Z 1800Z	2 or 3 hr after observation	Analysis of mean sea level pressure pattern, surface location of fronts, surface precipitation and obstructions to vision based on reports. Surface pressure patterns can be considered as representative of the atmosphere up to 3 000 ft. Weather visible from the surface at any level is included.
Upper Level Chart—ANAL	0000Z 1200Z	Over 3 hr after observation	Charts prepared for following levels: 850 hPa (1 500 m / 5 000 ft) 700 hPa (3 000 m / 10 000 ft) 500 hPa (5 500 m / 18 000 ft) 250 hPa (10 400 m / 34 000 ft) Charts show reported atmospheric conditions at the pressure levels, such as wind speed and direction, temperatures, and moisture content.

4.0 GRAPHIC AREA FORECASTS (GFA)

4.1 General

The graphic area forecast (GFA) consists of a series of temporally adjusted weather charts, each depicting the most probable meteorological conditions expected to occur at or below 24 000 ft over a given area at a specified time. The GFA is primarily designed to meet general aviation and regional airline requirements for pre-flight planning in Canada.

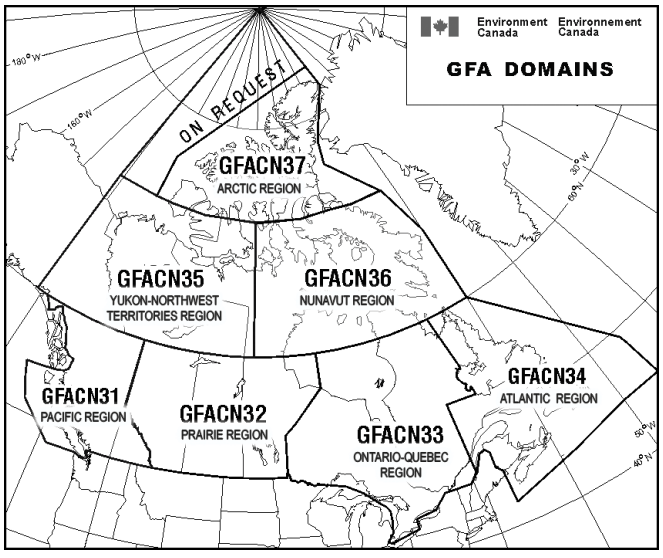
4.2 Issue and Valid Times

Graphic area forecast (GFA) charts are issued four times daily, approximately 30 min before the beginning of the forecast period. The GFA is issued at approximately 2330, 0530, 1130 and 1730 UTC and is valid at 0000, 0600, 1200 and 1800 UTC respectively. Each issue of the GFA consists of six charts: two charts valid at the beginning of the forecast period; two charts valid six hours into the forecast period; and the final two charts valid twelve hours into the forecast period. Of the two charts valid at each of the three forecast periods, one chart depicts clouds and weather while the other chart depicts icing, turbulence and freezing level. An instrument flight rules (IFR) outlook for an additional 12-hr period is also included in the comments box of the final clouds and weather chart.

4.3 Coverage Area

There are seven distinct graphic area forecast (GFA) areas, covering the entire Canadian domestic airspace (CDA), over which Canada is responsible for the provision of air traffic control (ATC) services. The following map illustrates the GFA coverage areas.

Figure 4.1—GFA Coverage Areas



MET

4.4 Units of Measure

Speeds in the graphic area forecast (GFA) are expressed in knots and heights in hundreds of feet. Horizontal visibility is measured in statute miles and all times are stated in Coordinated Universal Time. A nautical mile scale bar is included to assist in determining approximate distances on the chart. All heights are measured ASL unless otherwise noted.

4.5 Abbreviations and Symbols

Only standard meteorological abbreviations are used in the graphic area forecast (GFA). Symbols used in the GFA are consistent with those found on similar meteorological products described in this document such as significant weather prognostic charts (MET 12.0).

4.6 Layout

Each graphic area forecast (GFA) chart is divided into four parts: title box; legend box; comments box; and weather information section.

Table 4.1—GFA Layout

Weather Information Section	Title Box
	Legend Box
	Comments Box

4.7 Title Box

The title box includes the chart name; the issuing office four-letter identification; the name of the graphic area forecast (GFA) region; the chart type; the date and time of issue; and the valid date and time of the chart. The title box is found in the upper right corner of the GFA.

In the following example, the title box indicates the GFA name (GFACN33) and that it is issued by Canadian Meteorological Centre Network Operations in Montréal (CWAO). The GFA region for the sample chart is ONTARIO–QUÉBEC and the type of chart is clouds and weather. The next section indicates the date and time the GFA chart was issued, which was September 17, 2014, at 1130Z. The last section states the valid date and time for the GFA chart which, in this example, was September 18, 2014, at 0000Z.

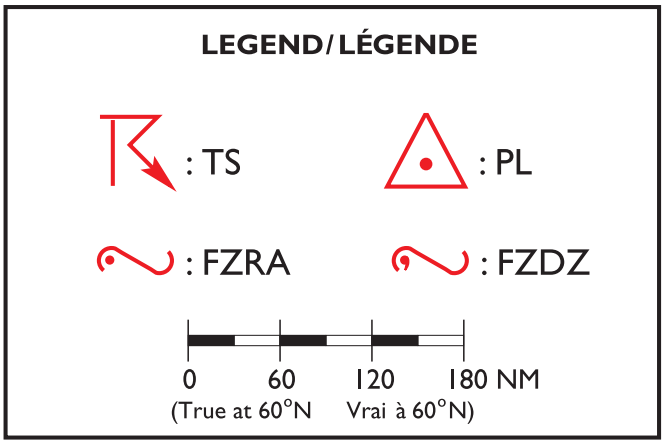
Table 4.2—GFA Title Box

GFACN33 CWAO REGION ONTARIO–QUÉBEC CLOUDS AND WEATHER NUAGES ET TEMPS		
ISSUED AT ÉMIS A	17/09/2014	1130Z
VLD	18/09/2014	0000Z

4.8 Legend Box

The legend box includes weather symbols that may be used in the weather information part of the graphic area forecast (GFA) chart. It also includes a nautical mile scale bar to facilitate the determination of distances. Symbols used in the GFA are consistent with those used in a significant weather prognostic chart. In the following example, symbols for thunderstorm (TS), ice pellets (PL), freezing rain (FZRA) and freezing drizzle (FZDZ) are indicated in the legend box. These symbols are depicted in red when shown in colour.

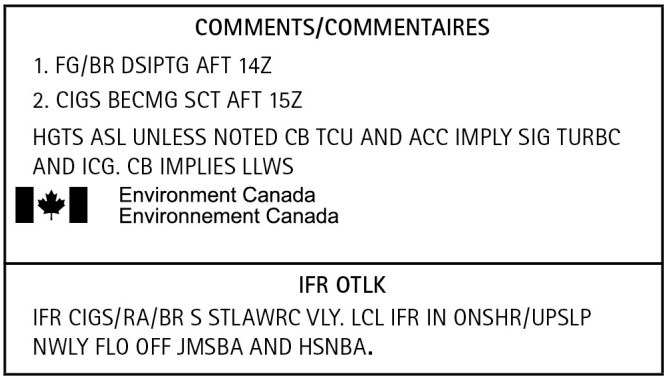
Figure 4.2—GFA Legend Box



4.9 Comments Box

The comments box provides information that the weather forecaster considers important (e.g. formation or dissipation of fog, increasing or decreasing visibility). It is also used to describe elements that are difficult to render pictorially or, if added to the depiction, would cause the chart to become cluttered (e.g. light icing). The standard phrases "HGTS ASL UNLESS NOTED" and "CB TCU AND ACC IMPLY SIG TURBC AND ICG. CB IMPLIES LLWS" are also included in the comments box.

Figure 4.3—GFA Comments Box



In this example, the forecaster has added two comments. The first indicates that the fog/mist will dissipate after 1400 UTC. The second comment advises that ceilings will become scattered after 1500 UTC.

The comments box of the 12-hr clouds and weather graphic area forecast (GFA) chart also includes an instrument flight rules (IFR) outlook for an additional 12-hr period in the lower section of the box. The IFR outlook is always general in nature, indicating the main areas where IFR weather is expected, the cause for the IFR weather and any associated weather hazards. In the example given, IFR conditions caused by low ceilings (CIG), rain (RA) and mist (BR) south of the St. Lawrence Valley are forecast. Also, local IFR conditions are forecast because of an onshore (ONSHR) and upslope (UPSLP) northwesterly flow of air from James Bay (JAMSBA) and Hudson's Bay (HSNBA).

For meteorological purposes, the IFR outlook is based on the following.

Table 4.3—IFR Outlook Criteria

CATEGORY	CEILING		VISIBILITY
IFR	less than 1 000 ft AGL	and/or	less than 3 SM
MVFR	between 1 000 ft and 3 000 ft AGL	and/or	between 3 and 5 SM
VFR	more than 3 000 ft AGL	and	more than 5 SM

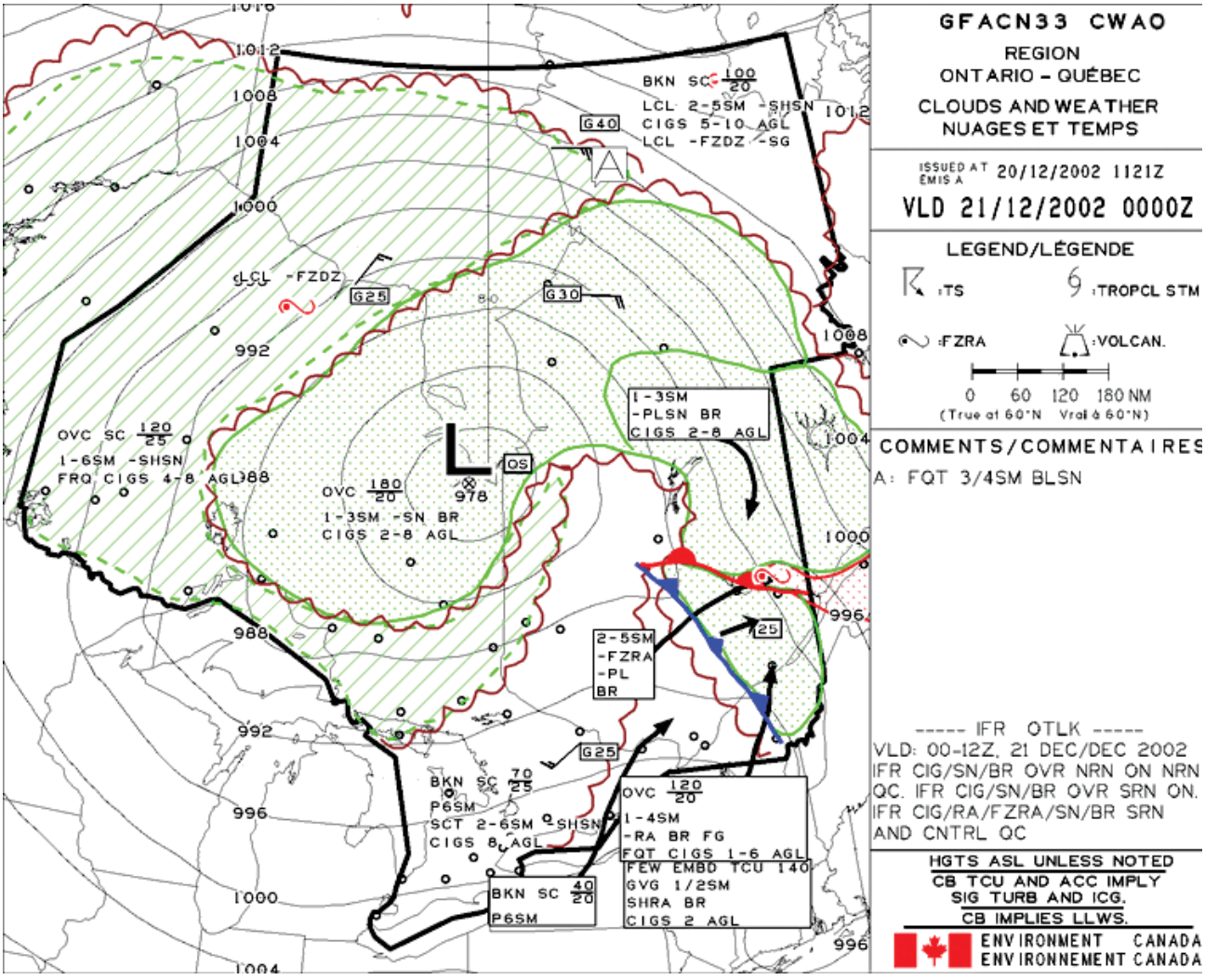
In the event that no organized IFR conditions are expected in the outlook period, NIL SIG WX is written in the comment box. Only IFR conditions are included in the IFR outlook of the GFA. Marginal visual flight rules (MVFR) conditions are defined in the table for reference only.

4.10 Weather Information

The weather information part of the chart depicts either a forecast of the clouds and weather conditions or a forecast of the icing, turbulence and freezing level conditions for a specified time.

4.11 Clouds and Weather Chart

Figure 4.4(a)—Example of a GFA Clouds and Weather Chart

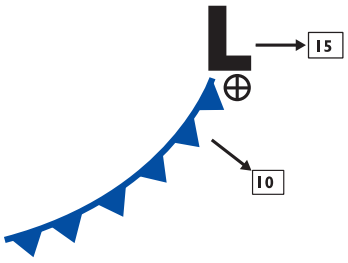


MET

The graphic area forecast (GFA) clouds and weather chart provides a forecast of cloud layers and/or surface-based phenomena, visibility, weather and obstructions to vision at the valid time indicated. Lines joining points of equal surface pressure (isobars) are depicted at 4-hPa intervals. In addition, relevant synoptic features that are responsible for the portrayed weather are also depicted, with an indication of their speed and direction of movement at the valid time.

a) *Synoptic features*—The motion of synoptic features when the speed of movement is forecast to be 5 kt or more will be indicated by an arrow and a speed value. For speeds less than 5 kt, the letters QS (quasi-stationary) are used. A low-pressure centre moving eastward at 15 kt with an associated cold front moving southeast at 10 kt would be indicated as follows:

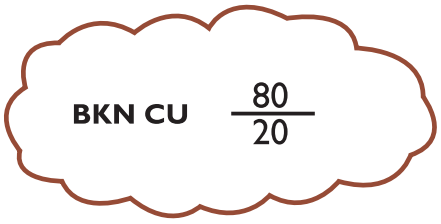
Figure 4.4(b)—Synoptic Features



b) *Clouds*—The bases and tops of forecast clouds between the surface and 24 000 ft ASL will be indicated on the GFA clouds and weather chart. The tops of convective clouds (i.e. TCU, ACC, CB) are indicated, even if they extend above 24 000 ft ASL. Cirrus clouds are not depicted on the chart. The cloud type will be indicated if considered significant; however, convective clouds, such as CU, TCU, ACC and CB, will always be stated if forecast to be present.

A scalloped border, depicted in brown when shown in colour, encloses organized areas of clouds where the sky condition is either broken (BKN) or overcast (OVC). An organized area of broken cumulus clouds based at 2 000 ft ASL with tops at 8 000 ft ASL would be indicated as follows:

Figure 4.4(c)—Organized Area of Clouds (scalloped border)



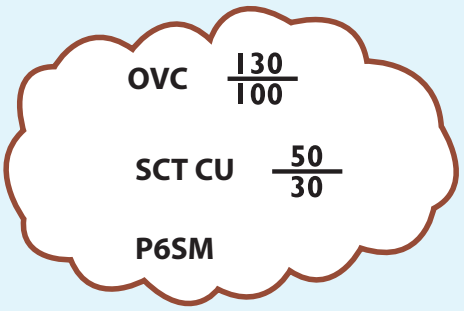
Where organized areas of clouds are not forecast and visibility is expected to be greater than 6 SM, a scalloped border is not used. In these areas, the sky condition is stated using the terms SKC, FEW or SCT. In the following example, unorganized scattered clouds are forecast based at 3 000 ft ASL with tops at 5 000 ft ASL:

Figure 4.4(d)—Unorganized Area of Clouds (no scalloped border)

SCT $\frac{50}{30}$

When a forecasted cloud deck contains more than one significant cloud layer, the cloud amount description depends on the space between the layers. When the separation is less than 2 000 ft, the descriptor represents the summation amount across all the layers, and the term LYRS is included immediately after it. When the separation is 2 000 ft or greater, each layer is stated, with its own descriptor that applies only to that layer. The bases and tops of each layer are indicated. For instance, a scattered layer of cumulus cloud based at 3 000 ft ASL with tops at 5 000 ft ASL and a higher overcast layer of cloud based at 10 000 ft ASL with tops at 13 000 ft ASL would be indicated as follows:

Figure 4.4(e)—Multiple Cloud Layers



All heights are indicated in hundreds of feet above sea level (2 means 200 ft, 45 means 4 500 ft, etc.) unless otherwise specified. Above ground level heights are indicated by the abbreviations CIG and AGL (e.g. CIGS 5–10 AGL). A note to this effect is included in the comments box in the lower right hand corner of the chart.

c) *Surface-based layers*—The vertical visibility into surface-based layers is measured in hundreds of feet AGL. Local obscured ceilings with a vertical visibility of between 300 and 500 ft AGL would be indicated as follows:

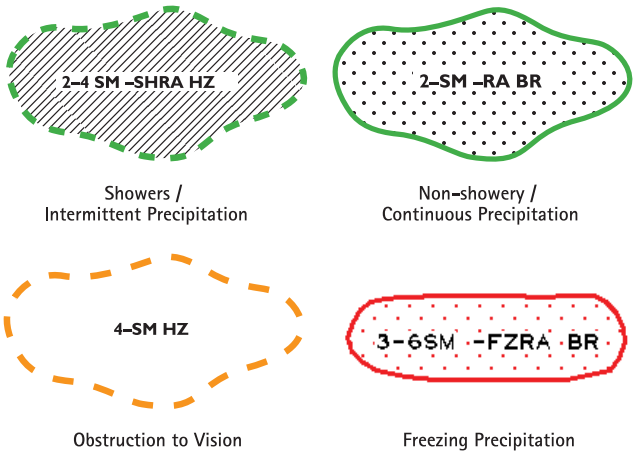
LCL CIGS 3–5 AGL

d) *Visibility*—The forecast visibility is measured in statute miles. When the visibility is expected to be greater than 6 SM, it is indicated as P6SM. A forecast visibility that is expected to vary between 2 and 4 SM with light rain showers would be indicated as:

2–4SM -SHRA

e) *Weather and obstructions to vision*—Forecast weather is always included immediately after visibility. Obstructions to vision are only mentioned when visibility is forecast to be 6 SM or less (e.g. 2–4SM –RA BR). Only standard abbreviations are used to describe weather and obstructions to vision. Areas of showery or intermittent precipitation are shown as hatched areas enclosed by a dashed green line when colour is used. Areas of continuous precipitation are shown as stippled areas enclosed by a solid green line when colour is used. Areas of obstruction to vision not associated with precipitation, where visibility is 6 SM or less, are enclosed by a dashed orange line when colour is used. Areas of freezing precipitation are depicted in red and enclosed by a solid red line when colour is used.

Figure 4.4(f)—Weather and Obstructions to Vision



Weather and obstructions to vision in the GFA may include spatial qualifiers, which describe the coverage of the depicted meteorological phenomena.

Convective clouds and showers:

Table 4.4—Convective Clouds and Showers

Abbreviation	Description	Spatial Coverage
ISOLD	Isolated	25% or less
OCNL	Occasional	26–50%
FRQ	Frequent	Greater than 50%

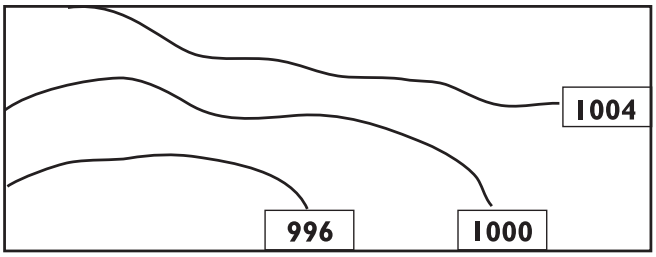
Non-convective clouds and precipitation, low stratus ceilings, precipitation ceilings, icing, turbulence, and restrictions to visibility:

Table 4.5—Non Convective Clouds and Precipitation

Abbreviation	Description	Spatial Coverage
LCL	Local	25% or less
PTCHY	Patchy	26–50%
XTNSV	Extensive	Greater than 50%

f) *Isobars*—These lines joining points of equal mean sea level pressure are depicted on the GFA clouds and weather chart. Isobars are drawn at 4-hPa intervals from a reference value of 1 000 hPa.

