

AERONAUTICAL INFORMATION CIRCULAR 5/15

INSTRUMENT FLIGHT RULES (IFR) OPERATIONS USING GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)

(Supersedes AIC 16/08)

1.0 Introduction

This aeronautical information circular (AIC) describes the permitted uses of the GNSS, specifically the Global Positioning System (GPS) and the Wide Area Augmentation System (WAAS), in Canadian IFR flight operations.

1.1 References

- a) *Transport Canada Aeronautical Information Manual (TC AIM) (TP 14371);*
- b) *Commercial and Business Aviation Advisory Circular (CBAAC) No. 0123R—Use Of Global Positioning System for Instrument Approaches;*
- c) *Transport Canada Civil Aviation (TCCA) Advisory Circular (AC) No. 700-006—Required Navigation Performance 4 (RNP 4) and Required Navigation Performance 10 (RNP 10) Airspace;*
- d) *TCCA AC No. 700-015—En Route Area Navigation Operations RNAV 5 (Formerly B-RNAV);*
- e) *TCCA AC No. 700-019—Terminal and En Route Area Navigation Operations (RNAV 1 and 2);*
- f) *TCCA AC No. 700-023—Required Navigation Performance Approach (RNP APCH);*
- g) *TCCA AC No. 700-024—Required Navigation Performance Authorization Required Approach (RNP AR APCH);*
- h) *TCCA AC No. 700-025—Required Navigation Performance 1 (RNP 1).*

2.0 Avionics

2.1 General

The following general provisions apply:

- a) GNSS indicated in *AIP Canada (ICAO)*, Part ENR, Table 4.3 may be used for en route and terminal operations.
- b) The avionics shall be approved in accordance with the applicable standards specified under “Equipment Requirements” in this AIC.
- c) The avionics shall be installed and approved in accordance with appropriate sections of the *Canadian Aviation Regulations (CARs)*, Part V—*Airworthiness*.
- d) Aircraft shall be equipped with an approved and operational traditional navigation system appropriate to the area of operations. The avionics requirements for IFR flight are described in CAR 605.18—*Power-driven Aircraft—IFR*.
- e) If the loss of GNSS navigation performance accuracy or integrity results in the inability to support the planned flight operation, the pilot-in-command (PIC) shall advise the air traffic service (ATS) as soon as practical.

2.2 Equipment Requirements

2.2.1 En Route and Terminal

The GNSS avionics must comply with the following technical standard orders (TSOs) issued by the U.S. Federal Aviation Administration (FAA):

- GPS equipment must comply with TSO C129/C129a (any class);
- WAAS equipment must comply with TSO C145a/C145b/C145c/C145d or C146a/C146b/C146c/C146d (Class 1, 2 or 3) or equivalent criteria.

For flight within Canadian minimum navigation performance specifications (CMNPS) airspace or required navigation performance capability (RNAV) airspace, an installation meeting the requirements defined in Part VI—*General Operating and Flight Rules* and Part VII—*Commercial Air Services* of the CARs may serve as the long-range navigation system. CMNPS and RNAV airspace is defined in the *Designated Airspace Handbook* (DAH) (TP 1820) and illustrated in TC AIM, RAC chapter, Figure 12.1—*CMNPS, RNAV and CMNPS Transitional Airspace*.

2.2.2 Approach

Lateral navigation (RNAV) approaches, including overlays, may be flown using:

- GPS (TSO C129/C129a, Class A1, B1, B3, C1 or C3); or
- WAAS (TSO C145a/C145b/C145c/C145d or C146a/C146b/C146c/C146d, any class) avionics.

Lateral/vertical navigation (RNAV/VNAV) approaches may be flown using:

- WAAS (TSO C145a/C145b/C145c/C145d or C146a/C146b/C146c/C146d, Class 2 or 3) avionics; or
- multi-sensor flight management systems (FMS) (TSO C115b or later) with barometric vertical navigation (BARO VNAV) capability, certified in accordance with FAA AC 20-129 or equivalent.

Localizer performance with vertical navigation (LPV) approaches may only be flown using WAAS (TSO C145a/C145b/C145c/C145d or C146a/C146b/C146c/C146d, Class 3 or 4) avionics.

3.0 En Route and Terminal Operations

GNSS equipment (GPS or WAAS) may be used for all en route and terminal operations, provided sufficient navigation capability is available to continue to the planned destination or another aerodrome in the event of a loss of GNSS navigation (in accordance with CARs, Part VI—*General Operating and Flight Rules*).

