



## Civil Aviation Authority of Sri Lanka

### AVIATION SAFETY NOTICE

ASN No: 089	Ref No: OPS/2006/06	File Ref: OP/23/15/1
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- Recipients: 1. Holders of Air Operator Certificates issued by DGCA, for Commercial Air Transport Operations  
2. Prospective applicants for Air Operator Certificates for Commercial Air Transport Operations.
01. Subject : **Requirements for grant of Basic RNAV (RNP-5) Approval**
02. Nature : Compulsory
03. Issue No : 01
04. Status : New
05. Effective Date : With immediate effect
06. Validity : Until further notice
07. Contact Person : Inquiries may be directed, preferably by letter to, Deputy Director (Operations), Civil Aviation Authority, No. 64, Galle Road, Colombo 3, Sri Lanka. Telephone: 94 11 2441523
08. Availability : A copy of this document is available for reference at the technical library of the Civil Aviation Authority. Copies can be collected at reproduction cost.
09. Applicability : Any aircraft registered in Sri Lanka and intended to be engaged in BRNAV operations in European Airspace.
10. Comments : Comments (if any) on the contents of this Aviation Safety Notice may be forwarded to the contact person. However the Aviation Safety Notice will come into effect on the date shown therein notwithstanding any objection or comment made by any person or party unless and until an amendment to the Aviation Safety Notice is issued afresh by the Director General.
11. Notice : Any aircraft to be operated into and out of BRNAV airspace/air route in European Airspace shall conform to the requirements specified in the Attachment hereto.

12. History of Revision : Not applicable
13. Related ASNs : Nil
14. Action Required : For strict compliance by the holders of Air Operator Certificates engaged in Commercial Air Transport Operations.
15. Check list : List of current ASN nos. are as follows.

ASN No	Issue No	Date of Applicability	Remarks
ASN002	01	10.03.2000	nil
ASN003	01	18.08.2000	nil
ASN004	01	13.02.2001	nil
ASN005	01	26.03.2001	nil
ASN007	01	15.09.2001	nil
ASN009	01	18.02.2002	nil
ASN010	01	18.02.2002	nil
ASN011	01	18.02.2002	nil
ASN012	01	18.02.2002	nil
ASN013	01	08.02.2002	nil
ASN014	01	01.03.2002	nil
ASN015	01	01.03.2002	nil
ASN016	01	01.03.2002	nil
ASN017	02	10.03.2005	Replaced issue no 01
ASN018	01	20.03.2002	nil
ASN019	01	01.04.2002	nil
ASN021	01	01.04.2002	nil
ASN022	01	08.04.2002	nil
ASN023	02	01.06.2002	Replaced ASN003
ASN024	01	02.09.2002	nil
ASN025	02	15.10.2002	Replaced ASN001
ASN026	01	15.10.2002	nil
ASN027	01	12.12.2002	nil
ASN028	01	12.03.2003	nil
ASN029	01	21.03.2002	nil
ASN030	01	10.07.2002	nil
ASN031	02	15.07.2003	Replaced ASN 006
ASN032	01	25.07.2003	nil
ASN033	02	25.08.2005	Replaced issue no 01
ASN034	01	11.09.2003	nil
ASN035	01	12.09.2003	nil
ASN036	01	12.09.2003	nil
ASN037	01	13.10.2003	nil
ASN038	01	07.06.2004	nil
ASN039	02	03.04.2006	Replaced issue no 01
ASN040	01	07.07.2004	nil
ASN041	01	16.07.2004	nil
ASN042	02	21.12.2005	Replaced ASN050 and 1 <sup>st</sup> issue of ASN 042
ASN043	02	12.08.2004	Amendment to ASN no 013
ASN044	02	06.09.2004	Replaced issue no 01
ASN045	01	10.09.2004	nil
ASN046	01	14.09.2006	nil
ASN047	02	30.01.2006	Replaced issue no 01
ASN048	01	17.09.2004	nil
ASN049	01	20.09.2004	nil
ASN051	01	20.09.2004	nil
ASN052	01	20.09.2004	nil