Figure 4.4(g)—Isobars



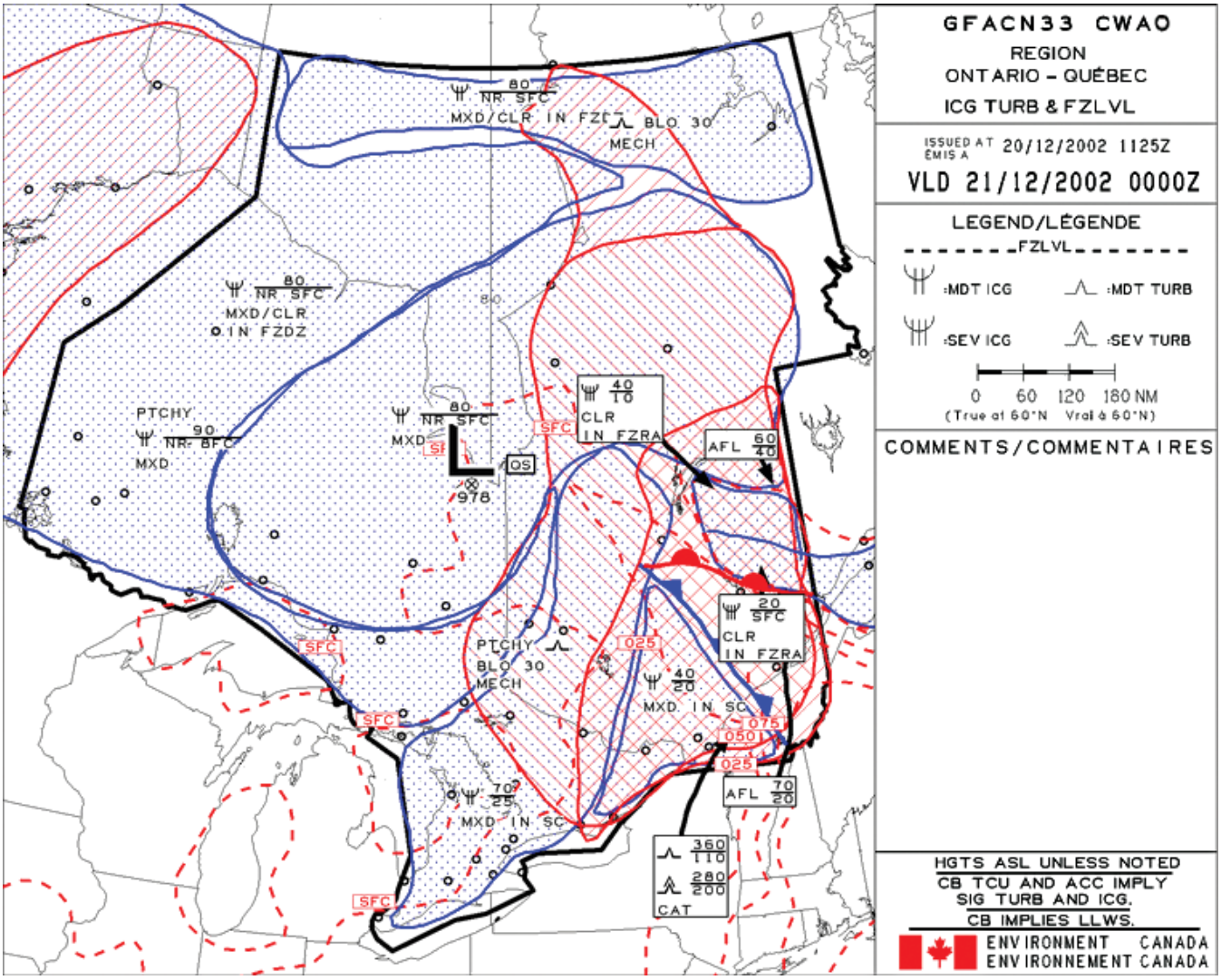
g) *Surface winds*—The speed and direction of forecast surface winds with a sustained speed of at least 20 kt are indicated by wind barbs and an associated wind-speed value. When accompanied by strong gusts, mean sustained winds of less than 20 kt may also be included, at the forecaster's discretion, if moderate mechanical turbulence is expected to occur as a result of the wind gusts. Wind gusts are indicated by the letter "G," followed by the peak gust speed in knots. In the following example, the surface wind is forecast to be from the west (270° true) with a speed of 25 kt and a peak gust speed of 35 kt.

Figure 4.4(h)—Surface Winds



4.12 Icing, Turbulence and Freezing Level Chart

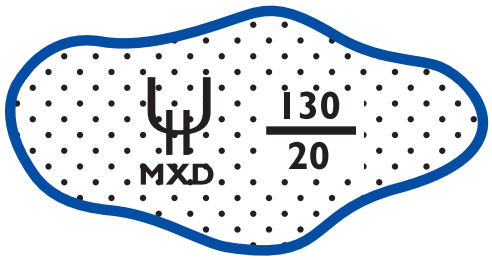
Figure 4.5(a)—Example of a GFA Icing Turbulence and Freezing Level Chart



The graphic area forecast (GFA) icing, turbulence and freezing level chart depicts forecast areas of icing and turbulence as well as the expected freezing level at a specific time. Included on the chart are the type, intensity, bases and tops of each icing and turbulence area. Surface synoptic features such as fronts and pressure centres are also shown. This chart is to be used in conjunction with the associated GFA clouds and weather chart issued for the same period of validity.

a) *Icing*—Depicted in blue when shown in colour and indicated whenever moderate or severe icing is forecast for the coverage area. The bases and tops of each icing layer, measured in hundreds of feet above mean sea level, as well as the type of icing (e.g. "RIME", "MXD" [mixed], "CLR" [clear]) will be indicated. Areas of light icing are described in the comments box. An area of moderate mixed icing based at 2 000 ft ASL with a top of 13 000 ft ASL would be indicated as follows:

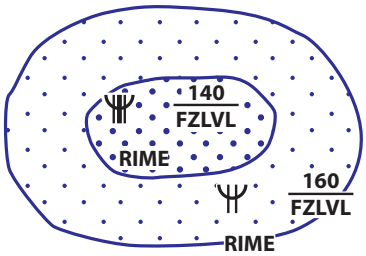
Figure 4.5(b)—Icing



If icing is expected to be present during only part of the forecast period covered by the chart, the time of occurrence of the icing is indicated in the comments box.

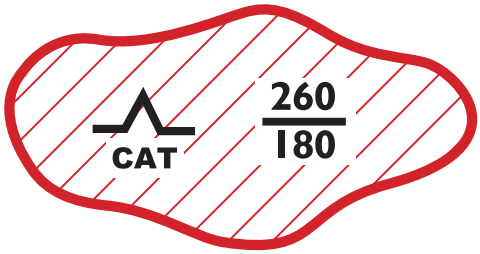
Areas of severe icing are indicated with a denser stippling. The following is an example of an area of severe icing contained within an area of moderate icing:

Figure 4.5(c)—Severe Icing



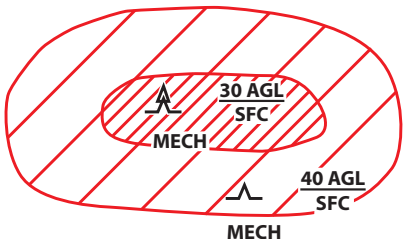
b) *Turbulence*—Depicted in red when shown in colour and indicated whenever moderate or severe turbulence is forecast for the coverage area. The base and top of each turbulence layer is measured in hundreds of feet above sea level except for surface-based turbulence, which is measured in feet above ground level. An abbreviation indicating the cause of the turbulence will be included. Turbulence due to mechanical turbulence, low-level wind shear, lee/mountain waves, a significant low-level jet or in clear air will be indicated as MECH, LLWS, LEE WV, LLJ or CAT, respectively. The following example indicates an area of moderate clear air turbulence (CAT) based at 18 000 ft ASL with a top at 26 000 ft ASL.

Figure 4.5(d)—Turbulence



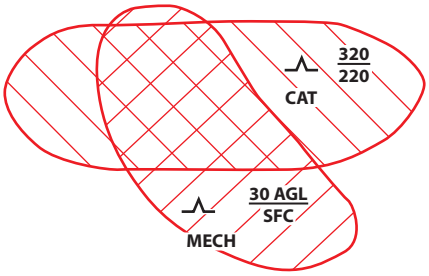
Severe turbulence is depicted with a higher density of hatching. The following example shows an area of severe turbulence surrounded by a larger area of moderate turbulence:

Figure 4.5(e)—Severe and Moderate Turbulence



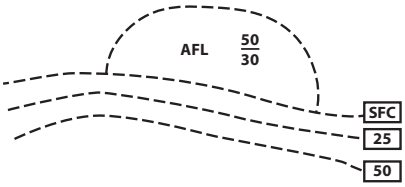
When separate areas of turbulence are occurring at different altitudes, the lower level is shown with hatching that slants upward to the right, while the higher level is depicted with hatching that slants downward to the right, as indicated below:

Figure 4.5(f)—Areas of Turbulence at Different Altitudes



c) *Freezing level*—Freezing level contours are indicated on a GFA by dashed lines. The height of the freezing level is indicated to the nearest multiple of 2 500 ft using the standard heights in hundreds of feet above sea level (e.g. SFC, 25, 50, 75, 100, meaning surface, 2 500, 5 000, 7 500, 10 000). When more than one freezing level is forecast, only the lowest level needs to be indicated, unless meteorological conditions are expected to be relevant to aviation safety (e.g. freezing precipitation aloft). An above freezing layer (AFL) is indicated by a closed area as shown below:

Figure 4.5(g)—Freezing Level

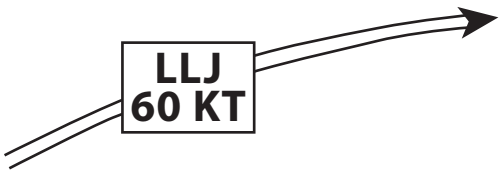


Temporal changes in the freezing level, when significant, are indicated in the comments box of the chart, as in the following example:

FZLVL 20 LWRG TO SFC AFT 03Z

d) *Low-level jet (LLJ)*—Included on the GFA icing, turbulence and freezing level chart when it is expected to have a peak core speed of 50 kt or more. It may be included at speeds between 35 and 45 kt when significant associated turbulence or shear is expected. An LLJ is depicted as follows, with the wind being in the direction of the arrow and the speed shown being the maximum expected wind speed:

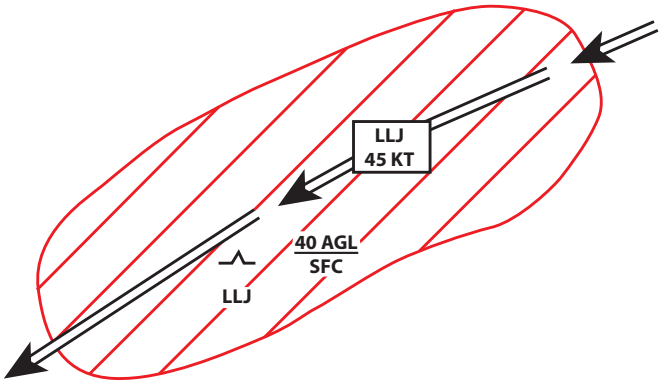
Figure 4.5(h)—LLJ



MET

In general, LLJs are not included if they are above 6 000 ft ASL, except as required over higher terrain. The height of the jet is not indicated. In many cases, there may be associated turbulence, as shown in the example below:

Figure 4.5(i)—LLJ and Turbulence



4.13 Graphic Area Forecast (GFA) Amendments

Once issued, a significant meteorological information (SIGMET) or AIRMET message automatically amends the current and relevant graphic area forecast (GFA). The remark (RMK) found in the national version of those messages indicates the GFA region(s) to which the SIGMET or AIRMET applies.

4.14 Graphic Area Forecast (GFA) Corrections

A correction to a graphic area forecast (GFA) is issued for the following events:

a) The occurrence of any unforecast weather phenomena that do not require an AIRMET (i.e. they are below the AIRMET criteria threshold) or any other unforecast weather phenomena that, according to the forecaster, should be depicted in the GFA.

b) Forecast weather phenomena in the GFA fail to occur, in which case the weather phenomena that are no longer occurring or no longer expected to occur are removed.

c) A significant error was made in a GFA chart. A significant error is one which, if uncorrected, would result in an erroneous interpretation of the GFA and create a potential hazard to aviation.

For detailed guidance on GFA correction, refer to Appendix C of the *Manual of Standards and Procedures for Aviation Weather Forecasts* (MANAIR). Information about the nature of the correction made to the chart is included in the comments box.

When reissued, the correction code "CCA" is added to the first line of the title box to indicate the first correction, "CCB" for the second, "CCC" for the third, etc.

Table 4.6—Example of Corrected GFA

GFACN33 CWAO CCA REGION ONTARIO-QUÉBEC CLOUDS AND WEATHER NUAGES ET TEMPS		
ISSUED AT ÉMIS A	17/09/2014	1211Z
VLD	17/09/2014	1200Z

5.0 AIRMETs

5.1 Definition

An information message issued by a meteorological watch office (MWO) to advise pilots of the occurrence or expected occurrence of weather phenomena, which may affect the safety of aircraft operations and which were not already included in the graphic area forecast (GFA). The message shall describe potentially hazardous weather conditions up to and including 24 000 ft (FL 240).

5.2 Issuance Criteria

AIRMETs are issued when the following criteria occur or are expected to occur and were not forecast in the graphic area forecast (GFA) and a significant meteorological information (SIGMET) message is not warranted. The abbreviations shown in all capitals will be used as described below.

a) *Surface wind speed*: Widespread mean surface wind speed above 30 kt is indicated by SFC WND SPD (along with details of the wind speed or wind speed range and units).

b) *Surface visibility and/or cloud*:
   (i) Widespread areas affected by reduced visibility of less than 3 SM (5 000 m), including weather phenomena causing reduced visibility indicated by SFC VIS (along with details of the visibility or visibility range and the weather phenomena or combinations thereof);
   (ii) Widespread areas of broken or overcast cloud with height of base less than 1 000 ft (300 m) AGL indicated by BKN CLD or OVC CLD (along with details of the height or height range of the base, top and units).

c) *Thunderstorms and/or towering cumulus*:
   (i) Isolated thunderstorms (ISOLD TS);
   (ii) Occasional thunderstorms (OCNL TS);
   (iii) Isolated thunderstorm with hail (ISOLD TSGR);
   (iv) Occasional thunderstorms with hail (OCNL TSGR);
   (v) Isolated towering cumulus (ISOLD TCU);
   (vi) Occasional towering cumulus (OCNL TCU);
   (vii) Frequent towering cumulus (FRQ TCU);
   (viii) Occasional towering cumulus and isolated thunderstorms (OCNL TCU ISOLD TS);
   (ix) Frequent towering cumulus and isolated thunderstorms (FRQ TCU ISOLD TS);
   (x) Occasional towering cumulus and isolated thunderstorms with hail (OCNL TCU ISOLD TS GR);
   (xi) Frequent towering cumulus and isolated thunderstorms with hail (FRQ TCU ISOLD TSGR).

d) *Turbulence*—moderate turbulence (except for turbulence in convective clouds) (MDT TURB).

e) *Icing*—moderate icing (except for icing in convective clouds) (MDT ICG).

f) *Mountain wave*—moderate mountain wave (MDT MTW).

An AIRMET will be issued for only one of these criteria at any time. If more than one criterion occurs then more than one AIRMET will be issued.

An isolated (ISOLD) phenomenon consists of individual features which affect, or are forecast to affect, an area with a maximum spatial coverage of 25% or less of the area concerned (at a fixed time or during the period of validity).

An occasional (OCNL) phenomenon consists of well separated features which affect, or are forecast to affect, an area with a maximum spatial coverage of 26% to 50% of the area concerned (at a fixed time or during the period of validity).

Frequent (FRQ) coverage indicates an area of towering cumulus (TCU) within which there is little or no separation between adjacent clouds and with a maximum spatial coverage greater than 50% of the area affected, or forecast to be affected, by the phenomenon (at a fixed time or during the period of validity).

5.3 Coordinate Points

The International Civil Aviation Organization (ICAO) AIRMET message describes a coordinate point using only latitude and longitude.

The national AIRMET message describes a coordinate point using latitude and longitude. In addition, an equivalent description is given in terms of direction and distance from an aviation reference site.

There are two exceptions to this rule for the national AIRMET:

a) Any coordinate point located within Gander Oceanic flight information region (FIR) will be described in latitude and longitude only.

b) Any coordinate point north of N72°00’ will be described with respect to an aviation reference site only if it is within a 90-NM radius of that site. Otherwise, the coordinate point will be represented in latitude and longitude only. This is due to the sparse number of aviation reference sites in northern Canada.

The usable reference points are a subset of aerodromes listed in the *Canada Flight Supplement* (CFS). A complete list is included in the *Manual of Standards and Procedures for Aviation Weather Forecasts* (MANAIR).

5.4 Rules for the Use of Letters

All eight flight information regions (FIRs) share 25 letters of the alphabet (T is used only for tests).

The letter used cannot currently be in service in any other FIR and has to have been retired for a minimum of 24 hr. Otherwise the next letter is used. In addition, the same letter cannot be used for widely separated occurrences of the same phenomenon, even within a single FIR.

The letter Z will wrap back to A if necessary.

If all letters are unavailable, the letter that has had the longest retirement will be re-used.

The letter attributed to a bulletin will not change during its lifespan (updates and cancellation).

AIRMET messages do not share the same alphabet with WS (SIGMET). The letter A may be used simultaneously in both a WS (or WC or WV) and a WA.

5.5 Rules for the Use of Numbers

a) Numbering of an event (as defined by the unique use of a letter in a flight information region (FIR) begins at 1 (i.e. B1).

b) The number is incremented by 1 when updating a message, including cancellation.

c) The sequence number shall correspond with the number of messages issued for an event within a FIR since 0000Z on the day concerned.

d) The numbering is thus reset at 0000Z (messages are not updated at 0000Z for the sole purpose of resetting the number).

5.6 Validity

The period of validity of an AIRMET is 4 hr and it may be issued up to 4 hr prior to the start of the validity period (i.e. expected time of occurrence of the phenomenon).

In the case of an AIRMET for an ongoing phenomenon, the date/time group indicating the start of the AIRMET period will be rounded back to 5 min from the filing time (date/time group in the World Meteorological Organization (WMO) heading).

In the case of an AIRMET for an expected phenomenon (forecast event), the beginning of the validity period will be the time of the expected commencement (occurrence) of the phenomenon.

An AIRMET for an expected phenomenon (forecast event) is issued only for the first appearance of that event in Canadian airspace (e.g. moving in from the USA or onset inside a Canadian flight information region (FIR). A phenomenon moving from one Canadian FIR to another is treated as an ongoing phenomenon. No forecast event AIRMET messages would be sent for the second FIR.

5.7 Location of the Phenomenon

The location of the phenomenon is depicted as an area using coordinate points. The description always begins with the abbreviation WTN (within) and the area can be described as a circle, a line or a polygon. Distances are in nautical miles and direction is to one of the eight points of compass (octants).

5.7.1 Circle

Example:

ICAO

WTN 45 NM OF N4643 W07345

National

WTN 45 NM OF /N4643 W07345/75 N CYUL

Plain language explanation of the national format: Within 45 NM of a point, with specified latitude and longitude, that is 75 NM north of Montréal/Pierre Elliott Trudeau International Airport.

5.7.2 Line

Example:

ICAO

WTN 45 NM OF LINE N4459 W07304 – N4855 W07253 – N5256 W06904

National

WTN 45 NM OF LINE /N4459 W07304/45 SE CYUL – / N4855 W07253/30 NW CYRJ – /N5256 W06904/75 W CYWK

Plain language explanation of the national format: Within 45 NM of a line from a point 45 NM southeast of Montréal/Pierre Elliott Trudeau International Airport to a point 30 NM northwest of Roberval Airport, followed by a point 75 NM west of Wabush Airport with the latitude and longitude of each point being specified.

5.7.3 Polygon

Example:

ICAO

WTN N4502 W07345 – N4907

W07331 – N5345 W06943 – N5256

W06758 – N4848 W07149 – N4508

W07206 – N4502 W07345

National

WTN /N4502 W07345/25 SW CYUL –/N4907 W07331/60 SE CYMT – /N5345

W06943/150 E CYAH – /N5256 W06758/45 W CYWK – / N4848 W07149/25 NE CYRJ – /N4508 W07206/25 SW CYSC – /N4502 W07345/25 SW CYUL

Plain language explanation of the national format: Within an area bounded by points that are 25 NM southwest of Montréal/ Pierre Elliott Trudeau International Airport; 60 NM southeast of Chibougamau/Chapais Airport; 150 NM east of La Grande-4 Airport; 45 NM west of Wabush Airport; 25 NM northeast of Roberval Airport and 25 NM southwest of Sherbrooke, then back to a point 25 NM southwest of Montréal/Pierre Elliott Trudeau International Airport. The latitude and longitude of each point being specified.

NOTE:
The polygon must be closed. The last coordinate is a repeat of the first one.

5.8 Flight Level and Extent

The location and extent of the phenomenon in the vertical is given by one or more of the following:

a) Reporting a layer (FL<nnn/nnn>), where the lower level is reported first; this is used particularly in reporting turbulence and icing.

b) Reporting a layer with reference to one FL and the surface (SFC).

c) Reporting the level of the tops of the thunderstorm (TS) and/ or towering cumulus (TCU) clouds using the abbreviation TOP.

