SOUTH AFRICAN CIVIL AVIATION AUTHORITY

RNP

Advisory Circular

Subject: OPERATOR AIRCREW AND AIRCRAFT APPROVAL FOR REQUIRED NAVIGATION PERFORMANCE CA AOC-AC-FO-012

Date: 18/09/2015

APPLICABILITY: SACAA Civil Aviation Regulations for Parts 91, 121, 127 and 135

1. **PURPOSE.** This bulletin contains directions for Operators regarding required navigation performance (RNP) authorization in terminal areas, approaches, and departures under Part 121 and 135.

2. **BACKGROUND**. RNP as a concept applies to navigation performance within an airspace and therefore affects both the airspace and the aircraft. The appendix contains a more extensive explanation of the RNP concept.

3. ***GUIDANCE.***

   A. *Official guidance and documentation for operational approval for RNP in the terminal area is in development through the coordination efforts, Aircraft Certification, Air Traffic, and other government and industry organizations.*

   B. General Requirements for Operational Approval. If an operator requests authorization to conduct RNP RNAV operations in the terminal area and for approach and departure, the guidelines are similar to those for other approvals:

- Aircraft eligibility through written documentation in the airplane flight manual or supplement, Flight Standards Board Reports, or supplemental type certificate.
- Equipment installed and airworthy in accordance with the appropriate SACAA documentation.
- Approved training program which provides training in the equipment, all applicable conditions, limitations, and special procedures to be used.
- Validation tests as required.
- Authorization given by operations specifications.

CONCEPT OF REQUIRED NAVIGATION PERFORMANCE

Required navigation performance (RNP) as a concept applies to navigation performance within an airspace and therefore affects both the airspace and the aircraft. RNP is intended to characterize an airspace through a statement of the navigation performance accuracy (RNP type) to be achieved within the airspace. The RNP type is based on a navigation performance accuracy that is expected to be achieved at least 95 per cent of the time by the population of aircraft operating within the airspace.

The continuing growth of aviation places increasing demands on airspace capacity and emphasizes the need for the optimum utilization of the available airspace. These factors, allied with the requirement for operational efficiency in terms of direct routings and track-keeping accuracy, together with the enhanced accuracy of current navigation systems, have resulted in the concept of RNP.

The implementation of RNP is part of ICAO's Global Air Navigation Plan for communication/navigation/surveillance (CNS), and supports ICAO's air traffic management (ATM) concepts. The end state of the transition is the implementation of Free Flight, allowing aircraft user-defined trajectory during the secondary departure, en route, and initial arrival phases of flight.

It is anticipated that most aircraft operating in the future RNP environments will carry some type of area navigation (RNAV) equipment. The carriage of RNAV equipment is a requirement by some regions and countries at present and many other countries are considering making it a requirement. The development of the RNP concept recognizes that current aircraft navigation systems are capable of achieving a predictable level of navigation performance and that a more efficient use of available airspace can be realized on the basis of this navigation capability.

The concept of RNAV is not new. In the early 1960s, RNAV systems using inertial navigation systems, Doppler and even Decca were being introduced into the national airspace system. These systems were followed by the introduction of Loran and Omega. The concept was further refined in the early 1980s with computerized flight management systems (FMS) introduced on the Boeing 757/767. RNAV systems based on VOR and DME position fixing also grew popular with the general aviation community during this time period. In the early 1990s, public awareness of the U.S. Military Global Positioning System (GPS) fostered a rapid expansion of GPS-based RNAV avionics.

RNAV operations within the RNP concept permit flight in any airspace with prescribed accuracy tolerances without the need to fly directly over ground-based navigation facilities. RNAV equipment operates by automatically determining the aircraft position from one or more of a variety of inputs. Distances along and across track are computed to provide the estimated time to a selected waypoint, together with a continuous indication of steering guidance that may be used.

