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## OPERATION OF AIRCRAFT

### NAVIGATION AND LANDING AIDS

#### USE OF THE GLOBAL POSITIONING SYSTEM FOR RNAV (GNSS) TERMINAL AND APPROACH PROCEDURES IN SOUTH AFRICA

1. The intention of this AIC is to inform the aviation community of the technical detail regarding the performance of RNAV (GNSS) Non-precision Approaches in South Africa.

#### **INTRODUCTION**

2. Global Navigation Satellite System (GNSS) is a generic term encompassing all navigation satellite and augmentation systems. Current GNSS-based aircraft operations use signals from the global positioning system (GPS) to calculate a precise position anywhere in the world. GPS enhances the efficiency of aircraft operations by supporting area navigation (RNAV) for the en route, terminal and non-precision approach phases of flight. Until additional GNSS elements are operational and approved for use, aircraft must carry traditional avionics, as described below, for the infrequent occasions when there are not enough GPS satellites in view to support operations.
3. This aeronautical information circular (AIC) specifies the terms and conditions associated with the approval to use GPS for RNAV (GNSS) terminal and approach procedures for instrument flight rules (IFR) operations in South Africa. The applicable airports and procedures will be published in AIRAC AIP SUP's.
4. International standards covering the use of GPS for the above IFR operations are published in ICAO Annex 10 and in the ICAO PANS-OPS Volume II. All terminal and approach procedures authorised by this AIC meet these ICAO standards.
5. GNSS national regulations pertaining to requirements for:
  - a. Airworthiness
  - b. Maintenance
  - c. Pilot licence
  - d. Operations
  - e. Air traffic service
  - f. Aeronautical telecommunication,

are described in the Civil Aviation Regulations of 1997, as amended.

#### **TERMS AND CONDITIONS**

##### **RNAV (GNSS) Terminal and Approach Operations**

6. GPS shall be used for IFR flight guidance during RNAV (GNSS) Procedures subject to the following terms and conditions:
  - a. All aircraft operators shall be authorised by the State of Registry to conduct terminal and approach procedures using GPS.
  - b. GPS avionics shall meet FAA TSO C129 or C129a or C145a/C146a requirements or equivalent criteria and shall be installed and approved in accordance with accepted standards and regulations as laid out in the Civil Aviation Regulations of 1997 as amended. The GPS avionics shall be operated in accordance with the aircraft flight manual or applicable flight manual supplement, both of which take precedence over the terms and conditions specified in this AIC.

- c. *The avionics navigation database shall be current. All RNAV (GNSS) procedures shall be retrieved from the avionics navigation database, which shall store the location of all waypoints required to define the procedures and present them in the order depicted on the published procedure charts. Pilots shall verify procedure waypoints either by verifying co-ordinates or by ensuring that bearings and distances between waypoints are consistent with charted data.*
- d. *Receiver autonomous integrity monitoring (RAIM) shall be available upon commencement of an RNAV (GNSS) procedure and throughout the procedure to provide integrity for the navigation guidance. If a RAIM warning is displayed when the aircraft is established on the final approach course, the pilot shall not continue the approach using GPS guidance. Aircraft with integrated GPS/IRS systems may meet this requirement by alternate means if such means are authorised by the State of Registry. In the case of an instrument approach procedure, if an avionics RAIM prediction indicates that RAIM will not be available at the expected approach time, the pilot shall advise ATC of his/her intentions as soon as possible.*
- e. *Aircraft using GPS equipment under IFR shall be equipped with another approved and operational means of navigation. Should GPS navigation capability be lost, this equipment shall allow approach using a suitable alternate procedure.*
- f. *GPS may be used to identify all DME and ADF fixes, including fixes that are part of any instrument approach procedure, when the applicable named and charted DME or ADF fix is selected as a GPS waypoint. Where ATC requests a position based on a distance from a DME facility for separation purposes, the pilot may report GPS distance from that DME facility, stating the DME facility name, but omitting the term "DME" (e.g., "30 miles from Sunspot VOR").*
- g. *For the purpose of longitudinal separation, pilots may be requested to provide GNSS distance reports from any fix. To this end, pilots should be familiar with their avionics equipment to be able to provide this information in an expeditious manner.*
- h. *Where a take-off and/or en-route alternate is required, at least one non-GPS based approach procedure shall be available at the alternate(s).*
- i. *When communicating with ATC, pilots shall identify and request a procedure by its published name, omitting the (GNSS) part of the name (e.g., "cleared for an RNAV RWY 24 approach)". Phraseology to be used is attached.*