5.9 Movement or Expected Movement

Direction of movement is given with reference to one of the 16 points of compass (radials). Speed is given in knots. The abbreviation QS (quasi stationary) is used if no significant movement is expected.

5.10 Change in Intensity

The expected evolution of a phenomenon's intensity is indicated by one of the following abbreviations:

a) *INTSFYG*—intensifying;

b) *WKNG*—weakening;

c) *NC*—no change.

5.11 Remark

The remark (RMK) is found only in the national AIRMET message. It begins on a new line. The purpose is to allow additional information of national interest to be conveyed in the AIRMET message. Items listed in the remark line will be separated by a forward slash (/).The remark always includes the graphic area forecast (GFA) region(s) to which the AIRMET applies (see Example 1 in MET 5.16). The remark may also include:

a) Cross-references to AIRMET messages when a phenomenon straddles one or several flight information region (FIR) boundaries (see Example 1 in MET 5.16).

b) For a phenomenon that has moved out of a flight information region (FIR), the cancelled AIRMET message will refer to the continuing AIRMET message in neighbouring FIR(s) within Canada's area of responsibility.

5.12 Updated AIRMET

An updated AIRMET, when issued, automatically replaces the previous AIRMET in the same series (i.e. the previous AIRMET with the same letter). An AIRMET must be updated every 4 hr (from date/time group in the World Meteorological Organization (WMO) heading).

However, a forecaster may update an AIRMET at any time if it is considered necessary.

5.13 Cancellation

An AIRMET must be cancelled when, during its validity period:

a) the phenomenon for which the AIRMET had been issued is no longer occurring or no longer expected to occur (forecast AIRMET);

b) the phenomenon for which the AIRMET had been issued strengthens such that significant meteorological information (SIGMET) is now required; or

c) the new issue of the graphic area forecast (GFA) has been transmitted and now includes the phenomenon.

An AIRMET does not cancel itself automatically at the end of its validity period. A cancellation AIRMET with the abbreviation CNCL must be issued.

5.14 Test AIRMET

There may be occasions when test AIRMET messages are transmitted by the meteorological watch office (MWO). The test AIRMET messages will be identifiable by the letter T in the alphanumeric sequence (see MET 5.4). Additionally, the statement "**THIS IS A TEST**" will be added at the beginning and end of the message.

5.15 AIRMET Identifiers

Table 5.1—AIRMET Identifiers

INDICATOR	FIR NAME	ICAO	NATIONAL
CZVR	VANCOUVER	WACN01 CWAO	WACN21 CWAO
CZEG	EDMONTON	WACN02 CWAO	WACN22 CWAO
CZWG	WINNIPEG	WACN03 CWAO	WACN23 CWAO
CZYZ	TORONTO	WACN04 CWAO	WACN24 CWAO
CZUL	MONTREAL	WACN05 CWAO	WACN25 CWAO
CZQM	MONCTON	WACN06 CWAO	WACN26 CWAO
CZQX	GANDER DOMESTIC	WACN07 CWAO	WACN27 CWAO
CZQX	GANDER OCEANIC	WANT01 CWAO	WANT21 CWAO

5.16 AIRMET Examples

Example 1:

At 1305Z a pilot weather report (PIREP) from a Beechcraft 1900 (B190) indicated moderate turbulence. This was not forecast in GFACN32, leading the forecaster to issue the following AIRMET messages.

ICAO

WACN02 CWAO 251315

CZEG AIRMET H1 VALID 251315/251715 CWEG-

CZEG EDMONTON FIR MDT TURB OBS AT 1305Z WTN 45 NM OF LINE

N6228 W11427 – N6441 W10840 – N6453 W09605 FL190/340 MOV NE 10KT NC=

National

WACN22 CWAO 251315

CZEG AIRMET H1 VALID 251315/251715 CWEG-

CZEG EDMONTON FIR MDT TURB OBS AT 1305Z WTN 45 NM OF LINE

/N6228 W11427/CYZF – /N6441 W10840/45 W CYOA – / N6453 W09605/30 W CYBK

FL190/340 MOV NE 10KT NC

RMK GFACN32=

Example 2:

Freezing drizzle (FZDZ) was observed at 0700Z at Churchill (CYYQ), Man. Icing was not forecast in GFACN32, leading the forecaster to issue the following AIRMET messages.

ICAO

WACN03 CWAO 250725

CZWG AIRMET A1 VALID 250725/251125 CWEG-

CZWG WINNIPEG FIR MDT ICG OBS AT 0700Z WTN 45NM OF LINE

N5955 W09403 – N5845 W09404 – N5646 W08903 SFC/ FL020 QS NC=

National

WACN23 CWAO 250725

CZWG AIRMET A1 VALID 250725/251125 CWEG-

CZWG WINNIPEG FIR MDT ICG OBS AT 0700Z WTN 45NM OF LINE

/N5955 W09403/75 S CYEK – /N5845 W09404/CYYQ – / N5646 W08903/60 NW CYER

SFC/FL020 QS NC

RMK GFACN32=

Example 3:

Unforecast convective activity (CB) in the GFACN31 area required the issuance of the following AIRMET messages.

ICAO

WACN01 CWAO 301925

CZVR AIRMET U1 VALID 301925/302325 CWEG-

CZVR VANCOUVER FIR ISOLD TS OBS WTN N5138 W12321 – N4903 W11759 – N4900 W11546 – N5000 W11546 – N5123 W11811 – N5138 W12321 TOP FL240 QS WKNG=

National

WACN21 CWAO 301925

CZVR AIRMET U1 VALID 301925/302325 CWEG-

CZVR VANCOUVER FIR ISOLD TS OBS WTN /N5138 W12321/45 SE CYPU – /N4903

W11759/20 SW CYCG – /N4900 W11546/30 S CYXC – / N5000 W11546/25 N CYXC –

/N5123 W11811/25 N CYRV – /N5138 W12321/45 SE CYPU TOP FL240 QS WKNG

RMK GFACN31=

Example 4:

Satellite pictures and surface observations indicate an area of stratus and fog along the Quebec Lower North Shore was not well represented in GFACN34 and required the issuance of AIRMET messages.

ICAO

WACN05 CWAO 301925

CZUL AIRMET J1 VALID 301925/302325 CWEG-

CZUL MONTREAL FIR SFC VIS 1/4-1SM FG/BR – OVC CLD 100-500/1200FT

OBS WTN N5013 W06536 – N5011 W06046 – N4906 W06148 – N4932 W06444 –N5013 W06536 QS NC=

National

WACN25 CWAO 301925

CZUL AIRMET J1 VALID 301925/302325 CWEG-

CZUL MONTREAL FIR SFC VIS 1/4-1SM FG/BR – OVC CLD 100-500/1200FT

OBS WTN /N5013 W06536/25 E CYZV – /N5011 W06046/45 E CYNA – /N4906

W06148/60 SE CYNA – /N4932 W06444/25 SW CYPN – / N5013 W06536/25 E CYZV QS NC

RMK GFACN34=

6.0 SIGNIFICANT METEOROLOGICAL INFORMATION (SIGMET)

6.1 Definition

Information message issued by a meteorological watch office (MWO) to advise pilots of the occurrence or expected occurrence of specified weather phenomena, which may affect the safety of aircraft operations, and the development of those phenomena in time and space.

6.2 Issuance Criteria

Significant meteorological information (SIGMET) is issued in response to the following criteria (the abbreviations are shown in all capital letters):

a) Thunderstorms:
   (i) Frequent (FRQ TS);
   (ii) Frequent with hail (FRQ TSGR);
   (iii) Frequent with hail and possible tornado/waterspout (FRQ TSGR PSBL +FC);
   (iv) Frequent with hail and tornado/waterspout (FRQ TSGR +FC);
   (v) Squall line (SQLN TS);
   (vi) Squall line with hail (SQLN TSGR);
   (vii) Squall line with possible tornado/waterspout (SQLN TSGR PSBL +FC);
   (viii) Squall line with tornado/waterspout (SQLN TSGR +FC);

b) Severe turbulence (SEV TURB);

c) Severe icing (SEV ICG);

d) Severe icing due to freezing rain (SEV ICG [FZRA]);

e) Severe mountain wave (SEV MTW);

f) Low-level wind shear (LLWS);

g) Heavy dust storm (HVY DS);

h) Heavy sandstorm (HVY SS);

i) Radioactive cloud (RDOACT CLD);

j) Volcanic ash (VA);

k) Tropical cyclone (TC).

NOTES:
1. A squall line is defined as thunderstorms along a line with little or no space between the individual clouds.
2. Severe (SEV) turbulence (TURB) refers only to:

   a) low-level turbulence associated with strong surface winds;

   b) rotor streaming;

   c) turbulence whether in cloud or not in cloud (i.e. CAT) near jet streams.
3. TS implies severe icing and turbulence; therefore separate SIGMET for these phenomenon are not issued in connection with convective clouds.
4. SIGMET will only be issued for one of these criteria at any time. If more than one criterion occurs then more than one SIGMET will be issued.
5. Frequent (FRQ) coverage indicates an area of thunderstorms within which there is little or no separation between adjacent thunderstorms and with a maximum spatial coverage greater than 50% of the area affected or forecast to be affected by the phenomenon (at a fixed time or during the period of validity).

6.3 Coordinate Points

The International Civil Aviation Organization (ICAO) significant meteorological information (SIGMET) message describes a coordinate point using latitude and longitude only.

The national SIGMET message describes a coordinate point using latitude and longitude. However, in addition, an equivalent description is also given in terms of direction and distance from an aviation reference site.

There are two exceptions to the rule for the national SIGMET:

a) Any coordinate point located within Gander Oceanic flight information region (FIR) will be described in latitude and longitude only.

b) Any coordinate point north of N72°00’ will be described with respect to an aviation reference site only if it is within a 90-NM radius of that site. Otherwise, the coordinate point will be represented in latitude and longitude only. This is due to the sparse number of aviation reference sites in northern Canada.

The usable reference sites are a subset of aerodromes listed in the *Canada Flight Supplement (*CFS) and the closest aerodrome(s) to the area of the phenomenon are used. A complete list is included in the *Manual of Standards and Procedures for Aviation Weather Forecasts* (MANAIR).

6.4 Rules for the Use of Letters

All 8 flight information regions (FIRs) share 25 letters of the alphabet (T is used only for tests).

The letter used cannot currently be in service in any other FIR and has to have been retired for a minimum of 24 hr. Otherwise the next letter is used. In addition, the same letter cannot be used for widely separated occurrences of the same phenomenon, even within a single FIR.

The letter Z will wrap back to A if necessary.

If all letters are unavailable, the letter that has had the longest retirement will be re-used.

The letter attributed to a bulletin will not change during its lifespan (updates and cancellation).

Significant meteorological information (SIGMET) messages do not share the alphabet with WA (AIRMET). The letter A may be used simultaneously in both a WS (or WC or WV) and a WA.

6.5 Rules for the Use of Numbers

a) Numbering of an event (as defined by the unique use of a letter in a flight information region [FIR]) begins at 1 (i.e. B1).

b) Number incremented by 1 when updating a message, including cancellation.

c) The sequence number shall correspond with the number of messages issued for an event within a FIR since 0000Z on the day concerned.

d) The numbering is thus reset at 0000Z (messages are not updated at 0000Z for the sole purpose of resetting the number).

6.6 Validity

The period of validity of a WS SIGMET is 4 hr and it may be issued up to 4 hr prior to the commencement of the phenomenon in the corresponding flight information region (FIR). There is an exception for volcanic ash and tropical storm SIGMETs which are valid for 6 hr and may be issued up to 12 hr before they enter the corresponding FIR.

In the case of a SIGMET for an ongoing phenomenon, the date/time group indicating the start of the SIGMET period will be rounded back to 5 min from the filing time (date/time group in the World Meteorological Organization [WMO] heading).

In the case of a SIGMET for an expected phenomenon (forecast event), the beginning of the validity period will be the time of the expected commencement (occurrence) of the phenomenon.

Any SIGMET for an expected phenomenon (forecast event) is issued only for the first appearance of an event in Canadian airspace (e.g. moving in from the U.S. or onset inside a Canadian FIR). A phenomenon moving from one Canadian FIR to another is treated as an ongoing phenomenon. No forecast event SIGMET messages would be sent for the second FIR.

6.7 Location of the Phenomenon

The location of the phenomenon is depicted as an area using coordinate points. The description always begins with the abbreviation WTN (within) and the area can be described as a circle, a line or a polygon. Distances are in nautical miles and direction is to one of the eight points of compass (octants). For plain language explanations of circle, line and polygon descriptions in the national format, see MET 5.7.

6.7.1 Circle

Example:

ICAO

WTN 45 NM OF N4643 W07345

National

WTN 45 NM OF /N4643 W07345/75 N CYUL

6.7.2 Line

Example:

ICAO

WTN 45 NM OF LINE N4459 W07304– N4855 W07253 – N5256 W06904

National

WTN 45 NM OF LINE /N4459 W07304/45 SE CYUL – / N4855 W07253/30 NW CYRJ –/N5256 W06904/75 W CYWK

6.7.3 Polygon

Example:

ICAO

WTN N4502 W07345 – N4907

W07331 – N5345 W06943 – N5256

W06758 – N4848 W07149 – N4508

W07206 - N4502 W07345

National

WTN /N4502 W07345/25 SW CYUL –/N4907 W07331/60 SE CYMT – /N5345

W06943/150 E CYAH – /N5256 W06758/45 W CYWK – / N4848 W07149/25 NE CYRJ – /N4508

W07206/25 SW CYSC – /N4502 W07345/25 SW CYUL

NOTE:
Tropical cyclone and volcanic ash SIGMETs also describe the affected location at the end of the forecast period.

6.8 Flight Level and Extent

The location and extent of the phenomenon in the vertical is given by one or more of the following:

a) Reporting a layer—FL<nnn/nnn>—where the lower level is reported first; this is used particularly in reporting turbulence and icing.

b) Reporting a layer with reference to one FL and the surface (SFC).

c) Reporting the level of the tops of the thunderstorms (TS) using the abbreviation TOP.

6.9 Movement or Expected Movement

Direction of movement is given with reference to one of the 16 points of compass (radials). Speed is given in knots. The abbreviation QS (quasi stationary) is used if no significant movement is expected.

6.10 Change in Intensity

The expected evolution of a phenomenon's intensity is indicated by one of the following abbreviations:

a) *INTSFYG*—intensifying;

b) *WKNG*—weakening;

c) *NC*—no change.

6.11 Remark

The remark (RMK) is found only in the national significant meteorological information (SIGMET) message. It begins on a new line. The purpose is to allow additional information of national interest to be conveyed in the SIGMET message. Items listed in the remark line will be separated by a forward slash (/).

The remark always includes the graphic area forecast (GFA) region(s) to which the SIGMET message applies (see Example 1a and 1b in MET 6.16). The remark may also include:

a) Cross-references to SIGMET messages when a phenomenon straddles one or several flight information region (FIR) boundaries (see Example 1a and 1b in MET 6.16).

b) For a phenomenon that has moved out of a FIR, the cancelled SIGMET message will refer to the continuing SIGMET message in neighbouring FIR(s) within Canada's area of responsibility (see Example 2 in MET 6.16).

6.12 Updated Significant Meteorological Information (SIGMET)

An updated significant meteorological information (SIGMET) message, when issued, automatically replaces the previous SIGMET in the same series (i.e. the previous SIGMET with the same letter).

A WS SIGMET must be updated every 4 hr (from date/time group in the World Meteorological Organization (WMO) heading).

A WV and a WC SIGMET must be updated every 6 hr (from date/time group in the WMO heading).

However, a forecaster may update a SIGMET at any time if it is considered necessary.

6.13 Cancellation

If, during the validity period of a significant meteorological information (SIGMET) message, the phenomenon for which the SIGMET had been issued is no longer occurring or no longer expected to occur, this SIGMET should be cancelled by the issuing meteorological watch office (MWO). A cancellation SIGMET will be issued and will include the abbreviation CNCL.

6.14 Test Significant Meteorological Information (SIGMET) Message

There may be occasions when test significant meteorological information (SIGMET) messages are transmitted by the meteorological watch office (MWO). The test SIGMET messages will be identifiable by the letter T in the alphanumeric sequence. Additionally, the statement "**THIS IS A TEST**" will be added at the beginning and end of the message.

6.15 Significant Meteorological Information (SIGMET) Message Identifiers

Table 6.1—SIGMET Message Identifiers

INDICATOR	FIR NAME	TYPE	ICAO	NATIONAL
CZVR	VANCOUVER	SIGMET SIGMET (TC) SIGMET(VA)	WSCN01 CWAO WCCN01 CWAO WVCN01 CWAO	WSCN21 CWAO WCCN21 CWAO WVCN21 CWAO
CZEG	EDMONTON	SIGMET SIGMET (TC) SIGMET(VA)	WSCN02 CWAO WCCN02 CWAO WVCN02 CWAO	WSCN22 CWAO WCCN22 CWAO WVCN22 CWAO
CZWG	WINNIPEG	SIGMET SIGMET (TC) SIGMET(VA)	WSCN03 CWAO WCCN03 CWAO WVCN03 CWA	WSCN23 CWAO WCCN23 CWAO WVCN23 CWAO
CZYZ	TORONTO	SIGMET SIGMET (TC) SIGMET(VA)	WSCN04 CWAO WCCN04 CWAO WVCN04 CWAO	WSCN24 CWAO WCCN24 CWAO WVCN24 CWAO
CZUL	MONTREAL	SIGMET SIGMET (TC) SIGMET(VA)	WSCN05 CWAO WCCN05 CWAO WVCN05 CWAO	WSCN25 CWAO WCCN25 CWAO WVCN25 CWAO
CZQM	MONCTON	SIGMET SIGMET (TC) SIGMET(VA)	WSCN06 CWAO WCCN06 CWAO WVCN06 CWAO	WSCN26 CWAO WCCN26 CWAO WVCN26 CWAO
CZQX	GANDER DOMESTIC	SIGMET SIGMET (TC) SIGMET(VA)	WSCN07 CWAO WCCN07 CWAO WVCN07 CWAO	WSCN27 CWAO WCCN27 CWAO WVCN27 CWAO
CZQX	GANDER OCEANIC	SIGMET SIGMET (TC) SIGMET(VA)	WSNT01 CWAO WCNT01 CWAO WVNT01 CWAO	WSNT21 CWAO WCNT21 CWAO WVNT21 CWAO

MET

6.16 Significant Meteorological Information (SIGMET) Message Examples

Example 1a:

An observed line of thunderstorms is over northwestern Ontario late in the day. This is the fourth significant meteorological information (SIGMET) message issued for this event.

ICAO

WSCN03 CWAO 162225

CZWG SIGMET A4 VALID 162225/170225 CWEG-

CZWG WINNIPEG FIR SQLN TS OBS WTN 20NM OF LINE N4929 W09449 –

N5104 W09348 – N5209 W09120 TOP FL340 MOV E 15KT NC=

National

WSCN23 CWAO 162225

CZWG SIGMET A4 VALID 162225/170225 CWEG-

CZWG WINNIPEG FIR SQLN TS OBS WTN 20NM OF LINE / N4929 W09449/25 SW

CYQK – /N5104 W09348/CYRL – /N5209 W09120/60 NW CYPL TOP FL340 MOV E

15KT NC

RMK GFACN33=

Example 1b:

This SIGMET was updated after 000Z on the 17th, so the SIGMET number was reset while the letter remains the same.

ICAO

WSCN03 CWAO 170205

CZWG SIGMET A1 VALID 170205/170605 CWEG-

CZWG WINNIPEG FIR SQLN TS OBS WTN 20NM OF LINE N4915 W09332 – N5103

W09212 – N5144 W08943 TOP FL310 MOV E 15KT WKNG=

National

WSCN23 CWAO 170205

CZWG SIGMET A1 VALID 170205/170605 CWEG-

CZWG WINNIPEG FIR SQLN TS OBS WTN 20NM OF LINE / N4915 W09332/45 SE

CYQK – /N5103 W09212/60 E CYRL – /N5144 W08943/25 NE CYPL TOP FL310 MOV E 15KT WKNG

RMK GFACN33=

Example 2:

Severe mountain waves (lee waves) along the eastern side of the Rockies. The line falls entirely within the Edmonton flight information region (FIR) but covers two graphic area forecast (GFA) regions. The remark line in the national SIGMET message will mention the affected GFACNs.

ICAO

WSCN02 CWAO 161220

CZEG SIGMET L1 VALID 161220/161620 CWEG-

CZEG EDMONTON FIR SEV MTW FCST WTN 30NM OF LINE N5614 W12155 – N5105 W11440 FL070/140 QS INTSFYG=

National

WSCN22 CWAO 161220

CZEG SIGMET L1 VALID 161220/161220 CWEG-

CZEG EDMONTON FIR SEV MTW FCST WTN 30NM OF LINE / N5614 W12155/45 W CYXJ – /N5105 W11440/25 W CYYC FL070/140 QS INTSFYG

RMK GFACN31/GFACN32=

Example 3:

Following an air report (AIREP) for severe turbulence encountered over the North Atlantic (NAT), the following SIGMET messages are issued. This event spans over Gander Domestic and Gander Oceanic FIRs as well as GFACN34.