RNAV flexibility allows pilots to navigate along optimum tracks. The application of RNAV in various parts of the world has demonstrated a number of advantages over source-referenced navigation (i.e., VOR, DME, TACAN, and NDB), including:

- Establishment of more direct routes permitting a reduction in flight distances
- Establishment of dual or parallel routes to accommodate a greater flow of en route traffic
- Establishment of bypass routes for aircraft over-flying high-density terminal areas
- Establishment of alternatives or contingency routes on either a planned or an ad hoc basis, e.g., severe weather avoidance.

- Establishment of optimum locations for holding patterns
- Possible reduction in the number of ground-based navigation facilities

The development of the RNP concept recognizes that technological advancements in current aircraft navigation systems provide an increase in the predictable level of navigation performance accuracy. It also recognizes that a more efficient use of finite airspace can be realized on the basis of this navigation capability in concert with the elements of communications and surveillance. RNAV equipment approval should address protected airspace where separation is predicated on route widths. Other types of navigation (which may or may not be based on RNAV) should, for an interim period, be permitted using conventional VOR/DME-defined ATS routes.

The RNP type is used to identify the navigation requirements that are generally associated with a specific type of operation. Ideally, the airspace should have a single RNP type; however, RNP types may be mixed within a given airspace. RNP can apply from take-off to landing with the different phases of flight requiring different RNP types. As an example, an RNP type for take-off and landing may be very stringent whereas the RNP type for en route may be less demanding. Types of RNP for public operations or procedures are as specified below:

TABLE 1-1: RNP Types

RNP Type	Applicability/ Operation	Normal Performance 95 %	Containment Limit*
RNP - 10	Oceanic	10 NM	None
RNP - 4	Oceanic	4 NM	None
RNP - 2	En route	2 NM	+/- 4 NM
RNP - 1	Terminal Area	1 NM	+/- 2 NM
RNP - 0.3	Approach	0.3 NM	+/- .6 NM

*Note: Containment Limit may be defined as a region about the aircraft's desired position, as determined by the airborne navigation system, which contains the true position of the aircraft to a probability of 99.999 percent.

Certain types of RNAV equipment will utilize default RNP types dependent upon phase of flight. For example, Wide Area Augmentation System (WAAS) class Gamma (TSO-C146)-compliant receivers will satisfy the "standard" RNP RNAV types of 2, 1, and 0.3 for en route, terminal area, and approach, respectively. It would then be possible for the RNAV equipment to satisfy RNP requirements without having to impose unique operational issues and/or procedures.

RNAV approach procedures assigned an RNP type should evolve to the point where two basic approach classifications are afforded system users:
1) precision landing systems (e.g., ILS, MLS, and future global positioning system landing system (GLS) precision systems) and
2) RNAV procedures where RNP RNAV approaches mirror the precision approach.

In the end state, RNP RNAV will allow expansion of the current program to develop three-dimensional RNAV approaches. The added integrity types of RNP RNAV will enable the use of smaller RNP types and thus create more opportunities for approaches in obstacle-rich environments. When tied to current procedures, the ability to fly the same flight path (repeatability) during periods when the precision system is not available, duplicates existing (and known) procedures. This mirroring allows controllers and pilots to continue to provide a known level of service without dependence on sensor-specific navigation sources.

Departure routes can be optimized for environmental concerns and reduce delays caused by integration of high speed and lower speed aircraft. Departures can be created to improve the departure flow and to avoid critical terrain or obstructions.

REVIEWED & VALIDATED BY:		
[signature]	J. Nkosinde	17/09/15
SIGNATURE OF SENIOR MANAGER: FOD	**NAME IN BLOCK LETTERS**	**DATE**
APPROVED BY:	SOUTH AFRICAN CIVIL AVIATION AUTHORITY CAA AUTHORISED OFFICER	
[signature] Acting	B. VORSTER 0271029449 Designated as an Authorised Officer in terms of Section 88(1) of the Civil Aviation Act 13 of 2009	201[illegible]-09-18
pp **SIGNATURE OF EXECUTIVE MANAGER: ASO**	**NAME IN BLOCK LETTERS**	**DATE**

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