4.0 Approach Operations

4.1 RNAV (GNSS) Approaches

GPS- and WAAS-based approaches are charted as “RNAV (GNSS) RWY XX”, denoting that GNSS navigation shall be used for approach guidance. Pilots and controllers shall use the prefix “RNAV” in radio communications (e.g. “cleared the RNAV RWY 04 approach”). These approaches may have up to four charted minima lines, as follows:

1. RNAV only;
2. RNAV/VNAV;
3. LPV; and
4. CIRCLING.

4.2 GNSS Overlay Approaches

GNSS overlay approaches were introduced as a transition strategy while RNAV (GNSS) approaches were being developed. As RNAV (GNSS) procedures are published, the corresponding overlay approach procedure will be revoked.

Overlay approaches are traditional very high frequency omnidirectional range (VOR) or non-directional beacon (NDB) based approaches that have been approved to be flown using the guidance of an IFR approach certified GPS or WAAS. They are not localizer (LOC) based approaches. They are identified in the *Canada Air Pilot* (CAP) with the letters GNSS in parentheses and in small capitals after the runway designation [e.g. NDB RWY 04 (GNSS)].

When conducting GNSS overlay approaches:

- the VOR, distance measuring equipment (DME), and/or NDB onboard navigation equipment does not need to be installed and/or functioning (see Table 1); and
- the underlying approach navigation aid(s) (NAVAID[s]) do(es) not need to be functioning (see Table 1).

4.3 Approach Database

Approaches flown using GNSS must be retrieved from a current navigation database. The PIC is responsible for ensuring that the navigation data matches the current CAP information as amended by NOTAM.

4.4 Alternate Aerodrome Requirements

Pilots can take credit for a GNSS-based approach at an alternate aerodrome when all of the following conditions are met:

- An approach completely independent of GNSS at the planned destination is expected to be available at the estimated time of arrival (ETA).
- The PIC verifies that LNAV approach-level receiver autonomous integrity monitoring (RAIM) or WAAS integrity is expected to be available at the planned alternate ETA, taking into account predicted satellite outages.
- For TSO C129/C129a compliant GPS avionics and WAAS avionics when not in the geostationary footprint/WAAS coverage area, the PIC verifies, periodically during the flight and at least once before the mid-point of the flight, that approach-level RAIM is expected to be available at the planned alternate ETA.
- The published LNAV minima are the lowest landing limits for which credit may be taken when determining alternate aerodrome weather minima requirements. No credit may be taken for LNAV/VNAV or LPV minima.

For additional guidance on flight planning of GNSS-based approaches at alternate aerodromes, refer to the TC AIM, COM 3.14.10—*GNSS and WAAS Approaches at Alternate Aerodromes*.

5.0 Use of GNSS in Lieu of Ground-Based Aids (GNSS Substitution)

GNSS may be used in lieu of DME during en route/terminal/approach operations; it may be used in lieu of conventional (VOR and NDB) for en route/terminal operations provided the following conditions are met:

- an integrity alert is not displayed;
- fixes that are part of a terminal instrument procedure are named, charted and retrieved from a current navigation database; and
- when ATS requests a position based on a distance from a DME facility for separation purposes, reported GNSS distance from the same DME facility may be used by stating the distance in miles and the DME facility name (e.g. “30 miles from Sumspot VOR,” vice “30 DME from Sumspot VOR”).

GNSS may not be used in lieu of ground-based aids for:

- VOR and NDB final approach segment LNAV guidance on VOR- or NDB- instrument approach procedures unless the instrument approach procedure is part of the GNSS overlay approach program (see Table 1); or
- LOC LNAV guidance (see Table 1 for GNSS substitution examples).

6.0 Operator Certification

Holders of air operator certificates (AOCs) issued under CARs, Part VII—*Commercial Air Services* or holders of private operator certificates issued under CARs, Part VI, Subpart 4—Private Operators may require authorization from Transport Canada Commercial Flight Standards to conduct some of the activities described in this AIC.

Table 1. GNSS Substitution Examples

Approach Type	Failed Item	GNSS Substitution Allowed
NDB RWY 08R	Aircraft ADF* or approach NDB	No
NDB/DME RWY 08R	Aircraft DME or approach DME	Yes
NDB/DME RWY 08R (GNSS)	Aircraft ADF* or approach NDB	Yes
VOR RWY 09	Aircraft VHF Navigation or approach VOR	No
VOR/DME RWY 09 (GNSS)	Aircraft VHF Navigation or approach VOR	Yes
ILS Y RWY 16	Aircraft ADF*/DME or missed approach NAVAID	Yes

*ADF = automatic direction finder



Martin J. Eley
Director General
Civil Aviation