ICAO

CZQX WSCN07 CWAO 161220

CZQX SIGMET E1 VALID 161220/161620 CWUL-

CZQX GANDER DOMESTIC FIR SEV TURB OBS AT 1155Z WTN 45NM OF LINE

N5319 W06025 – N5615 W05245 – N5930 W04715 FL280/350 MOV NE 20KT NC=

CZQX (Oceanic)

WSNT01 CWAO 161220

CZQX SIGMET U1 VALID 161220/161620 CWUL-

CZQX GANDER OCEANIC FIR SEV TURB OBS AT 1155Z WTN 45NM OF LINE N5319

W06025 – N5615 W05245 – N5930 W04715 FL280/350 MOV NE 20KT NC=

National

CZQX WSCN27 CWAO 161220

CZQX SIGMET E1 VALID162225/170225 CWUL-

CZQX GANDER DOMESTIC FIR SEV TURB OBS AT 1155Z WTN 45NM OF LINE

/N5319 W06025/CYYR – /N5615 W05245/ – /N5930 W04715/ FL280/350 MOV NE 20KT NC

RMK GFACN34/CZQX GANDER OCEANIC FIR SIGMET U1=

CZQX (Oceanic)

WSNT21 CWAO 162225

CZQX SIGMET U1 VALID 162225/170225 CWUL-

CZQX GANDER OCEANIC FIR SEV TURB OBS AT 1155Z WTN 45NM OF LINE /N5319

W06025/CYYR – /N5615 W05245/ – /N5930 W04715/ FL280/350 MOV NE 20KT NC

RMK GFACN34/CZQX GANDER DOMESTIC FIR SIGMET E1=

NOTE:
Since this event spans over two FIRs, the remark line includes cross-references to the SIGMET messages. Note that only the first coordinate point relates to an aviation reference site. The other two coordinate points are in Gander Oceanic FIR and are defined only in latitudes and longitudes.
Example 4:

The centre of hurricane Maria is about to move across the Avalon Peninsula. The tropical cyclone SIGMET (WCCN) is updated and only covers the Gander Domestic FIR and GFACN34, since the CB activity is confined within a radius of 150 NM from the centre of the hurricane.

ICAO

WCCN07 CWAO 161220

CZQX SIGMET G3 VALID 1601800/170000 CWUL-

CZQX GANDER DOMESTIC FIR TC MARIA OBS AT 1800Z N4720 W05430/ CB TOP

FL360 WTN 150NM OF CENTRE MOV NE 40KT WKNG FCST 0000Z TC CENTRE N5110 W05030 =

National

WCCN27 CWAO 161220

CZQX SIGMET G3 VALID 161800/170000 CWUL-

CZQX GANDER DOMESTIC FIR TC MARIA OBS AT 1800Z N4720 W05430/75 SW

CYYT CB TOP FL360 WTN 150NM OF CENTRE MOV NE 40KT WKNG FCST 0000Z

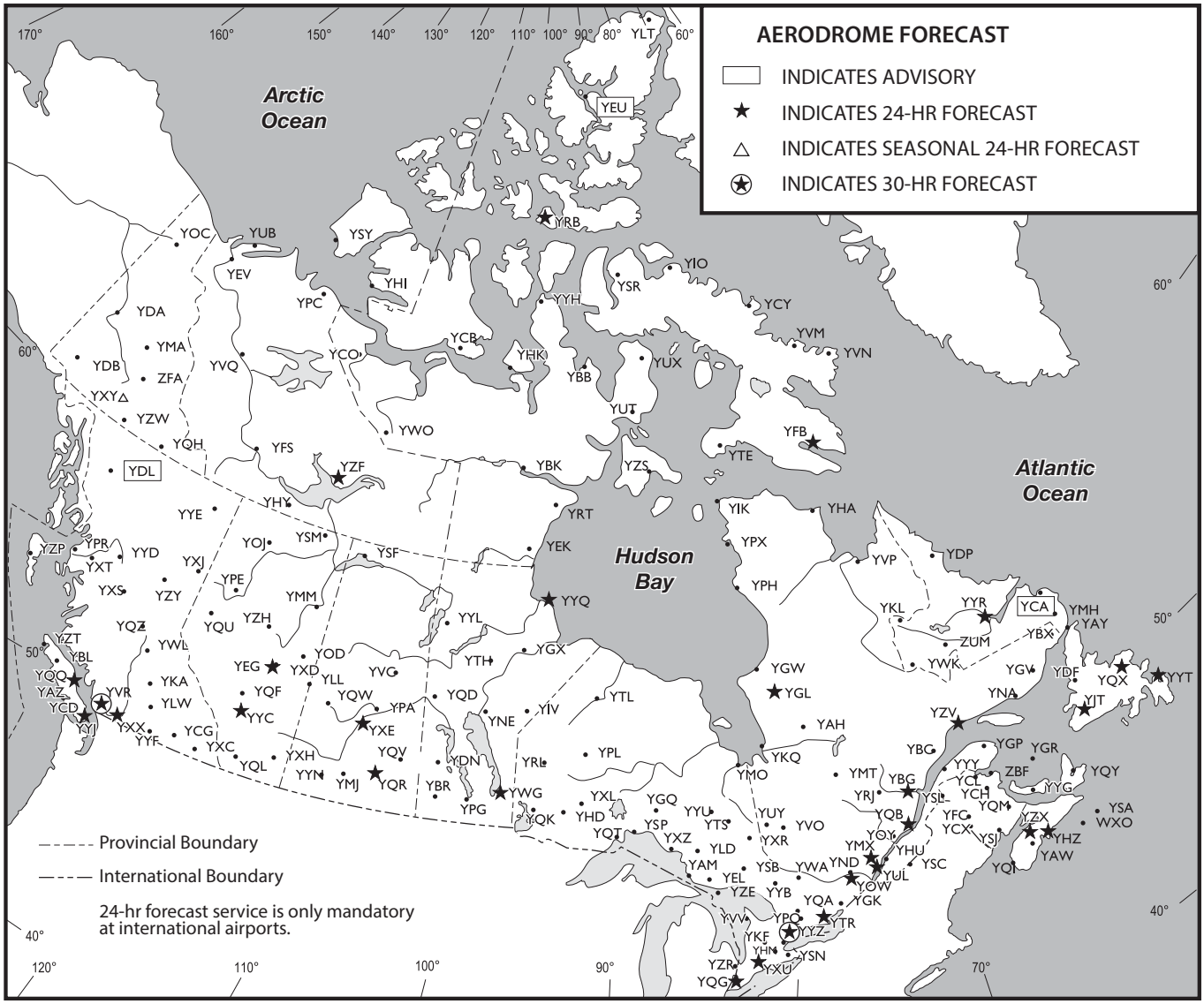
TC CENTRE N5110 W05030/180 NE CYYT

RMK GFACN34=

7.0 AERODROME FORECASTS (TAFs)

7.1 Aerodrome Forecast (TAF) Locations

Figure 7.1—TAF Locations



MET

7.2 General

TAF is the international meteorological code for an aerodrome forecast, which is a description of the most probable weather conditions expected to occur at an aerodrome, together with their most probable time of occurrence. It is designed to meet the pre-flight and in-flight requirements of flight operations. The abbreviations of expected weather conditions follow the same form and order as those found in an aerodrome routine meteorological report (METAR) (see MET 8.0); they also have the same meaning.

In normal situations, an observation is considered representative of the specific weather conditions at the aerodrome if it is taken within 1.6 NM (3 km) of the geometric centre of the runway complex. TAFs are intended to relate to weather conditions for flight operations within 5 NM of the centre of the runway complex, depending on local terrain. Significant weather conditions, such as thunderstorms, within 5 to 10 NM of the aerodrome are also included. A regular and complete observation program that meets Transport Canada (TC) standards for METARs and aerodrome special meteorological reports (SPECI) is a prerequisite for the production of a TAF. Aerodrome advisories may be issued when this observation program prerequisite cannot be completely satisfied.

Aerodrome advisories are identified by the word "ADVISORY" appearing after the date/time group, followed by one of the qualifying reasons listed below. Advisories are formatted in the same manner as TAFs.

OFFSITE—The advisory is based on an observation that is not taken at or near the airport. "OFFSITE" is added after the word "ADVISORY," followed by one space, if an observation is not considered representative. It is intended to indicate to the users that the observations do not necessarily reflect the actual conditions at the aerodrome.

OBS INCOMPLETE or NO SPECI—The advisory is based on incomplete data, either because the observations could not be completed, or because the aerodrome does not have an on-going weather watch in order to produce SPECIs. "OBS INCOMPLETE" or "NO SPECI" shall be added after the word "ADVISORY," followed by one space.

7.3 National Variations

As with the aerodrome routine meteorological report (METAR) code, even though aerodrome forecast (TAF) is an international code, there are national variations. For example, "CAVOK" is not authorized for use in Canadian TAFs, while "RMK" is used, but is not part of the international code. See MET 1.1.8 for more information on differences from the International Civil Aviation Organization (ICAO) Annex 3.

7.4 Sample Message

TAF CYXE 281139Z 2812/2912 24010G25KT WS011/ 27050KT 3SM –SN BKN010 OVC040 TEMPO 2818/2901 1 1/2SM –SN BLSN BKN008 PROB30 2820/2822 1/2SM SN VV005 FM290130Z 28010KT 5SM –SN BKN020 BECMG 2906/2908 000000KT P6SM SKC RMK NXT FCST BY 281800Z

a) *Sample message decoded*—Aerodrome Forecast; Saskatoon, Saskatchewan; issued on the 28th day of the month at 1139Z; covers the period from the 28th day of the month at 1200Z to the 29th day of the month at 1200Z; surface wind 240° true at 10 kt, gusting to 25 kt; wind shear is forecast to exist in the layer from the surface to 1 100 ft AGL, with the wind at the shear height of 270° true at 50 kt; forecast prevailing visibility is 3 SM in light snow; forecast cloud layers are broken at 1 000 ft and overcast at 4 000 ft; between 1800Z on the 28th day and 0100Z on the 29th day there will be a temporary change to the prevailing visibility to 1 1/2 SM in light snow and blowing snow with a broken cloud layer at 800 ft; there is a 30% probability between 2000Z and 2200Z on the 28th day that the prevailing visibility will be 1/2 SM in moderate snow and create an obscuring phenomena, resulting in a vertical visibility of 500 ft; at 0130Z on the 29th day there will be a permanent change, the wind is forecast to be 280° true at 10 kt with a prevailing visibility of 5 SM in light snow and a broken cloud layer at 2 000 ft; between 0600Z and 0800Z on the 29th day there will be a gradual change in the weather to calm winds and a forecast visibility greater than 6 SM, and the sky will be clear of clouds;

Remarks: the next routine aerodrome forecast for this site will be issued by 1800Z on the 28th day.

b) *Report type*—The code name "TAF" is given in the first line of text. It may be followed by "AMD" for amended or corrected forecasts.

c) *Location indicator*—A four-letter International Civil Aviation Organization (ICAO) location indicator is used, as in aerodrome routine meteorological reports (METARs). See MET 8.3.

d) *Date and time of origin*—As with the METAR format, the date (day of the month) and time (Coordinated Universal Time [UTC]) of origin are included in all forecasts. TAFs are issued approximately 20 min before the validity period. Some forecasts have update cycles as frequent as every three hours; however, the next issue time will always be indicated in the remarks section.

e) *Period of validity*—The period of validity for the TAF is indicated by two four-digit date/time groups; the first four-digit group indicates the start date and time of the TAF, and the second four-digit group indicates the end date and time of the TAF. A TAF is considered to be valid from the moment it is issued (e.g. a TAF with an indicated period of validity from 1100Z to 2300Z that was issued at 1040Z is considered to be valid from 1040Z) until it is amended; until the next scheduled TAF for the same aerodrome is issued; or until the period of validity ends and no new TAF has been issued. The maximum period of validity for a TAF is 30 hr; however, some TAFs have staggered issue times and more frequent update cycles, which affects their periods of validity.

f) *Wind*—This group forecasts the 2-min mean wind direction and speed to the nearest 10° true, and speed to the nearest whole knot. "KT" is used to indicate the speed units. If the maximum gust speed is forecast to exceed the mean speed by 10 kt or more, the letter G and the value of the gust speed, in knots, is added between the mean wind and the unit indicator (KT). "VRB" is normally coded for variable direction only if the wind speed is 3 kt or less; however, it may also be coded with higher speeds when it is impossible to forecast a single direction (e.g. when a thunderstorm passes). A north wind of 20 kt would be coded as 36020KT, while calm wind is coded as 00000KT.

g) *Low-level wind shear*—This group is used if the forecaster has strong evidence to expect significant, non-convective wind shear that could adversely affect aircraft operation within 1 500 ft AGL over the aerodrome. The height of the top of the shear layer (in hundreds of feet above ground level) is given, followed by the forecast wind speed and direction at that height.

While the main effect of turbulence is related to erratic changes in altitude or attitude of the aircraft, or both, the main effect of wind shear is the rapid gain or, more critical, loss of airspeed. Therefore, for forecasting purposes, any cases of strong, non-convective low-level wind shear within 1 500 ft AGL will be labelled as "WS."

To a great extent, wind shear is an element that, for the time being, cannot be satisfactorily observed from the ground. As a result, aircraft observations and radiosonde reports represent the only available evidence.

However, the following guidelines are used to establish whether significant non-convective wind shear hazardous to aircraft exists:

(i) vector magnitude exceeding 25 kt within 500 ft AGL;
(ii) vector magnitude exceeding 40 kt within 1 000 ft AGL;
(iii) vector magnitude exceeding 50 kt within 1 500 ft AGL;
(iv) a pilot report of loss or gain of IAS of 20 kt or more within 1 500 ft AGL.

h) *Prevailing visibility*—The horizontal prevailing visibility is indicated in statute miles and fractions up to 3 SM, then in whole miles up to 6 SM. Visibilities greater than 6 SM are indicated as P6SM. The letters "SM" are added, without a space, to each forecast visibility, to identify the unit.

i) *Significant weather*—Forecast significant weather may be decoded using the list of significant weather given in the WMO Code Table 4678 (Table 8.1) in MET 8.3. Intensity and proximity qualifiers, descriptors, precipitation, obscuration and other phenomena are included as required. A maximum of three significant weather groups is allowed per forecast period. If more than one group is used, they are considered one entity. When one of the significant weather groups is forecast to change, all the significant weather groups that will apply after the change are indicated following the change group. Details on the specific effects of change groups on significant weather will be addressed under the change group headings.

NOTE:
The meaning of the proximity qualifier, vicinity (VC), in the TAF code differs slightly from that in the METAR. In the METAR code, "VC" means elements observed within 5 SM., but not at the station. In the TAF code, "VC" means between 5 and 10 NM from the centre of the runway complex.

j) *Sky condition*—Sky condition is decoded as in a METAR. Possible codes for sky cover amounts are SKC, FEW, SCT, BKN, OVC and VV. In case of a significant change in a cloud layer, as forecast using "BECMG" or "TEMPO", the entire cloud group, including those cloud layers that are not expected to change, shall be repeated.

CB layers are the only forecast layers to have cloud type identified, e.g. "BKN040CB."

k) *Change groups*—For forecast purposes, all components of the following elements are grouped together:

(1) sky condition,
(2) visibility, present weather and obstruction to vision.

Conditions listed after the change group represent new conditions.

In the following example, since wind is considered a group on its own and is not mentioned in the section after the "BECMG" change group, it is unchanged and will remain variable at 3 kt. However, changes have occurred to the sky condition and visibility, present weather and obstruction to vision. For the sky condition, the broken layer at 300 ft will no longer exist after 1400Z.

Example:

TAF CYVP 301213Z 3012/3024 VRB03KT 1/4SM -RA FG BKN003 OVC007

BECMG 3012/3014 4SM -DZ BR OVC007

Plain language explanation of the forecast: TAF for Kuujjuaq, Que., issued on the 30th day of the month at 1213Z,

valid from the 30th day of the month at 1200Z until the 30th day of the month at 2359Z. Wind variable at 3 kt, visibility 1/4 SM with light rain and fog; forecast cloud layers are broken at 300 ft and overcast at 700 ft. From 1200Z until 1400Z, conditions will become visibility 4 SM with light drizzle and mist; overcast cloud layer at 700 ft.

(i) *Permanent change group (rapid)(FM)*—FM is the abbreviation for "from." It is used for a permanent change to the forecast that will occur rapidly. All forecast conditions given before this group are superseded by the conditions indicated after the group. In other words, a complete forecast will follow and all elements must be indicated, including those for which no change is forecast. The time group represents hours and minutes in UTC.

Example:
"FM280930 would decode as the beginning of a new part period forecast from the 28th day of the month at 0930Z.

NOTE:
Where the permanent change group indicator (FM) indicates a change after the beginning of a whole hour, as in the example above, any subsequent use of a gradual change group (BECMG) or transitory change group (TEMPO) shall indicate changes after the time indicated in hours and minutes in the "from" (FM) indicator. Using the above example, if there was a subsequent use of "TEMP0 2809/2811," the temporary change would be between 0930Z and 1100Z on the 28th day of the month.

(ii) *Permanent change group (gradual) (BECMG)*—If a permanent change in a few weather elements is forecast to occur gradually, with conditions evolving over a period of time (normally one to two hours, but not more than four hours), the new conditions that differ from those immediately prior are indicated following "BECMG." Normally only those elements for which a change is forecast to occur will follow "BECMG." Any forecast weather element not indicated as part of the "BECMG" group remains the same as in the period prior to the onset of the change.

If a significant change in weather or visibility is forecast, all weather groups, as well as the visibility, are indicated following "BECMG," including those that are unchanged. When the ending of significant weather is forecast, the abbreviation "NSW" (no significant weather) is used.

The start and stop time of the change period is indicated by two four-digit date/time groups following "BECMG." The first two digits of each group indicate the date, while the last two digits of each group indicate the time in whole UTC hours.

As a general rule, to keep the forecast clear and unambiguous, the use of the "BECMG" change group is kept to a minimum, and confined to those cases where only one, or at most two, weather groups are expected to change while all the others stay the same.

In those cases where more than two groups are expected to change, the permanent change group "FM" will be used to start a new self-contained part period. For the purposes of flight planning, and specifically for the selection of IFR alternate aerodromes, if forecast conditions are improving, the new conditions will apply when the change period is complete, and if the conditions are deteriorating, the new conditions will apply at the beginning of the period.

Example:
"BECMG 2808/2809 OVC030" would decode as a change towards overcast sky conditions at 3 000 ft AGL occurring gradually between 0800Z and 0900Z on the 28th day of the month; and

(A) if the previous sky condition forecast was for better than overcast conditions at 3 000 ft AGL, then the change would apply as of 0800Z; or

(A) if the previous sky condition forecast was for worse than overcast conditions at 3 000 ft AGL, then the change would apply as of 0900Z.

(ii) *Transitory change group (TEMPO)*—If a temporary fluctuation in some or all of the weather elements is forecast to occur during a specified period, the new conditions that differ from those immediately prior are indicated following "TEMPO." In other words, when an element is not indicated after "TEMPO," it shall be considered to be the same as that for the prior period. The time period, as with "BECMG," is indicated by two four-digit date/time groups following "TEMPO." The first two digits of each group indicate the date, while the last two digits of each group indicate the time in whole UTC hours.

Example:
FM281100 VRB03KT 3SM RA BR OVC020 TEMPO 2812/2815 1SM RA BR FM28150...

In this example, the cloud group "OVC020" is not repeated after "TEMPO" because it is forecast to remain unchanged. On the other hand, the weather group "RA BR" is repeated after "TEMPO" because a significant change in visibility is forecast.

When a significant change in weather or visibility is forecast, all weather groups are indicated following "TEMPO," including those that are unchanged, and any weather element not indicated is forecast to remain the same as in the period prior to the temporary fluctuation. When the ending of significant weather is forecast, the abbreviation "NSW" (no significant weather) is used.

"TEMPO" is only used when the modified forecast condition is expected to last less than one hour in each instance, and if expected to recur, the total period of the modified condition will not cover more than half of the total forecast period. The total period of the modified condition is the time period during which the actual modified weather condition is expected to occur, and not the total time stated for the "TEMPO" time

period. When the modified forecast condition is expected to last more than one hour, either "FM" or "BECMG" must be used.

(iii) *Probability group (PROB)*—In order to indicate the probability of occurrence of alternative values of forecast groups, PROB30 (a 30% probability) or PROB40 (a 40% probability) is placed directly before the change group's validity period and alternative value(s) to indicate that different conditions will occur within the specified time period. The time period is given in whole UTC hour values. For example, "PROB30 2817/2821" would indicate that between 1700Z and 2100Z on the 28th day of the month there is a 30% probability that the indicated weather will occur. The weather elements used in the PROB group are restricted to hazards to aviation, which include, but are not limited to, the following:

(A) thunderstorms;
(A) freezing precipitation;
(A) low-level wind shear at or below 1 500 ft AGL; or
(A) ceiling and visibility values important to aircraft operations (e.g. threshold such as alternate limits, lowest approach limits).