**APPLICATION FOR APPROVAL TO USE RNAV (GNSS) SHOULD BE MADE TO:**

7. *Applications for approval for the use of RNAV (GNSS) procedures will be made in line with the CAA Three Phase Implementation Plan as laid out in AIC 40.9 dated 9 May 2008.*

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*Note: Approved users are expected to submit details of any anomalies experienced during the use of GNSS and/or any other comments in writing to the SA CAA for evaluation to the above address (the attached GNSS Incident Report can be used to report anomalies):*

*Further notices in respect of implementation will follow.*





## GNSS/RNAV Phraseology for AIC

**Reporting distance:**

For RNAV... "REPORT (number) 'MILES' FROM (waypoint, fix, significant point, NAVAID, etc.)"

For GNSS... "REPORT (number) 'MILES' FROM (waypoint, fix, significant point, NAVAID, etc.)"

For DME... "REPORT (number) 'DME' FROM ((DME) facility name)"

**Issuing crossing instructions:**

For DME equipped "CROSS 25 'DME' AT 10,000"...

For RNAV/GNSS equipped "CROSS 24 'MILES' FROM (waypoint, fix, significant point, NAVAID, etc.) AT 10,000"

**Phraseology for reporting RAIM status:**

"REPORT RAIM STATUS"

**Different phraseology for reporting RAIM alerts:**

... "RAIM OUTAGE"

... "RAIM FAILURE"

... "RAIM STATUS ANNUNCIATION"

... "RAIM FLAG"

... "RAIM NOT AVAILABLE"

... "RAIM HOLE"

... "RAIM WARNING"

... "RAIM ALERT"

**Issuing clearance via arcs:**

"CLEARED TO THE AIRPORT VIA 15 DME ARC... CLEARED VIA (number) MILE ARC – RNAV"

**Requesting progress reports from aircraft on approach:**

... "REPORT ESTABLISHED ON THE RNAV APPROACH COURSE"

**Approach Clearances:**

Clearances for RNAV(GNSS) approaches... "CLEARED TO THE (name) AIRPORT RNAV RWY 08 APPROACH"

Clearances for RNAV(GNSS LNAV) approaches... "CLEARED TO THE (name) AIRPORT RNAV RWY 08 APPROACH"

Clearances for RNAV(GNSS Baro-VNAV) approaches... "CLEARED TO THE (name) AIRPORT RNAV RWY 08 APPROACH"

Clearances for RNAV(GLS) approaches... "CLEARED TO THE (name) AIRPORT RNAV RWY08 APPROACH"

**Clearances via fixes of a GNSS approach:**

... "CLEARED VIA INITIAL APPROACH FIX"

... "CLEARED VIA INTERMEDIATE FIX"

... "CLEARED TO THE FINAL APPROACH FIX"

**Clearances for RNAV STARs/SIDs:**

Clear an aircraft flying an RNAV STAR to fly direct to...

"CLEARED DIRECT (waypoint/fix) MAINTAIN (altitude) EXPECT VECTORS TO FINAL APPROACH"

**Occurrence No:**

**ORIGINATOR INFORMATION**

Name:

Organisation:

Telephone:

Fax:

E-mail:

**GNSS EQUIPMENT INSTALLATION**

Aircraft registration:

GNSS Equipment Make/Model:

**OCCURRENCE INFORMATION**

Geographic location:

Latitude:

Date:

Time (UTC)

from:

Altitude:

Longitude:

to:

Satellite vehicle numbers, if known (please circle):

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

Total number of

**Flight rules**

**Phase of flight**

**RAIM warning**

satellites available

VFR

En route (...)

Yes (...)

IFR

Terminal (...)

No (...)

Approach (...)

Brief description of occurrence:

Corrective action (if any):

Assessment of effect on safety of flight or severity of problem:

**ONCE COMPLETED PLEASE RETURN THIS FORM TO:**

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