A probability of less than 30% of actual values deviating from those forecasts is not considered to justify the use of the PROB group. When the possibility of an alternative value is 50% or more, this shall be indicated by the use of BECMG, TEMPO or FM, as appropriate. The PROB group will not be used in combination with the TEMPO or BECMG groups.

l) *Remarks*—Remarks will appear in TAF from Canada, prefaced by "RMK." Currently, the following remarks are allowed:

(i) *FCST BASED ON AUTO OBS*—This remark indicates that the TAF is based on METAR AUTO observations.
(ii) *NXT FCST BY 290000Z*—This remark indicates the date and time (UTC) the next regular TAF will be issued, which will correspond to the beginning of its new period of validity. This remark will normally mark the end of the TAF.
(iii) *PARTIAL PROGRAM NOTICES*—For aerodromes with a partial observing program (e.g. no night-time observations are taken), a remark is included in the last regular TAF issued for the day to indicate when forecast coverage will resume, e.g. "NXT FCST WILL BE ISSUED AT 291045Z". For military aerodromes, remarks may also be used and will take the form of either, "NO FCST COVERAGE 2820–2911Z," or "NO FCST ISSUED UNTIL FURTHER NOTICE".
(iv) *POSSIBLE DISCREPANCIES*—Forecasters will use remarks to explain possible discrepancies between an AWOS and a TAF if the forecasters have reason to believe that the AWOS observations are not representative of the actual weather at the aerodrome. For example, the remarks could be "RMK AUTO OBS REPG NON-REPRESENTATIVE WND SPD" or "RMK AUTO OBS REPG NON-REPRESENTATIVE VIS."

7.5 Aerodrome Forecasts (TAFs) from Automatic Aerodrome Routine Meteorological Reports (METAR AUTO)

At some sites equipped with automated weather observation system (AWOS), forecasters will issue an aerodrome forecast (TAF) based in part on the METAR AUTO observations made by the AWOS at the aerodrome. The only visible distinction between this forecast and a TAF that is based on human observations is the comment at the end of the TAF "FCST BASED ON AUTO OBS". The TAF based on automated observations, like the TAF based on human observations, provides a description of the most probable weather conditions expected to occur at an aerodrome, together with the most probable time of occurrence.

The abbreviated comment "FCST BASED ON AUTO OBS" at the end of the TAF is meant to inform pilots that the forecast has been developed from an automated weather observation. The pilot using this forecast should be familiar with the characteristics of METAR AUTO weather observations, and the comparison of automated and human observations contained in MET 8.5, e.g. the automated weather observation system (AWOS) cloud height sensor tends to under-read during precipitation events. The forecaster is also familiar with AWOS characteristics and has taken time to analyze not only AWOS data, but also additional information such as satellite and radar imagery, lightning data, remote video imagery, pilot reports, and observations from surrounding stations. Based on integration of this data, the forecaster may have inferred actual weather conditions that differ slightly from the METAR AUTO report. On those few occasions when there are differences between a METAR AUTO report and a TAF, it may not imply that the TAF is inaccurate, or that an amendment is required. In the event that an AWOS sensor is missing, inoperative, or functioning below standards, the forecaster will attempt to infer the value of the missing weather element from other available data and may include a remark in the TAF. If the forecaster is unable to infer the weather conditions, a decision may be made to cancel the TAF, pending correction of the problem. The decision to cancel will depend on the weather conditions prevailing at the time, and how critical the missing information is to the issuance of a credible TAF based on the automated data that is available.

7.6 Amended Aerodrome Forecast (TAF)

An aerodrome forecast (TAF) is amended when the forecast conditions are no longer representative of the current or expected conditions. An amendment is issued in response to a aerodrome routine meteorological report (METAR), aerodrome special meteorological report (SPECI) or pilot weather report (PIREP) indicating a significant change in weather relative to the conditions

forecast in the TAF or whenever, in the forecaster's judgment, the TAF is not representative of existing or expected weather conditions.

The amendment criteria include thresholds defined by changes in ceiling, visibility, present weather, wind speed and direction or the existence of low-level wind shear. TAF amendments are issued for weather that is better than previously forecast as well as for weather that is worse than previously forecast.

An amendment will also be issued to correct a TAF when typographical errors and/or forecast text omissions are such that the information content of the TAF is unclear.

An amended forecast covers the remaining period of the original forecast and is identified by TAF AMD in place of TAF prior to the aerodrome identifier in the first line of the forecast. In all cases, the issue time added to the body of the TAF will always indicate which TAF is the latest.

A TAF does not have to be amended for changes in ceiling and/or visibility when both the forecast and observed values are below the normal visual flight rules (VFR) minima or the lowest published instrument landing minima for an aerodrome (whichever is lower).

The VFR minima criteria for TAF amendment purposes are a ceiling of less than 1 000 ft and/or ground visibility of less than 3 SM.

8.0 AERODROME ROUTINE METEOROLOGICAL REPORTS (METARs)

8.1 The Aerodrome Routine Meteorological Report (METAR) Code

An aerodrome routine meteorological report (METAR) describes the actual weather conditions at a specified location and at a specified time as observed from the ground. METAR is the name of the international meteorological code for an aerodrome routine meteorological report. METAR observations are normally taken and disseminated on the hour. An aerodrome special meteorological report (SPECI), the name of the code for an aerodrome special meteorological report, will be reported when weather changes of significance to aviation are observed (see MET 8.4).

In Canada, METARs and SPECIs are not encoded by the observer, but are generated by computer software, based on hourly or special observations taken at either staffed or automatic sites.

The code is composed of several groups which are always in the same relative position to one another. When a weather element or phenomenon does not occur, the corresponding group (or extension) is omitted. Certain groups may be repeated.

The large majority of METARs and SPECIs are provided by NAV CANADA; however, at Department of National Defence (DND) aerodromes they are provided by DND. If METARs and SPECIs are being provided by another source, they will be indicated as being "private" in the *Canada Flight Supplement* (CFS). For these sites, the aerodrome operator is the primary contact for further information.

8.2 National Variations

Despite the fact that an aerodrome routine meteorological report (METAR) is an international code, there are some national variations. For example, wind speed may be reported in different units; however, the units are always appended to the values to avoid any misunderstanding. See MET 1.1.8 for more information on differences from the International Civil Aviation Organization (ICAO) Annex 3.

8.3 Sample Message

METAR CYXE 292000Z CCA 09015G25KT 3/4SM R09/4000FT/D –RA BR BKN008 0VC040 21/19 A2992 WS RWY 09 RMK SF5NS3 VIS NW 3/8 SLP134 DENSITY ALTITUDE 2500FT

a) *Decoding of example*—Aerodrome routine meteorological report; Saskatoon, Sask., issued on the 29th day of the month at 2000 UTC; first correction to the original observation; wind 090° true, 15 kt with gusts to 25 kt; visibility 3/4 SM; RVR for Runway 09 is 4 000 ft and has had a downward tendency; present weather is light rain and mist; broken clouds at 800 ft AGL, and combined with the lower layer, overcast clouds at 4 000 ft; temperature 21°C; dew point 19°C; altimeter setting 29.92 in Hg; wind shear Runway 09; remarks: stratus fractus 5/8, nimbostratus 3/8, visibility to the northwest 3/8 SM, sea level pressure 1013.4 hPa, density altitude 2 500 ft.

b) *Report type*—The code name METAR (or SPECI) is given in the first line of text. An aerodrome special meteorological report (SPECI) is issued only when significant changes in weather conditions occur off the hour.

c) *Location indicator*—Canadian aviation weather reporting stations are assigned four-character International Civil Aviation Organization (ICAO) indicators commencing with C and followed by W, Y or Z. These stations are normally located within 1.6 NM (3 km) of the geometric centre of the runway complex. Aviation weather reporting sites are listed in the *Canada Flight Supplement* (CFS).

d) *Date/time of observation*—The date (day of the month) and time (Coordinated Universal Time [UTC]) of the observation are included in all reports. The official time of the observation (on the hour) is used for all aerodrome routine meteorological reports (METARs) that do not deviate from the official time by more than 10 min. In SPECIs, the time refers to the time

of occurrence (hours and minutes) of the change(s) which required the issue of the report.

e) *Report modifier*—This field may contain two possible codes: "AUTO" or "CCA". Both codes may appear simultaneously, i.e. "AUTO CCA". "AUTO" is used when data for the primary report is gathered by an automated weather observation system (AWOS). See MET 8.5 for more information about AWOS reports. "CCA" is used to indicate corrected reports. The first correction is indicated as CCA, the second as CCB, etc.

f) *Wind*—This group reports the 2-min mean wind direction and speed, along with gusts. Wind direction is always three digits, given in degrees (true) but rounded off to the nearest 10° (the third digit is always a "0"). Wind speeds are two digits (or three digits, if required) and in knots. Calm is encoded as "00000KT". In Canada, the unit for wind speed is knots (nautical miles per hour) and is indicated by including "KT" at the end of the wind group. Other countries may use kilometres per hour (KMH), or metres per second (MPS).

(i) *Wind gusts*—Gust information will be included if gust speeds, averaged over a 5-second period, exceed the average wind speed by 5 kt or more in the 10-min period preceding the observation and the peak gust reaches a maximum speed of 15 kt or more. "G" indicates gusts and the peak gust is reported, using two or three digits as required.

(ii) *Variations in wind direction*—This group reports variations in wind direction. It is only included if, during the 10-min period preceding the observation, the direction varies by 60° or more and less than 180°, and the mean speed exceeds 3 kt. The two extreme directions are encoded in clockwise order. In the example below, the wind is varying from 260° true to 340° true.

Example:

METAR CYWG 172000Z 30015G25KT 260V340

In the case of variable wind direction, wind direction in tens of degrees (ddd) shall be coded as VRB when the wind speed is less than 3 kt. A variable wind at higher speeds shall be reported only when the variation in wind direction is 180° or more or when it is impossible to determine a single wind direction.

Example:

METAR CYQB 041500Z VRB02KT

(iii) When wind sensors are not functioning at a human METAR site, the wind speed and direction will be estimated and a remark will be added to the report ("WND ESTD").

g) *Prevailing visibility*—The prevailing visibility is reported in statute miles and fractions. There is no maximum visibility value reported. Lower sector visibilities which are half or less of the prevailing visibility are reported as remarks at the end of the report.

h) *RVR*—The runway visual range (RVR) for the touchdown zone of up to four available landing runways is reported as a 10-min average, based on the maximum runway light settings at the time of the report. It is included if the prevailing visibility is 1 SM or less, and/or the RVR is 6 000 ft or less. "R", the group indicator, is followed by the runway designator (e.g. 06), to which may be appended the letters "L", "C", or "R" (left, centre, or right) if there are two or more parallel runways. The RVR value is then reported in hundreds of feet, using three or four digits. FT indicates the units for RVR are feet. "M" preceding the lowest measurable value (or "P" preceding the highest) indicates the value is beyond the instrument range. The RVR trend is then indicated if there is a distinct upward or downward trend from the first to the second 5-min part-period such that the RVR changes by 300 ft or more (encoded "/U" or "/D" for upward or downward) or if no distinct change is observed, the trend "/N" is encoded. If it is not possible to determine the trend, the field will be left blank.

i) *Variations in RVR*—Two RVR values may be reported, the minimum and maximum 1-min mean RVR values during the 10-min period preceding the observation, if they vary from the 10-min mean by at least 20% (and by 150 ft).

Example:
"R06L/1000V2400FT/U" decodes as the minimum RVR for Runway 06 Left is 1 000 ft; the maximum RVR is 2 400 ft; and the trend is upward.

j) *Present weather*—The present weather is coded in accordance with the WMO Code Table 4678, which follows. As many groups as necessary are included, with each group containing from two to nine characters.

Present weather is comprised of weather phenomena, which may be one or more forms of precipitation, obscuration, or other phenomena. Weather phenomena are preceded by one or two qualifiers; one of which describes either the intensity or proximity to the station of the phenomena, the other of which describes the phenomena in some other manner.

Table 8.1—Significant Present Weather Codes
(WMO Code Table 4678, incorporating Canadian differences)

QUALIFIER			WEATHER PHENOMENA					
INTENSITY or PROXIMITY	DESCRIPTOR		PRECIPITATION		OBSCURATION		OTHER	
NOTE: Precipitation intensity refers to all forms combined.	MI	Shallow	DZ	Drizzle	BR	Mist (Vis ≥ 5/8 SM)	PO	Dust/sand Whirls (Dust Devils)
	BC	Patches	RA	Rain				
	PR	Partial	SN	Snow	FG	Fog (Vis < 5/8 SM)	SQ	Squalls
	DR	Drifting	SG	Snow Grains	FU	Smoke (Vis ≤ 6 SM)	+FC	Tornado or Waterspout
– Light	BL	Blowing	IC	Ice Crystals (Vis ≤ 6 SM)	DU	Dust (Vis ≤ 6 SM)	FC	Funnel Cloud
	SH	Shower(s)						
Moderate (no qualifier)	TS	Thunderstorm	PL	Ice Pellets	SA	Sand (Vis ≤ 6 SM)	SS	Sandstorm (Vis < 5/8 SM) (+SS Vis < 5/16 SM)
			GR	Hail				
+Heavy	FZ	Freezing	GS	Snow Pellets	HZ	Haze (Vis ≤ 6 SM)	DS	Dust storm (Vis < 5/8 SM) (+DS Vis < 5/16 SM)
VC In the vicinity			UP	Unknown precipitation (AWOS only)	VA	Volcanic Ash (with any visibility)		

(i) *Qualifiers*

(A) *Intensity: (–) light (no sign) moderate (+) heavy*
If the intensity of the phenomena being reported in a group is either light or heavy, this is indicated by the appropriate sign. No sign is included if the intensity is moderate, or when intensity is not relevant. If more than one type of precipitation is reported together in a group, the predominant type is given first; however, the reported intensity represents the overall intensity of the combined types of precipitation.

(B) *Proximity*: The proximity, qualifier "VC", is used in conjunction with the following phenomena:

SH	(showers)
FG	(fog)
FC	(funnel cloud)
+FC	(tornado or waterspout)
TS	(thunderstorm)
BLSN	(blowing snow)
BLDU	(blowing dust)
BLSA	(blowing sand)
PO	(dust/sand whirls)
DS	(dust storm)
SS	(sandstorm)

VC is used if these phenomena are observed within 5 SM, but not at the station. When VC is associated with SH, the type and intensity of precipitation are not specified because they cannot be determined.

(C) *Descriptor*: No present weather group has more than one descriptor. The descriptors MI (shallow), BC (patches) and PR (partial) are used only in combination with the abbreviation FG (fog), e.g. MIFG.

The descriptors DR (drifting) and BL (blowing) are used only in combination with SN (snow), DU (dust) and SA (sand). Drifting is used if the snow, dust or sand is raised less than 2 m above ground; if 2 m or more, blowing is used. If blowing snow (BLSN) and snow (SN) are occurring together, both are reported but in separate present weather groups, e.g. "SN BLSN".

SH (shower) is used only in combination with precipitation types RA (rain), SN (snow), PL (ice pellets), GR (hail) and GS (snow pellets) if occurring at the time of observation, e.g. "SHPL" or "–SHRAGR". SHGS refers to either snow pellet showers or small hail (less than 5 mm diameter). When it is used for small hail, the diameter of the hail is included in remarks and CB are usually present.

TS (thunderstorm) is either reported alone or in combination with one or more of the precipitation types. The end of a thunderstorm is the time at which the last thunder was heard, followed by a 15-min period with no further thunder.

TS and SH are not used together, since present weather groups can have only one descriptor.

FZ (freezing) is used only in combination with the weather types DZ (drizzle), RA (rain) and FG (fog).

(ii) Weather phenomena—Different forms of precipitation are combined in one group, the predominant form being reported first. The intensity qualifier selected represents the overall intensity of the entire group, not just one component of the group. The one exception is freezing precipitation (FZRA or FZDZ), which is always reported in a separate present weather group. Obstructions to vision are generally reported if the prevailing visibility is 6 SM or less, with some exceptions. Any obscuration occurring simultaneously with one or more forms of precipitation is reported in a separate present weather group. Other phenomena are also reported in separate groups, and, when funnel clouds, tornados or waterspouts are observed, they will be coded in the present weather section, as well as being written out in their entirety in remarks.

k) *Sky conditions*—This group reports the sky condition for layers aloft. A vertical visibility (VV) is reported in hundreds of feet when the sky is obscured. All cloud layers are reported based on the summation of the layer amounts as observed from the surface up, reported as a height above the station elevation in increments of 100 ft to a height of 10 000 ft, and thereafter in increments of 1 000 ft. The layer amounts are reported in eighths (oktas) of sky coverage as follows:

Table 8.2—Sky Conditions for METARs

SKC	"sky clear"	no cloud present
FEW	"few"	less than 1/8 to 2/8 summation amount
SCT	"scattered"	3/8 to 4/8 summation amount
BKN	"broken"	5/8 to less than 8/8 summation amount
OVC	"overcast"	8/8 summation amount
CLR	"clear"	clear below 25 000 ft as interpreted by an AWOS

Significant convective clouds (cumulonimbus or towering cumulus only), if observed, are identified by the abbreviations CB (cumulonimbus) or TCU (towering cumulus), which are appended to the cloud group without a space, e.g. "SCT025TCU".

When observed, CB and TCU of any amount are always reported in the remarks of the aerodrome routine meteorological report (METAR) or aerodrome special meteorological report (SPECI), even if they are only embedded or distant.

When either CB or TCU is the predominant cloud type in a layer reported in the cloud group of the METAR/SPECI, the applicable cloud type (CB or TCU) is included within the cloud group. When an individual layer of cloud is composed of CB *and* TCU with a common cloud base, the type shall be reported as CB only.

The automated weather observation system (AWOS) cannot report cloud types. AWOS cloud layers are limited to four, and it will report clear (CLR) when no layers are detected below a base of 25 000 ft (some private AWOS are limited to cloud bases of 10 000 ft).

A ceiling is the lesser of the following: the height above ground or water of the base of the lowest layer of cloud covering more than half of the sky, **or** the vertical visibility in a surface-based layer which completely obscures the whole sky. Therefore, a ceiling exists at the height of the first layer for which a coverage symbol of BKN or OVC is reported. The existence of a vertical visibility constitutes an obscured ceiling.

l) *Temperature and dew point*—This group reports the air temperature and the dew point temperature, rounded to the nearest whole Celsius degree (e.g. +2.5°C would be rounded to +3°C). Negative values are preceded by the letter M, and values with a tenths digit equal to precisely 5 are rounded to the warmer whole degree. For example, 2.5, –0.5, –1.5, and –12.5 would be reported as 03, M00, M01 and M12, respectively.

m) *Altimeter setting*—This group reports the altimeter setting. A is the group indicator, followed by the altimeter setting indicated by a group of four figures representing tens, units, tenths and hundredths of inches of mercury. To decode, place a decimal point after the second digit (e.g. A3006 becomes 30.06).

n) *Wind shear*—This group contains reports of low-level wind shear (within 1 500 ft AGL) along the take-off or approach path of the designated runway. The two-digit runway identifier is used, to which the letters "L", "C", or "R" may be appended. If the existence of wind shear applies to all runways, "WS ALL RWY" is used.

o) *Remarks*—Remarks will appear in reports from Canada, prefaced by RMK. Remarks will include, where observed, layer type and cloud or obscuring phenomena (in eighths of sky covered or oktas), general weather remarks, and sea level pressure, as required. The sea level pressure, prefixed by "SLP" and indicated in hectopascals, will be the last mandatory field in the METAR. Density altitude will be indicated after sea level pressure when the density altitude is 200 ft or more than the aerodrome elevation.

Abbreviations for cloud types:

CI = cirrus
CS = cirrostratus
CC = cirrocumulus
AS = altostratus
AC = altocumulus
CU = cumulus
TCU = towering cumulus
NS = nimbostratus
ST = stratus
SF = stratus fractus
SC = stratocumulus
ACC = altocumulus castellanus
CF = cumulus fractus
CB = cumulonimbus

8.4 Aerodrome Special Meteorological Reports (SPECI)

8.4.1 Criteria for Taking Aerodrome Special Meteorological Reports (SPECI)

Special observations will be taken promptly to report changes that occur between scheduled transmission times whenever one or more of the following elements have changed in the amount specified. The amount of change is measured with reference to the preceding routine or special observation.

a) *Ceiling*—The ceiling decreases to less than the following values, or it increases to equal to or greater than these values:
   (i) 1 500 ft
   (ii) 1 000 ft
   (iii) 500 ft
   (iv) 400 ft*
   (v) 300 ft
   (vi) 200 ft*
   (vii) 100 ft*
   (viii) the lowest published minimum

   Criteria marked with an asterisk (*) are applicable only at aerodromes with precision approaches, and only down to and including the lowest published minima for those aerodromes.

b) *Sky condition*—A layer aloft is observed below:
   (i) 1 000 ft and no layer aloft was reported below this height in the report immediately previous; or
   (ii) the highest minimum for IFR straight-in landing or takeoff, and no layer was reported below this height in the report immediately previous.

c) *Visibility*—Prevailing visibility decreases to less than, or increases to equal to or greater than:
   (i) 3 SM
   (ii) 1 1/2 SM
   (iii) 1 SM
   (iv) 3/4 SM*
   (v) 1/2 SM
   (vi) 1/4 SM*
   (vii) the lowest published minimum

   Criteria marked with an asterisk (*) are applicable only at aerodromes with precision approaches, and only down to and including the lowest published minima for these aerodromes.

d) *Tornado, waterspout or funnel cloud*—If one or more of these phenomena:
   (i) is observed;
   (ii) disappears from sight; or
   (iii) is reported by the public (from reliable sources) to have occurred within the preceding six hours and not previously reported by another station.

e) *Thunderstorm*—When storm activity:
   (i) begins;
   (ii) increases in intensity to become "heavy"; or
   (iii) ends (a SPECI shall be issued when 15 min have elapsed without the occurrence of thunderstorm activity).

f) *Precipitation*—When any of the following begins, ends or changes intensity:
   (i) freezing rain
   (ii) freezing drizzle
   (iii) ice pellets (showery and non-showery)
   (iv) rain
   (v) rain showers
   (vi) drizzle
   (vii) snow
   (viii) snow showers
   (ix) snow grains
   (x) hail
   (xi) snow pellets
   (xii) ice crystals begin or end

   SPECIs shall be taken as required to report the beginning and end of each individual type of precipitation, regardless of simultaneous occurrences of other types. A leeway of up to 15 min is allowed after the ending of precipitation before a SPECI is mandatory.

   Example:
   –RA to –SHRA; SPECI not required.

g) *Obstruction to vision*—A SPECI shall be taken to report the beginning or end of freezing fog.

h) *Wind—A SPECI shall be taken to report when the wind:*
   (i) speed (2 min mean) increases suddenly to at least double the previously reported value and exceeds 30 kt;
   (ii) direction changes sufficiently to fulfill criteria required for a "wind shift."

i) *Temperature—A SPECI shall be taken to report when the temperature*
   (i) increases by 5°C or more from the previous reported value and the previous reported value was 20°C or higher; or
   (ii) decreases to a reported value of 2°C or lower.

   The following airports have been identified for SPECI criteria for significant temperature changes between hourly reports:
   (i) Calgary Intl, Alta.
   (ii) Edmonton Intl, Alta.
   (iii) Gander Intl, N.L.
   (iv) Moncton/Greater Moncton Intl, N.B.
   (v) Montréal/Pierre Elliott Trudeau Intl, Que.
   (vi) Montréal/Mirabel Intl, Que.
   (vii) Ottawa/Macdonald-Cartier Intl, Ont.
   (viii) St. John's Intl, N.L.
   (ix) Toronto/Lester B. Pearson Intl, Ont.
   (x) Vancouver Intl, B.C.

(xi) Victoria Intl, B.C.
(xii) Halifax Intl, N.S.
(xiii) London, Ont.
(xiv) Québec/Jean Lesage Intl, Que.
(xv) Whitehorse Intl, Y.T.
(xvi) Winnipeg Intl, Man.
(xvii) Yellowknife, N.W.T.
(xviii) Charlottetown, P.E.I.
(xix) Fredericton, N.B.
(xx) Prince George, B.C.
(xxi) Regina Intl, Sask.
(xxii) Saint John, N.B.
(xxiii) Saskatoon/John G. Diefenbaker Intl, Sask.
(xxiv) Thunder Bay, Ont.

j) *Volcanic eruption*—A SPECI shall be issued when a volcano erupts.

8.4.2 Local Criteria

Additional criteria may be established to meet local requirements.

8.4.2.1 Observer's Initiative

The criteria specified in the preceding paragraphs shall be regarded as the minimum requirements for taking special observations. In addition, any weather condition that, in the opinion of the observer, is important for the safety and efficiency of aircraft operations, or otherwise significant, shall be reported by a special observation.

8.4.2.2 Check Observations

Check observations are taken between regular hourly observations to ensure that significant changes in weather do not remain unreported. If such an observation does not reveal a significant change, it is designated as a "check observation." If a significant change has occurred, the report is treated as a "special observation."

A check observation shall be taken whenever a PIREP is received from an aircraft within 1 1/2 SM of the boundary of an airfield, and the PIREP indicates that weather conditions, as observed by the pilot, differ significantly from those reported by the current observation (i.e. the PIREP indicated that a special report may be required). This check observation should result in one of the following:

a) transmission of a special observation over regular communications channels; or

b) if no special observation is warranted, transmission of the check observation, together with the PIREP, to local airport agencies.

8.5 Automatic Aerodrome Routine Meteorological Reports (METAR AUTO) and Limited Weather Information System (LWIS) Reports

8.5.1 Automatic Aerodrome Routine Meteorological Reports (METAR AUTO)

Automated aviation weather observations are an integral component of the aviation weather reporting system in Canada, and there are currently more than 80 in operation in all regions of the country. They were developed to provide an alternative method of collecting and disseminating weather observations from sites where human observation programs could not be supported. Automation provides accurate and reliable data, but it does have limitations and characteristics that are important to understand when using the information.

NAV CANADA AWOS that produces METAR AUTO reports incorporates sensors capable of measuring cloud base height (up to 25 000 ft AGL); sky cover; visibility; temperature; dew point; wind velocity; altimeter setting; precipitation occurrence, type, amount and intensity; and the occurrence of icing. METARs and SPECIs based on automated weather observations include the word "AUTO". METAR AUTO observations are reported on the hour and SPECI AUTO observations are issued to report significant changes in cloud ceiling, visibility and wind velocity, as well as the onset and cessation of thunderstorms, precipitation or icing. AWOS operated by NAV CANADA and DND issue METAR AUTO reports and, when appropriate, SPECI AUTO reports.

AWOS is based on sensors that sample the atmosphere and prepare a data message every minute. If the observed weather conditions have changed significantly enough to meet the SPECI criteria, subject to the various processing algorithms, a SPECI AUTO will be issued. Human observers view the entire celestial dome and horizon; this results in a naturally smoothed and more representative value for ceiling and visibility. Because of the precise measurement, continuous sampling and unidirectional views of the sensors, NAV CANADA AWOS normally produces more SPECI observations than human observation sites (five to six percent of the time SPECI AUTO counts exceed six per hour). In cases where there are several reports issued over a short period of time, it is important to summarize the observations to gain an appreciation of the weather trend. One report in a series should not be expected to represent the prevailing condition.

For more information about METAR AUTO reports, please refer to MET 1.2.6.1.

8.5.2 Limited Weather Information System (LWIS) Reports

LWIS is an automated weather system which produces an hourly report containing wind speed and direction; temperature; dew point; and altimeter setting. LWIS is designed for use at aerodromes where provision of METAR AUTO and SPECI AUTO reports is not justified, but support for a CAP approach is required. For more information about LWIS reports, see MET 1.2.6.2.

Example:

LWIS CYXP 221700Z AUTO 25010G15KT 03/M02 A3017=

8.5.3 Automated Weather Observation System (AWOS) and Limited Weather Information System (LWIS) Performance Characteristics

All AWOS and LWIS systems operated by NAV CANADA have the following performance characteristics.

a) Thunderstorm reporting (AWOS) at sites within the domain of the CLDN. Thunderstorm activity, based on the proximity of the lightning strike(s) to the site, will be reported as:
   (i) TS—Thunderstorm (at site), if lightning detected at 6 SM or less;
   (ii) VCTS—Thunderstorm in vicinity, if lightning detected from > 6 to 10 SM;
   (iii) LTNG DIST (direction)—If lightning detected from > 10 to 30 SM, lightning distant with octant compass cardinal direction shall be reported in remarks, e.g. LTNG DIST NE, S, SW; and
   (iv) LTNG DIST ALL QUADS—Lightning distant all quadrants will be reported in remarks if lightning is detected in four or more octants.

b) Ice-resistant anemometer (AWOS and LWIS)—New ice-resistant technology essentially eliminates anemometer performance degradation due to freezing precipitation, freezing fog or snow contamination.

c) Freezing drizzle and drizzle are not reported. When drizzle is occurring, the AWOS will usually report either rain or unknown precipitation. When freezing drizzle is occurring, the AWOS will usually report either freezing rain or freezing precipitation of an unknown type.

d) Density altitude reporting capability (AWOS and LWIS)—Density altitude is the altitude in ISA at which the air density would be equal to the air density at field elevation at the current temperature. This remark is only added when the density altitude, rounded to the nearest 100 ft, is 200 ft or higher than the aerodrome elevation. A rough value of density altitude can be approximated by adding 118.8 ft to the aerodrome pressure altitude for every degree Celsius the temperature is above ISA. Density altitude can also be less than aerodrome elevation and can be estimated by subtracting 118.8 ft from the aerodrome pressure altitude for every degree Celsius colder than ISA, but it is not reported.

e) Visibility (AWOS)—Visibility will be reported in daytime and at night in a manner similar to human assessment.

f) Ceilometer—AWOS is capable of reporting cloud bases up to 25 000 ft.

g) "Obstructions to vision" reporting capability—AWOS is able to report haze (HZ); mist (BR); fog (FG); freezing fog (FZFG); and blowing snow (BLSN).

h) VGSS—Text-to-voice technology at many sites for local VHF transmission of weather report to pilots.

i) Icing—The occurrence of icing at the time of observation or during the past hour will be noted in remarks.

j) RVR reporting (AWOS) at sites where RVR sensors are installed.

k) Digital aviation weather cameras (WxCam) are installed at stand-alone locations as well as at many AWOS and LWIS sites.

All regulated observations of wind speed, direction, and character, as well as temperature, dew point, and altimeter setting must meet the same performance specifications regardless of the means of assessment (either human or automated). Among these requirements is one that stipulates that all reports of altimeter setting must be based upon a fail-safe design that utilizes two or more independently operating pressure sensors that must agree within established tolerances before they can be included in a report.

8.5.4 Automatic Aerodrome Routine Meteorological Reports (METAR AUTO) and Human Observation Comparison

METAR AUTO provided by NAV CANADA AWOS and METAR issued by human are compared in the following table.

Table 8.3—METAR Observation Comparison

WX Report Parameter	Human Observation	NAV CANADA METAR AUTO
Report type	METAR or SPECI	METAR or SPECI
Location indicator	Four-letter indicator (e.g. CYQM, CYVR).	No difference.
	At stations where the observer is not at the aerodrome, (beyond 1.6 NM [3 km] of the geometric centre of the runway complex) the Wx report indicator differs from the aerodrome indicator, e.g. Cartwright aerodrome is CYCA; the Wx report is identified as CWCA.	No difference.
Report time	Date and time in UTC, followed by a "Z", e.g. 091200Z.	No difference.
Type indicator		AUTO
Corrections indicator	Corrections can be issued, e.g. "CCA", the "A" indicates the first correction.	Not applicable.
Wind	A 2-min average direction in degrees true; speed in kt; "G" represents a gust, e.g. 12015G25KT.	No difference.
	Human observers shall provide an estimate of wind speed and direction in the event of wind sensor failure.	No difference. **NOTE**: When a VGSS is installed, the wind direction will be broadcast in degrees magnetic if the AWOS is located in SDA; elsewhere, it will be broadcast in degrees true. If wind information is missing, five forward slashes (/) are placed in the wind field, e.g. /////.
Variable wind group	Wind direction variation of 60° or greater.	No difference.
Visibility	Reported in SM up to 15 mi. After 15 mi., it is reported as 15+, e.g. 10 SM.	Reported in SM up to 9 mi.
	Fractional visibilities are reported.	No difference.
	Visibility is prevailing visibility, i.e. common to at least half the horizon circle.	Visibility is measured using fixed, unidirectional, forward scatter techniques.
		Reported visibilities tend to be comparable to (especially with visibility less than 1 SM) or higher than human observations in precipitation.
		Reported visibilities at night are the same as the day and tend to be comparable to or higher than human observations.
RVR	Runway direction, followed by the visual range in feet, followed by a trend. RVR will be reported where equipment is available.	No difference.

WX Report Parameter	Human Observation	NAV CANADA METAR AUTO
Weather group	See the WMO Code Table 4678 (Table 8.1) in MET 8.3 for the symbols used for obstructions to visibility (e.g. smoke, haze).	AWOS are capable of reporting FG, FZFG, BR, BLSN and HZ.
	See the table WMO Code Table 4678 (Table 8.1) in MET 8.3 for the symbols used for the description of weather.	AWOS will report weather phenomena using the following symbols: RA—rain, FZRA—freezing rain, SN—snow, UP—unknown precipitation type. AWOS reports thunderstorms (TS) and includes remarks on location of lightning. Drizzle (DZ) or freezing drizzle (FZDZ) are not reported and will usually be reported as rain (RA or FZRA) or unknown precipitation type (UP or FZUP).
	"+" or "–" is used to indicate weather intensity.	No difference. Squalls are not reported. AWOS does not report "in the vicinity" phenomena other than TS and lightning.
		AWOS may sporadically report freezing precipitation at temperatures above 0°C and below +3°C, during periods of wet snow, rain, drizzle or fog.
Cloud amount and sky conditions	Observer views entire celestial dome and determines cloud-base height, layer amounts and opacity, and cumulative amount and opacity.	Laser ceilometer views one point directly over the station. It measures the cloud-base height and then uses time integration to determine layer amounts.
	SKC or height of cloud base plus FEW, SCT, BKN, OVC.	Height of cloud base plus FEW, SCT, BKN, OVC. "CLR" is reported if no cloud below 25 000 ft AGL is detected.
	Surface-based layers are prefaced by "VV" and a three-figure vertical visibility.	No difference.
	The cloud layer amounts are cumulative.	No difference.
		Multiple overcast layers can be detected and reported.
		Ceilometer may occasionally detect ice crystals, smoke aloft or strong temperature inversion aloft and report them as cloud layers.
		Reported cloud layers in precipitation are comparable to or lower than human observations.
		Check GFA and TAF for further information.
Temperature and dew point	Temperature then dew point expressed as a two-digit number in degrees Celsius, separated by a forward slash (/) and preceded by an "M" for below freezing temperatures, e.g. 03/M05.	No difference.
Altimeter setting	An "A" followed by a four-digit number in inches of mercury. e.g. A2997.	No difference.
Wind shear	Existence in the lower layers shall be reported when known to the observer.	Not reported.

WX Report Parameter	Human Observation	NAV CANADA METAR AUTO
Supplementary information (Remarks)	See the WMO Code Table 4678 (Table 8.1) in MET 8.3 for the symbols used to describe clouds and obscuring phenomena.	Clouds and obscuring phenomena are not described in METAR AUTO or SPECI AUTO reports.
	Significant weather or variation not reported elsewhere in the report.	Currently, remarks are limited. When visibility is variable, the remark VIS VRB followed by the limits will appear, e.g. VIS VRB 1-2. When icing is detected, ICG, ICG INTMT or ICG PAST HR will appear. Remarks on precipitation amount, rapid changes in pressure and the location of lightning may also appear.
Barometric pressure	The last remark in the METAR or SPECI is the mean sea level pressure in hectopascals, e.g. SLP127 (1012.7 hPa).	No difference.
Density altitude	Density altitude for heights 200 ft above aerodrome elevation. The dry air density altitude will be included in the remarks.	No difference.

*Exampl*e of METAR issued by human observation:

METAR CYEG 151200Z CCA 12012G23KT 3/4SM R12/4000FT/D –RA BR FEW008 SCT014 BKN022 OVC035 10/09 A2984 RMK SF1SC2SC4SC1 VIS W2 SLP012=

Example of METAR AUTO issued by NAV CANADA's AWOS system:

METAR CZVL 151200Z AUTO 12012G23KT 3/4SM –RA FEW008 SCT014 BKN022 OVC035 10/09 A2984 RMK SLP012=

NOTE:
If an AWOS sensor is malfunctioning or has shut down, that parameter will be missing from the report.

8.6 Voice Generation Systems

Where a voice generator sub-system (VGSS), very high frequency (VHF) radio and/or telephone are connected to the automated weather observation system (AWOS) or limited weather information system (LWIS), the most recent data gathered once each minute will be broadcast to pilots on the VHF frequency and/or via the telephone number published in the *Canada Flight Supplement* (CFS). A pilot with a VHF receiver should be able to receive the VGSS transmission at a range of 75 NM from the site at an altitude of 10 000 ft AGL. Weather data will be broadcast in the same sequence as that used for aerodrome routine meteorological reports (METARs) and aerodrome special meteorological reports (SPECIs).

A human observed METAR/SPECI or a METAR AUTO/SPECI AUTO shall take priority over an automated voice generated report (minutely reports). During the hours when a human observation program is operating and there is no direct VHF communication between the pilot and the weather observer, the VGSS VHF transmitter will normally be off. This eliminates the risk of a pilot possibly receiving two contradictory and confusing weather reports.

In variable weather conditions, there may be significant differences between broadcasts only a few minutes apart. It is very important during these conditions to obtain several broadcasts of the minutely data for comparison to develop an accurate picture of the actual conditions to be expected at the location.

Below is the typical format of an NAV CANADA AWOS voice message:

"(site name) AUTOMATED WEATHER OBSERVATION SYSTEM—OBSERVATION TAKEN AT (time) — WIND (direction) (MAGNETIC/TRUE) AT (speed) KNOTS — VISIBILITY (visibility data) — (present weather data) — (sky condition/cloud data) — TEMPERATURE (temperature data)— DEW POINT (dew point data)— ALTIMETER (altimeter data)"

Below is an example of the LWIS voice message:

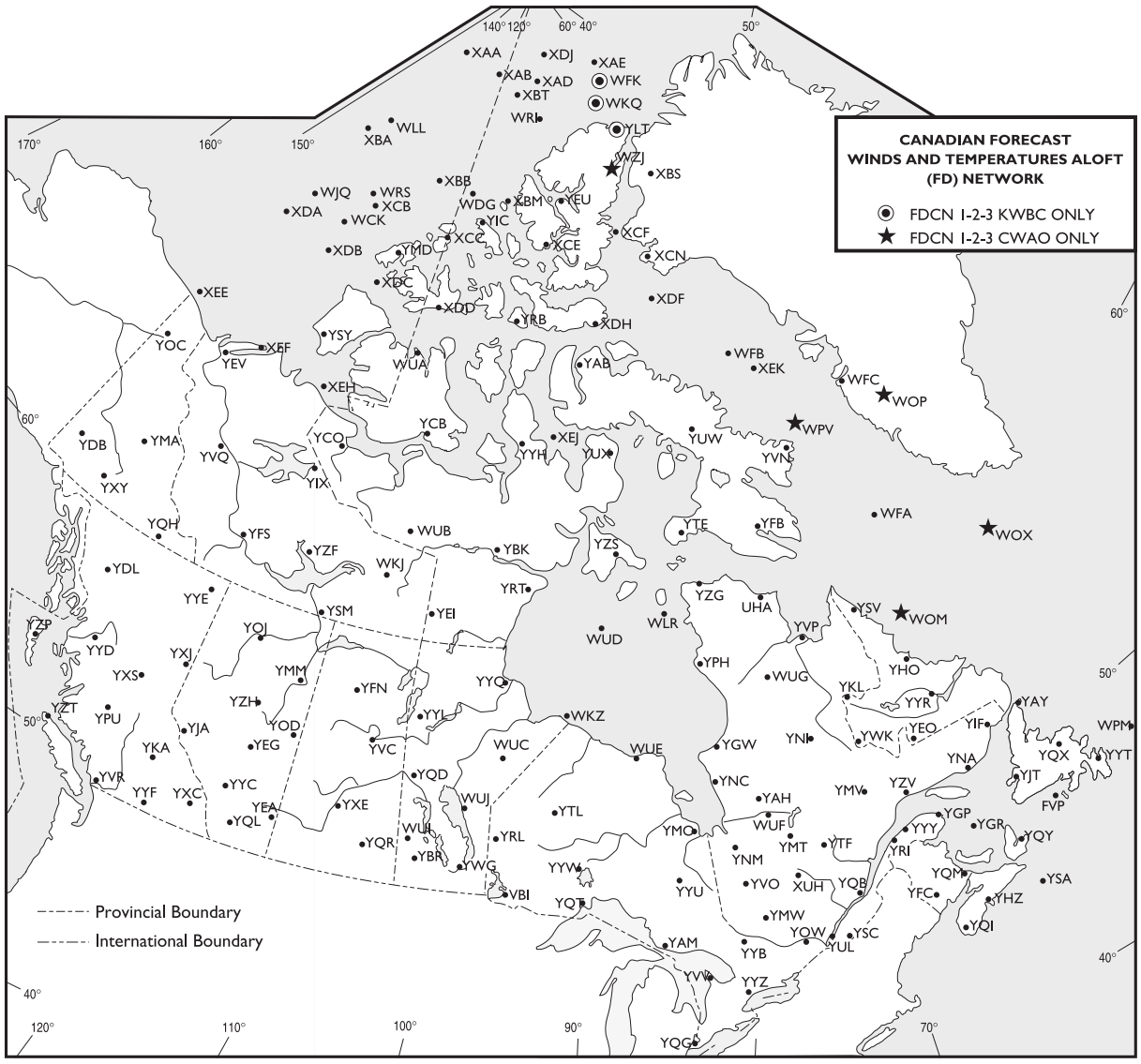
"(site name) LIMITED WEATHER INFORMATION SYSTEM— CURRENT OBSERVATION TAKEN AT (time) — WIND (direction) (MAGNETIC/TRUE) (speed) KNOTS — TEMPERATURE (temperature data) — DEW POINT (dew point data) — ALTIMETER (altimeter data)"

NOTE:
Missing data or data that has been suppressed is transmitted as "MISSING".

9.0 UPPER LEVEL WINDS AND TEMPERATURES

9.1 Canadian Forecast Winds and Temperatures Aloft Network

Figure 9.1—Canadian Forecast Winds and Temperatures Aloft Network



9.2 Upper Level Wind and Temperature Forecasts (FDs)

Upper level wind and temperature forecasts (FDs) are upper level forecasts of wind velocity, expressed in knots and to the nearest 10° true, and temperature, expressed in degrees Celsius. Temperatures are not forecast for 3 000 ft; in addition, this level is omitted if the terrain elevation is greater than 1 500 ft. All forecast temperatures for altitudes over 24 000 ft are negative.

Data for the production of FD forecasts are derived from a variety of atmospheric data sources, including upper air sounding measurements of pressure, temperature, relative humidity and wind velocity, taken at 32 sites twice daily (at 0000Z and 1200Z). Following the computer run of a subsequent numeric weather model, FD forecasts are available at the valid times indicated in MET 3.1.

MET

Table 9.1—FD Example 1

FDCN01 CWAO 071530 FCST BASED ON 071200 DATA VALID 080000 FOR USE 21-06					
Airport / FT	3 000	6 000	9 000	12 000	18 000
YVR	9900	2415-07	2430-10	2434-10	2542-26
YYF	2523	2432-04	2338-08	2342-13	2448-24
YXC		2431-02	2330-06	2344-11	2352-22
YYC		2426-03	2435-06	2430-12	2342-22
YQL		2527-01	2437-05	2442-10	2450-21

Table 9.2—FD Example 2

FDCN1 KWBC 080440DATA BASED ON 080000Z VALID 091200Z FOR USE 0900-1800Z. TEMPS NEG ABV 24 000				
Airport / FT	24 000	30 000	34 000	39 000
YVR	2973-24	293040	283450	273763
YYF	3031-24	314041	304551	204763
YXC	3040-27	315143	316754	306761
YYC	3058-29	317246	317855	306358
YQL	2955-28	306845	307455	791159

When the forecast speed is less than 5 kt, the code group is "9900," which reads "light and variable."

Encoded wind speeds from 100 to 199 kt have 50 added to the direction code and 100 subtracted from the speed. Wind speeds that have had 50 added to the direction can be recognized when figures from 51 to 86 appear in the code. Since no such directions exist (i.e. 510° to 860°), obviously they represent directions from 010° to 360°.

Should the forecast wind speed be 200 kt or greater, the wind group is coded as 199 kt, that is, 7799 is decoded as 270° at 199 kt or greater.

Examples of decoding FD winds and temperatures are as follows (the third and fourth examples are both for altitudes above 24 000 ft):

Table 9.3—Example of Code Used in FDs

EXAMPLE	DECODED
9900 + 00	Wind light and variable, temperature 0°C
2523	250° true at 23 kt
791159	290° true (79 - 50 = 29) at 111 kt (11 + 100 = 111), temperature - 59°C
859950	350° true (85 - 50 = 35) at 199 kt or greater, temperature -50°C

Forecasts in digital form of the winds and the temperatures aloft (FB) are currently available over the phone. They have a similar format to FD forecasts but are updated four times a day and include other improvements. FD forecasts will continue to be available but will gradually be replaced by FB forecasts.

10.0 SURFACE WEATHER MAPS

Figure 10.1—Surface Weather Maps Legend

COLOUR	SYMBOL	DESCRIPTION
BLUE	H	High pressure centre
RED	L	Low pressure centre
BLUE		Cold front
BLUE		Cold front aloft
RED		Warm front
RED		Warm front aloft
RED / BLUE		Stationary front
PURPLE		Occluded front
BLUE		Cold frontogenesis
RED		Warm frontogenesis
RED / BLUE		Stationary frontogenesis
BLUE		Cold frontolysis
RED		Warm frontolysis
RED / BLUE		Stationary frontolysis
PURPLE		Occluded frontolysis
PURPLE		Squall line
PURPLE		Trough
BLUE / RED		Trowal

The following is a list of things to keep in mind when reading surface weather maps:

1. Check the time of the map to make sure that it is the latest one available.

2. Always remember that weather moves. A map provides a static picture of weather conditions over a large area at a specific time. Always use a map along with the latest reports and forecasts.

3. The curving lines on the map, which form patterns like giant thumbprints, are called isobars. Joining points of equal sea level pressure, isobars outline the areas of high and low pressure, marked H and L, respectively.

4. The winds at 2 000 ft AGL blow roughly parallel to the isobars—in a clockwise direction around highs and counter-clockwise around lows. Wind speeds vary with the distance between isobars. Where the lines are close together, moderate to strong winds can be expected; where they are far apart, light variable winds are expected.

5. The red and blue lines are called fronts. These lines indicate the zones of contact between large air masses with differing physical properties—cold vs. warm, dry vs. moist, etc. Blue lines are for cold fronts—cold air advancing. Red lines are for warm fronts—warm air advancing. Alternate red and blue lines are for quasi-stationary fronts—neither warm air nor cold air advancing. Hook marks in red and blue are for trowals-troughs of warm air aloft. A purple line is called an occluded front—where a cold front has overtaken a warm front. Solid coloured lines are fronts which produce air mass changes at the ground level as well as in the upper air.

Dashed coloured lines represent "upper air" fronts—they also are important. Along all active fronts, one usually encounters clouds and precipitation.

6. When colours cannot be used to distinguish the various kinds of fronts, monochromatic symbols are used.

11.0 UPPER LEVEL CHARTS

Upper level charts depict two forms of data: actual and forecast. Actual measured conditions are represented on analyzed charts (ANAL). These charts show conditions as they were at a specific time in the past. Prognostic charts (PROG) show forecast conditions for a specific time in the future. Always check the map label for the type, date and valid time of a chart.

11.1 Upper Level Analysis Charts

Meteorological parameters in the upper atmosphere are measured twice a day (0000Z and 1200Z). The data are plotted and analyzed on constant pressure level charts. These charts always indicate past conditions. The 850 hPa (5 000 ft), 700 hPa (10 000 ft), 500 hPa (18 000 ft) and 250 hPa (34 000 ft) analyzed charts are available in Canada and are generally in weather offices and on NAV CANADA's aviation weather web site (AWWS)about three hours after the data are recorded.

The maps include the following useful information:

a) *Height*—The solid lines (contours) on all the charts represent the approximate height of the pressure level indicated by the map. The contours are labelled in decametres (10s of metres) such that on a 500 hPa map, 540 means 5 400 m and on a 250 hPa map, 1020 means 10 200 m. Contours are spaced 60 m (6 decametres) apart except at 250 hPa, where the spacing is 120 m.

b) *Temperature*—Temperature is analyzed on the 850 hPa and 700 hPa charts only. Dashed lines are drawn at 5°C intervals and are labelled 5, 0, -5, etc. Temperatures at 500 hPa and 250 hPa are obtained by reading the number in the upper left corner of each of the station plots.

c) *Wind direction*—Wind direction may be determined at any point by using the height contours. The wind generally blows parallel to the contours and the direction is determined by keeping the "wind at your back with low heights to the left". The plotted wind arrows also provide the actual wind direction at the stations.

d) *Wind speed*—Wind speed is inversely proportional to the spacing of the height contours. If the contours are close together, the winds are strong; if far apart, the winds are light. The plotted wind arrows also provide the wind speed.

On the 250 hPa chart, wind speeds are analyzed using dashed lines for points with the same wind speed (isotachs). The isotachs are analyzed by a computer and are drawn at 30-kt intervals starting at 60 kt.

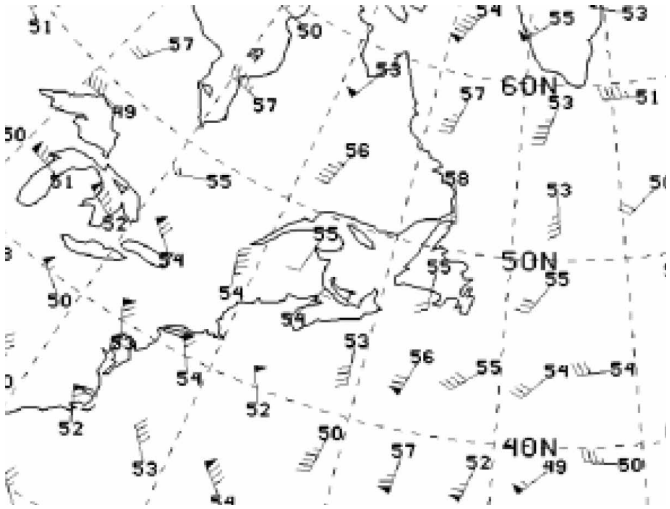
NOTE:
Computer analyzed charts have the analyzed parameters smoothed to some extent.

11.2 Upper Level Prognostic Charts

Upper level wind and temperature charts are issued by a world area forecast centre (WAFC), through the U.S. National Oceanic and Atmospheric Administration's National Weather Service in Washington, D.C. Winds are depicted for FL 240, FL 340, FL 390 and FL 450 using arrow shafts with pennants (50 kt each), full feathers (10 kt each) and half feathers (5 kt each). The orientation of the shaft indicates wind direction (degree true). Temperatures (°C) are presented in bold type at fixed grid points for the flight level. All temperatures are negative unless otherwise noted.

Wind and temperature information from these charts, in conjunction with the upper level wind and temperature forecast (FD) and significant weather charts (SIGWX), can be used to determine wind shear and other salient information such as the probability of clear air turbulence (CAT) over given points. Remember, the wind speed is normally highest at the tropopause and decreases above and below at a relatively constant rate.

Figure 11.1—Section of an Upper Level Wind and Temperature Chart

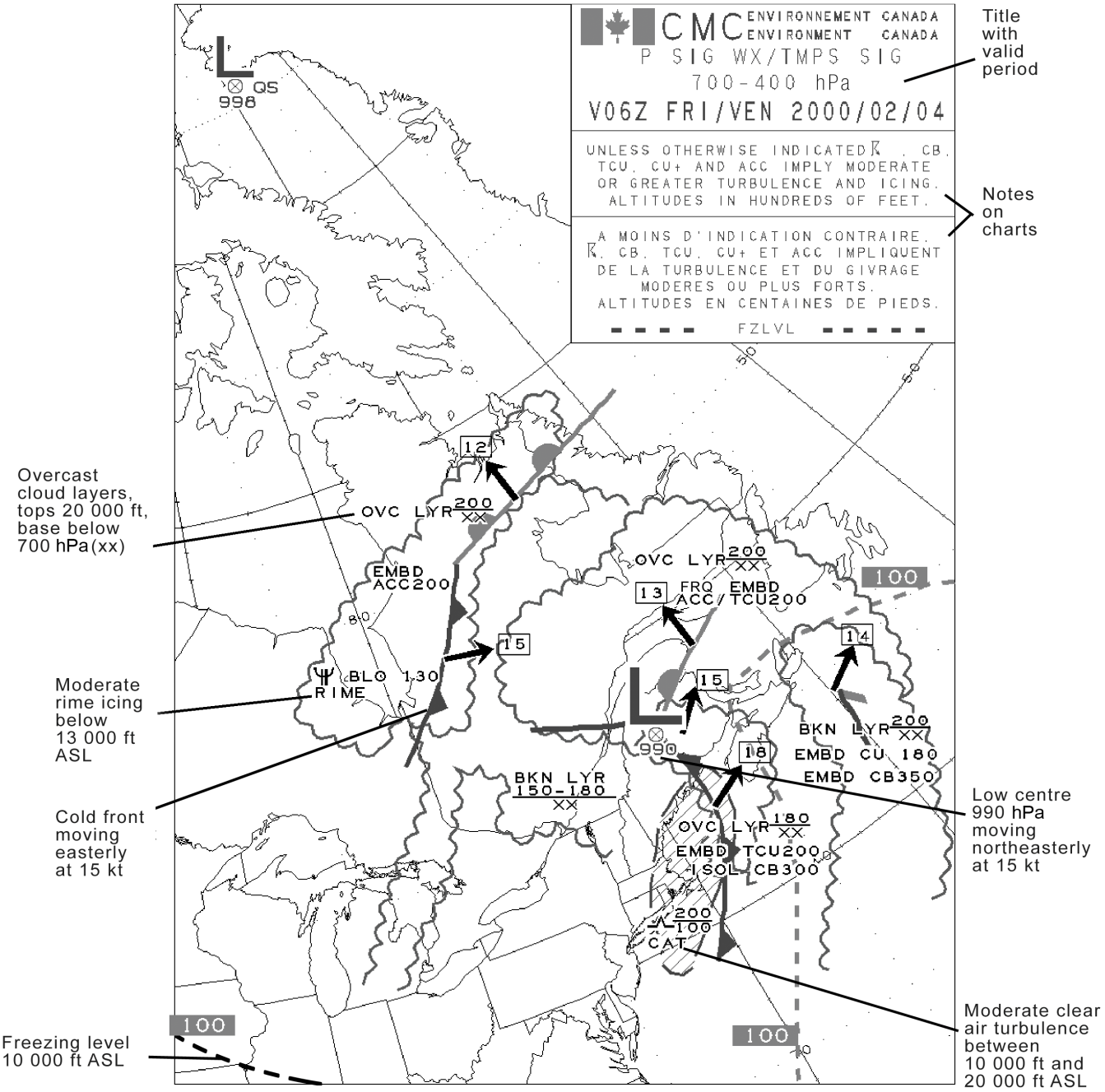


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12.0 SIGNIFICANT WEATHER PROGNOSTIC CHARTS

12.1 Mid-Level Charts

Figure 12.1(a)—Example of a Mid-Level Significant Weather Chart



The Canadian Meteorological Aviation Centres (CMACs) issue a series of significant weather prognostic charts for the mid-levels from 700 to 400 hPa (FL 100 to FL 240). They use the same criteria as the significant weather prognostic high-level charts plus the following:

a) moderate to severe icing (light icing is not depicted);

b) cloud layers of significance;

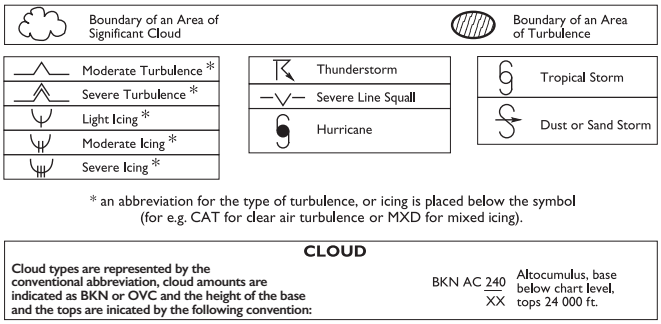
c) marked mountain waves;

d) freezing level line (0°C) at 5 000-ft intervals, and labeled in hundreds of feet; and/or

e) surface positions and direction of motion (in knots) of highs, lows, and other significant features (front, trough).

Symbols used on the Significant Weather Prognostic Charts by the CMAC:

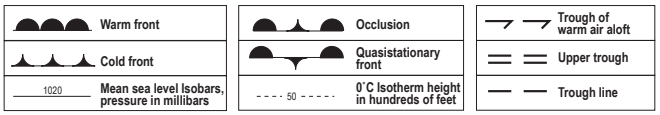
Figure 12.1(b)—Significant Weather Symbols



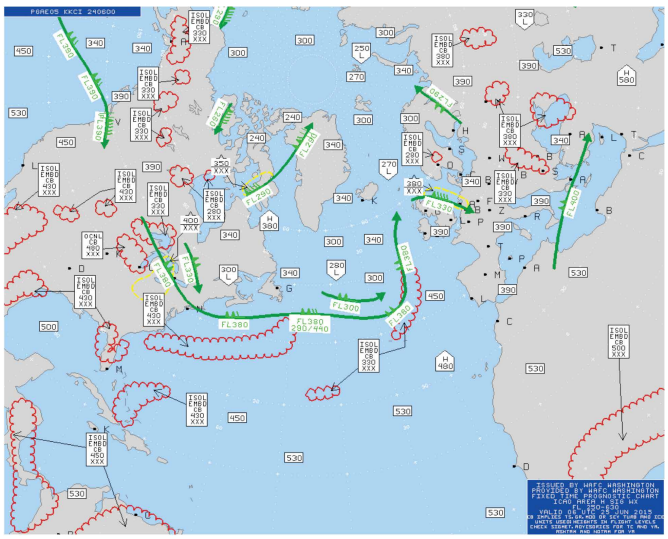
* ABBREVIATIONS

CAT	– clear air turbulence
ISOLD	– isolated
FRQ	– frequent
LYR	– layers
MXD	– mixed
OCNL	– occasional
LEE WV	– lee/mountain waves
CLR	– clear
FZLVL	– freezing level

Figure 12.1(c)—Fronts and Other Conventions



12.2 High-Level Charts



These charts, produced for the mid and high levels, show occurring or forecast weather conditions considered to be of concern to aircraft operations. A world area forecast centre (WAFC), through the U.S. National Oceanic and Atmospheric Administration's National Weather Service, issues a chart depicting forecast weather conditions between FL 250 and FL 630. Each chart includes a background that depicts the major bodies of land and water for the related region along with a few letters that correspond to the first letters of the names of cities located at the adjacent black dot. The meteorological conditions depicted and the symbols used are:

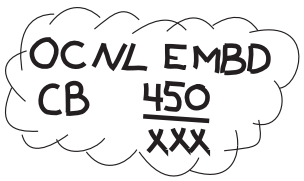
a) *Active thunderstorms*—The cumulonimbus (CB) symbol is used when thunderstorms occur, or are forecast to occur, over a widespread area, along a line, embedded in other cloud layers, or when concealed by a hazard. The amounts and the spatial coverage (in brackets) are indicated as:
   (i) *ISOL (isolated)*—for individual CBs (less than 50%)
   (ii) *OCNL (occasional)*—for well-separated CBs (50–75% inclusive)
   (iii) *FRQ (frequent)*—for CBs with little or no separation (greater than 75%)

NOTE:
The definitions of the above terms, as used in the International Civil Aviation Organization (ICAO) charts, differ from those used for national significant meteorological information (SIGMET), AIRMET and graphic area forecast (GFA). The ICAO definitions involve 25% greater coverage in all cases. Some charts may include SCT which refers to 25–50% area coverage. In addition, ISOL is used by ICAO while ISOLD is used in national forecasts.

Embedded CBs may or may not be protruding from the cloud or haze layer. The following abbreviations are used to indicate the presence of CBs: ISOL embedded CB, OCNL embedded CB, FRQ embedded CB and FRQ CB. All other clouds are depicted using OKTA amounts, followed by the cloud type. In certain cases the abbreviation LYR (layer or layered) is used to indicate cloud structure.

b) *Cloud heights*—When cloud tops or bases exceed the upper or lower limits of a significant weather prognostic chart, an XXX symbol is used on the appropriate side of the dividing line. Consider, for example, the significant weather prognostic chart that extends from FL 250 to FL 630. If well-separated embedded CBs based below FL 250 and topped at FL 450 were present, this would be depicted as follows:

Figure 12.2(b)—Clouds Heights



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The scalloped line indicates the area in which the conditions written inside apply.

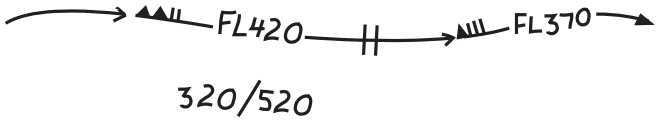
c) *Tropopause heights*—Tropopause heights are depicted as flight levels, except when defining areas of very flat slope, and are enclosed in a rectangular box. The centre of the box represents the grid point being forecast.

Figure 12.2(c)—Tropopause Heights



d) *Jet streams*—The height and speed of jet streams having a core speed of 80 kt or more are shown oriented to true north using arrows with pennants and feathers for speed and spaced sufficiently close to give a good indication of speed and height changes. A double-hatched line across the jet stream core indicates a speed increase or decrease of 20 kt or greater at a jet stream speed of 100 kt or higher. For example, a 120 kt jet stream initially at FL 420 dropping to 80 kt at FL 370 would be depicted as

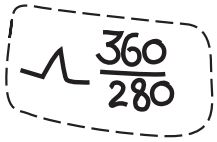
Figure 12.2(d)—Jet Streams



The vertical depth of the jet stream is depicted by two numbers, indicating the base and top of the 80-kt isotach in hundreds of feet above sea level. In the above example, the 80-kt isotach is forecast to be based at FL 320 and topped at FL 520. Only jet streams with a speed of 120 kt or more will contain vertical depth information.

e) *Turbulence*—Areas of moderate or severe turbulence in cloud or clear air are depicted using heavy dashed lines, height symbols, a ⌒ for moderate turbulence and a ⌒ for severe. Wind shear and mountain wave turbulence are included; convective turbulence is not. For example, an area of moderate turbulence between FL 280 and FL 360 would be shown as:

Figure 12.2(e)—Turbulence



f) *Severe squall lines*—Severe squall lines are depicted using the symbol –V– and are oriented to true north with a representative length. An area of frequent CBs associated with a squall line would be shown as:

Figure 12.2(f)—Severe Squall Lines

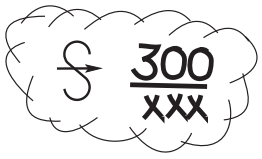


g) *Icing and hail*—Icing and hail are not specifically noted, but rather, the following statement is included in the label on each chart:

SYMBOL CB IMPLIES HAIL, MODERATE OR GREATER TURBULENCE AND ICING

h) *Widespread sandstorms or dust storms*—Areas of these conditions are shown using a scalloped line, height symbol and a S. For example:

Figure 12.2(g)—Widespread Sandstorms or Dust Storms



i) *Tropical cyclones*—The symbol § is used to depict tropical cyclones and, if any of the previous criteria are met, these will be included. For example, an area of frequent CBs between 10 000 ft and 50 000 ft with an associated tropical storm named "William" would be shown as:

Figure 12.2(h)—Tropical Cyclones



Significant weather prognostic charts depicting the tropical cyclone symbol will have a statement to the effect that the latest tropical cyclone advisory, rather than the tropical cyclone's prognostic position on the chart, is to be given public dissemination.

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j) *Volcanic eruptions*—Information on the location of volcanic eruptions that are producing ash clouds of significance to aircraft operations is shown as follows: the volcanic eruption symbol is shown at the location of the volcano; on the side of the chart, a box is shown containing the volcano eruption symbol, the name and international number of the volcano (if known), the latitude/longitude, and date and time of the first eruption (if known). Check SIGMET and NOTAM or ASHTAM for volcanic ash. The symbol is as follows, and may be depicted in red on colour charts:

Figure 12.2(i)—Volcanic Eruptions



k) *Radioactive material in the atmosphere*—Information on the location of a release of radioactive materials into the atmosphere that is of significance to aircraft operations is shown as follows: the radioactivity symbol at the site of the accident; on the side of the chart, in a box containing the radioactivity symbol, latitude/longitude of the site of the accident, date and time of the release and a reminder to users to check NOTAM for the area concerned. The symbol, in black on a yellow circular background when depicted in colour, is as follows:

Figure 12.2(j)—Radioactive Material in the Atmosphere



13.0 VOLCANIC ASH PRODUCTS

a) *ICAO products*—The Montréal volcanic ash advisory centre (VAAC), a unit of ECCC, is an International Civil Aviation Organization (ICAO) designated centre responsible for issuing specialized advisories when volcanic ash is present in Canadian-controlled airspace. VAAC Montréal issues volcanic ash advisories (VAA) on the horizontal and vertical extent of volcanic clouds, their altitude, and expected movements. These advisories are based on satellite observations, pilot reports, and weather forecast and dispersion models. VAA are issued as both text and graphic products and are available via the VAAC Montréal Web site at <https://weather.gc.ca/eer/vaac/index_e.html>.

Model simulations of volcanic ash—In addition to the official VAA described in the previous paragraph, results from simulations of the volcanic ash dispersion model, known as MLDPn (an abbreviation that stands for *modèle langrangien de dispersion de particules d'ordre n*), are also available at <https://weather.gc.ca/eer/vaac/index_e.html>. Forecasts of concentrations of ash and the expected paths of volcanic clouds are generated when volcanic ash threatens Canadian-controlled airspace.

Such simulations are also performed for active volcanos whose eventual eruption could affect Canadian-controlled airspace. These MLDPn outputs are produced automatically using hypothetical eruption start times that are three hours apart. Forecast ash concentrations are presented as prognostic charts composed of four panels. Figure 13.1 shows the average concentration for three layers expressed in terms of flight levels (in hundreds of feet) as well as the ash mass loading for the whole atmospheric column: surface to FL200 (upper left-hand panel), FL200–FL350 (upper right-hand panel), FL350–FL600 (lower left-hand panel), and ash mass loading (lower right-hand panel).

The time at which the run starts is indicated in the legend box in the lower, left-hand portion of the image. The date and time of forecast validity are indicated on the clock in the lower, right-hand portion of the image. The results are based on the execution of the last global numerical weather prediction (NWP) model using either 0000 or 1200 UTC data.

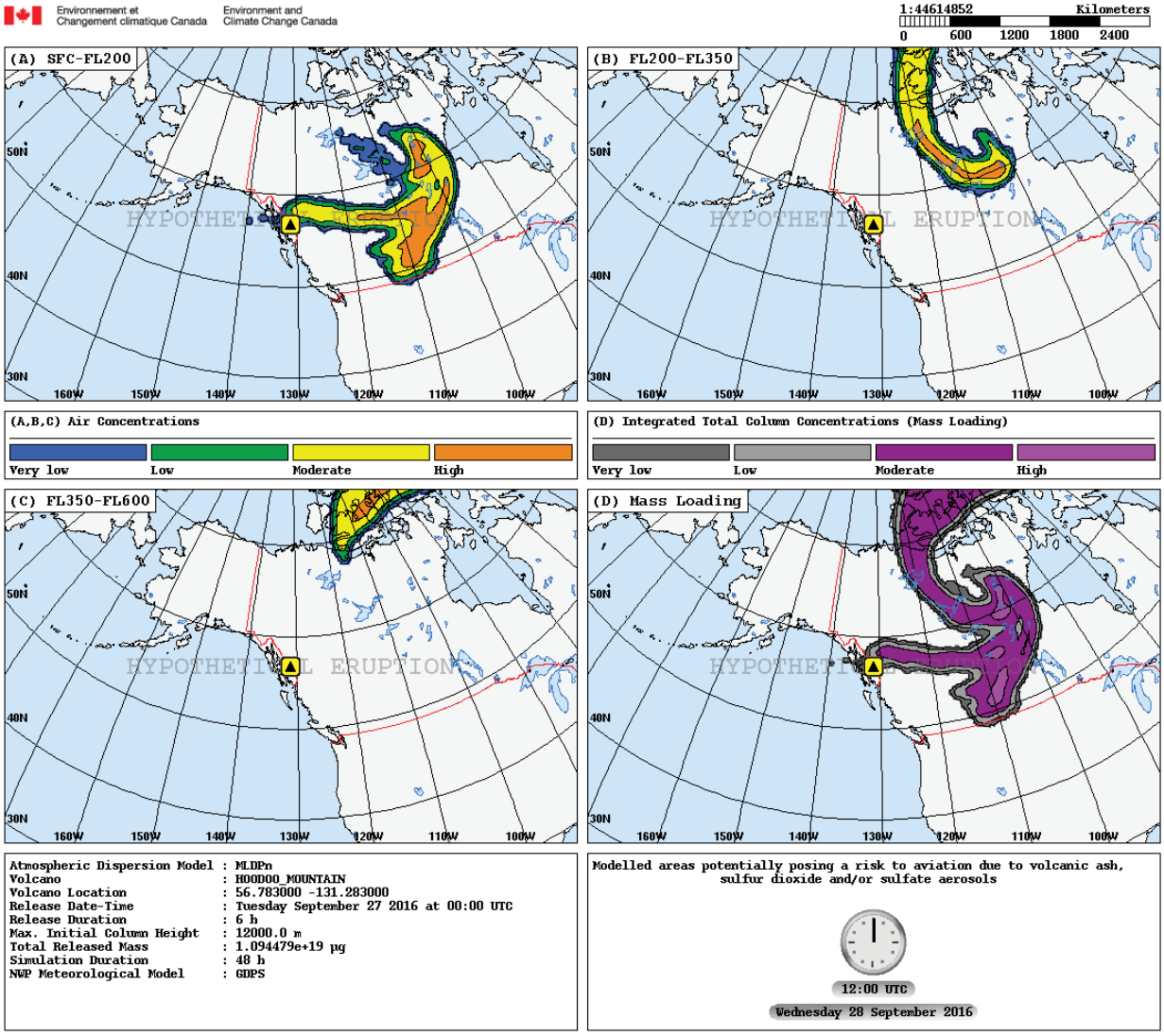
The volcano of interest is at the centre of the image. The average volcanic ash concentration in the atmospheric layer is depicted as very low, low, moderate, or high. The isolines are for 1, 10, 100 and 1 000 µg/m^3 (micrograms per cubic metre). The areas between the isolines are enhanced as follows:

(i) 1–10 µg/m^3 is indicated by blue stippling;
(ii) 10–100 µg/m^3 is indicated by green stippling;
(iii) 100–1 000 µg/m^3 is indicated by yellow stippling; and
(iv) > 1 000 µg/m^3 is indicated by orange stippling.

The total ash mass loading is also depicted as very low, low, moderate, or high, with isolines for 0.01; 0.1; 1 and 10 g/m^2.

CAUTION:
Users are reminded to consult the latest significant meteorological information (SIGMET) and official ICAO products for updates on the position and vertical extent of the volcanic ash warning area. Even light (LGT) concentrations constitute a potential danger to aviation. Turbine engine flameouts have been attributed to light volcanic ash clouds located up to 1 000 NM from the source (see AIR 2.6).

Figure 13.1—Example of Volcanic Ash Forecast Caused by a Hypothetical Eruption



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14.0 SPACE WEATHER INFORMATION SERVICE

14.1 Introduction

Civil aviation may be affected by space weather phenomena, notably with respect to:

a) high-frequency (HF) radio communications;

b) global navigation satellite system-based (GNSS-based) navigation and surveillance;

c) satellite communications; and

d) increased exposure to radiation aboard aircraft.

ICAO has therefore organized a space weather information service, whereby advisories will be disseminated through the aeronautical fixed service (AFS), including the aeronautical fixed telecommunications network (AFTN) and the Air Traffic Services Message Handling System (AMHS), in cases of moderate or severe impacts on the four domains identified above.

14.2 Nature of the Disturbances

Space weather events are caused by solar flares and particles ejected from the sun. The electromagnetic radiation from solar flares causes a shortwave fadeout (i.e. an increased absorption of HF radio waves on the dayside of the earth that lasts for up to an hour). The particles arriving from the sun are guided to high latitudes, where they produce polar cap absorption and auroral absorption, which cause a loss of HF radio communications that can last for many hours and recur for several days. In addition, ionospheric disturbances at mid-latitudes can reduce the maximum useable frequency for HF radio communications.

Ionospheric disturbances can also interfere with the radio signals used for global navigation satellite system (GNSS) positioning and navigation. Increases in the total electron content (TEC) of the ionosphere lead to an increase in the transit time of the GNSS signal, producing position errors in GNSS receivers. Scintillation (rapid variations in amplitude or phase) of the radio signals can cause GNSS receivers to "lose lock" on the radio signals and give false information or no information at all. Satellite communications (SATCOM) signals also pass through the ionosphere and can be affected by scintillation.

High-energy particles from the sun are guided by the earth's magnetic field and enter the atmosphere in polar regions. The latitudes affected depend on the energy of the particles. Most solar particles are absorbed by the atmosphere, but the high-energy particles that interact with atmospheric particles trigger secondary ionising particle cascades, which increase radiation aboard aircraft. The dose from these particles is greatest at the highest aviation altitudes and decreases with reduced altitude.

14.3 The ICAO Service Advisories

Space weather service providers will issue an advisory when conditions exceed thresholds for moderate (MOD) or severe (SEV) events. The parameters and thresholds used to define MOD and SEV events are listed in the first edition (2019) of the *ICAO Manual on Space Weather Information in Support of International Air Navigation* (Doc 10100).

The space weather advisories will contain information about current conditions, as well as forecast levels for 6 hours, 12 hours, 18 hours, and 24 hours ahead.

Separate advisories will be issued for each of the following three phenomena:

a) HF radio communications (HF COM)

b) GNSS-based navigation (GNSS)

c) Radiation at aircraft altitudes (RADIATION)

Advisories for satellite communications (SATCOM) will not be provided by any space weather centres as further work is required to establish operationally relevant thresholds for aviation SATCOM.

Affected geographic areas are referenced by their latitudes and longitudes, and above flight levels (ABV FL) for radiation. Abbreviations are also used:

a) High latitudes northern hemisphere (N9000 – N6000): HNH

b) Mid-latitudes northern hemisphere (N6000 – N3000): MNH

c) Equatorial latitudes northern hemisphere (N3000 – N0000): EQN

d) Equatorial latitudes southern hemisphere (S0000 – S3000): EQS

e) Mid-latitudes southern hemisphere (S3000 – S6000): MSH

f) High latitudes southern hemisphere (S6000 – S9000): HSH

NOTE:
Some advisories may be for the whole daylight side of Earth (daylight side).

Advisories will be issued as soon as an increase above the MOD or SEV thresholds are detected. Advisories are updated as often as necessary, but at least every 6 hours, until such time as the elevated space weather levels are no longer detected or no longer expected. At that time, an advisory will be issued stating that the event is finished, with the message that no elevated space weather is expected (NO SWX EXP).

Test or exercise advisories may be issued.

Space weather advisory information relevant to the whole route

should be supplied to operators and flight crew members as part of meteorological information.

14.4 Response to Advisories

The ICAO service does not define the operational responses to space weather events. Such responses are the responsibility of aircraft operators, who may choose to have operational procedures in place to be ready in case of space weather events. Guidance on the use of space weather advisory information is provided in Chapter 4 of the *ICAO Manual on Space Weather Information in Support of International Air Navigation* (Doc 10100, 2019).

14.5 Space Weather Advisory Message

A space weather advisory message has the following format:

Table 14.1—Space Weather Advisory Message Format

(1)	WMO Header (FNXX01, WMO location indicator, UTC date-time of issue of the message)
(2)	SWX ADVISORY (message type)
(3)	STATUS (either test (TEST) or exercise (EXER) if required)
(4)	DTG (Time of Origin – Year/month/date/time in UTC)
(5)	SWXC (name of Space Weather Centre)
(6)	ADVISORY NR (advisory number; unique sequence for each space weather effect: HFCOM, GNSS, RADIATION, SATCOM)
(7)	NR RPLC (number of the previously issued advisory being replaced)
(8)	SWX EFFECT (effect and intensity of space weather phenomenon)
(9)	OBS (or FCST) SWX (Date and time [in UTC] and description of spatial extent of observed or forecast space weather phenomenon)
(10)	FCST SWX +6HR (Date-time [in UTC] of forecast spatial extent of space weather event)
(11)	FCST SWX +12HR (as above)
(12)	FCST SWX +18HR (as above)
(13)	FCST SWX +24HR (as above)
(14)	RMK (NIL or free text)
(15)	NXT ADVISORY (Year/month/date/time [in UTC] or NO FURTHER ADVISORIES)

14.6 Examples of Space Weather Advisories

Table 14.2—Advisories: Example #1

FNXX01 YMMC 020100	
SWX ADVISORY	
DTG:	20190502/0054Z
SWXC:	ACFJ
ADVISORY NR	2019/319
SWX EFFECT:	HF COM MOD
OBS SWX:	02/0054Z DAYLIGHT SIDE
FCST SWX + 6 HR:	02/0700Z DAYLIGHT SIDE
FCST SWX + 12 HR:	02/1300Z DAYLIGHT SIDE
FCST SWX + 18 HR:	02/1900Z NOT AVBL
FCST SWX + 24 HR:	03/0100Z NOT AVBL
RMK:	SOLAR FLARE EVENT IN PROGRESS IMPACTING HF COM ON DAYLIGHT SIDE. PERIODIC LOSS OF HF COM ON DAYLIGHT SIDE POSSIBLE NXT 12HRS.
NXT ADVISORY:	WILL BE ISSUED BY 20190502/0654Z=

Table 14.3—Advisories: Example #2

FNXX01 EFKL 190300	
SWX ADVISORY	
DTG:	20190219/0300Z
SWXC:	PECASUS
ADVISORY NR:	2019/20
SWX EFFECT:	RADIATION MOD
OBS SWX:	19/0300Z HNH HSH E18000-W18000 ABV FL370
FCST SWX + 6 HR:	19/0900Z NO SWX EXP
FCST SWX + 12 HR:	19/1500Z NO SWX EXP
FCST SWX + 18 HR:	19/2100Z NO SWX EXP
FCST SWX + 24 HR:	20/0300Z NO SWX EXP
RMK:	RADIATION AT AIRCRAFT ALTITUDES ELEVATED BY SMALL ENHANCEMENT JUST ABOVE PRESCRIBED THRESHOLD. DURATION TO BE SHORT-LIVED
NXT ADVISORY:	NO FURTHER ADVISORIES=

Table 14.4—Advisories: Example #3

FNXX01 KWNP 020100	
SWX ADVISORY	
DTG:	20190502/0100Z
SWXC:	SWPC
ADVISORY NR:	2019/59
SWX EFFECT:	GNSS MOD
OBS SWX	02/0100Z HNH HSH E18000-W18000
FCST SWX + 6 HR:	02/0700Z HNH HSH E18000-W18000
FCST SWX + 12 HR:	02/1300Z HNH HSH E18000-W18000
FCST SWX + 18 HR:	02/1900Z NO SWX EXP
FCST SWX + 24 HR:	03/0100Z NO SWX EXP
RMK:	IONOSPHERIC STORM CONTINUES TO CAUSE LOSS-OF-LOCK OF GNSS IN AURORAL ZONE. THIS ACTIVITY IS EXPECTED TO SUBSIDE IN THE FORECAST PERIOD
NXT ADVISORY:	20190502/0700Z=

15.0 ABBREVIATIONS—AVIATION FORECASTS

The following list of commonly used abbreviations is not exhaustive. For a complete list of abbreviations, please consult the *Manual of Word Abbreviations* (MANAB) on the ECCC Web site.

Table 15.1—Aviation Forecast Abbreviations

CONTRACTION	PLAIN LANGUAGE
ABV	above
ACC	altocumulus castellanus
ACRS	across
ACSL	standing lenticular altocumulus
AFL	above freezing layer
AHD	ahead
ALG	along
APCH	approach
ASL	above sea level
BECMG	becoming
BGNG	beginning
BKN	broken
BL	blowing
BLO	below
BR	mist
BRF	brief
BRFLY	briefly
BRKS	breaks
BTN	between
CAT	clear air turbulence
CAVOK	ceiling and visibility OK
CB	cumulonimbus
CIG	ceiling
CLD	cloud
CLR	clear
CNTR	centre
CST	coast
CU	cumulus
DCRG	decreasing
DEG	degree
DNSLP	downslope
DP	deep
DPNG	deepening
DRFT	drifting
DURG	during
DVLPG	developing
DZ	drizzle
E	east
ELSW	elsewhere
EMBD	embedded
ENDG	ending
ERLY	easterly
EXC	except
FCST	forecast
FEW	Few
FG	fog
FM	from
FNT	front
FRQ	frequent
FT	foot
FU	smoke
FZ	freezing
FZLVL	freezing level
HGT	height
HI	high
HR	hour
HVY	heavy

CONTRACTION	PLAIN LANGUAGE
ICG	icing
ICGIC	icing in cloud
ICGIP	icing in precipitation
INSTBY	instability
INTMT	intermittent
INTS	intense
INTSFY	intensify
ISOL	isolate
ISOLD	isolated
KT	knot
LCL	local
LFTG	lifting
LGT	light
LK	lake
LLJ	low-level jet stream
LLWS	low-level wind shear
LN	line
LO	low
LTL	little
LTNG	lightning
LVL	level
LWR	lower
LWRG	lowering
LYR	layer
MDT	moderate
MOVG	moving
MTS	mountains
MXD	mixed
N	north
NE	northeast
NELY	northeasterly
NGT	night
NLY	northerly
NM	nautical mile
NMRS	numerous
NR	near
NRLY	nearly
NSW	no significant weather
NW	northwest
NWLY	northwesterly
OBSC	obscure

CONTRACTION	PLAIN LANGUAGE
OBSCD	obscured
OCNL	occasional
OCNLY	occasionally
OFSHR	offshore
ONSHR	onshore
OTLK	outlook
OTWZ	otherwise
OVC	overcast
OVR	over
PCPN	precipitation
PD	period
PL	ice pellets
PROB	probability
PROG	prognostic, prognosis
PRSTG	persisting
PTCHY	patchy
PTLY	partly
QS	quasi-stationary
RA	rain
RDG	ridge
REP	report
REPS	reports
RGN	region
RPDLY	rapidly
S	south
SCT	scattered
SE	southeast
SELY	southeasterly
SEV	severe
SFC	surface
SH	shower
SHLW	shallow
SIGWX	significant weather
SKC	sky clear
SLY	southerly
SM	statute mile
SN	snow
SPECI	special meteorological report
SQ	squall
STG	strong
SVRL	several

CONTRACTION	PLAIN LANGUAGE
SW	southwest
SWLY	southwesterly
TCU	towering cumulus
TEMPO	temporary
TROF	trough
TROWAL	trough of warm air aloft
TRRN	terrain
TS	thunderstorm
TURB	turbulence
UPR	upper
UPSLP	upslope
UTC	coordinated universal time
VC	vicinity
VIS	visibility
VLY	valley
VRB	variable
VV	vertical visibility
W	west
WDLY	widely
WK	weak
WLY	westerly
WND	wind
WRM	warm
WS	wind shear
WV	wave
XTNSV	extensive
XTRM	extreme
Z	ZULU (or UTC)