ASN053	02	11.11.2004	Replaced ASN064 and 1 <sup>st</sup> issue of ASN053
ASN054	01	01.04.2005	nil
ASN055	01	01.04.2005	nil
ASN056	01	01.12.2005	nil
ASN057	01	01.12.2005	nil
ASN058	01	01.12.2005	nil
ASN059			Not issued yet.
ASN060	02	05.08.2005	Replaced issue no 01
ASN061	02	05.08.2005	Replaced issue no 01
ASN062	01	01.04.2005	nil
ASN063	01	20.12.2004	nil
ASN065	01	06.04.2005	nil
ASN066	01	16.05.2005	nil
ASN067	01	16.05.2005	nil
ASN068	01	18.05.2005	nil
ASN069	01	18.05.2005	nil
ASN070	01	18.05.2005	nil
ASN071	01	18.05.2005	nil
ASN072	01	18.05.2005	nil
ASN073	01	19.05.2005	nil
ASN074	01	19.05.2005	nil
ASN075	01	19.05.2005	nil
ASN076	01	16.06.2005	nil
ASN077	01	08.08.2005	nil
ASN078	01	21.12.2005	nil
ASN079	01	16.09.2005	nil
ASN080	01	07.11.2005	nil
ASN081	01	14.11.2005	nil
ASN082	01	23.11.2005	nil
ASN083	01	01.12.2005	nil
ASN084	01	16.12.2005	nil
ASN085	01	05.01.2006	nil
ASN086	01	06.04.2006	nil
ASN087	01	06.04.2006	nil
ASN088	01	06.04.2006	nil

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## Civil Aviation Authority of Sri Lanka

### REQUIRED NAVIGATION PERFORMANCE IN EUROPEAN AIRSPACE DESIGNATED FOR BASIC RNAV (BRNAV) OPERATIONS (RNP-5)

#### 1. Introduction

Area Navigation (RNAV) is one of the key elements needed to increase the aviation system capacity. With RNAV, airspace users could expect to benefit from more direct routing and greater fuel savings. RNAV allows greater flexibility in airspace design and reduces the need to depend totally on ground-based point source navigation aids when planning ATS routes. With effect 23 April 1998, only RNAV equipped aircraft having a navigation accuracy meeting Required Navigation Performance 5 (RNP-5) may plan for operations under Instrument Flight Rules (IFR) on the ATS routes in European airspace designated for Basic RNAV (BRNAV) operations. RNP-5 was chosen as the initial stage of RNAV operations in the area taking into account of existing aircraft equipment and the current navigation infrastructure. Aircraft not equipped with RNAV but having a navigation accuracy meeting RNP-5 will be restricted to operations on ATS routes which States may designate within their lower airspace. In accordance with ICAO co-ordinated regional agreements, operators must obtain an RNP-5 approval from the appropriate State of Registry or State of the Operator in order to operate in RNP airspace/air routes. The RNP-5 criteria and a means of obtaining operational approval from the Director General of Civil Aviation – Sri Lanka are described in this document. This document is one means but not the only means of satisfying the intent of requirements for grant of RNP-5 approval and thereby meeting the requirements detailed in ICAO Doc. 9613-AN/937, Manual on Required Navigation Performance (RNP), First Edition, 1994. It is consistent with Regional Supplementary Procedures contained in ICAO Document 7030.

#### 2. Background

Regional Supplementary Procedures contained in ICAO Doc. 7030/4-EUR, Part 1, Rules of the Air, Air Traffic Services and Search and Rescue, have been amended to require RNP-5 for operations under Instrument Flight Rules (IFR) in European airspace designated for BRNAV operations after 23 April 1998. Joint Aviation Authorities (JAA) first published advisory material for the Airworthiness Approval of Navigation Systems for use in European airspace designated for BRNAV operations in July 1996. This material was developed by EUROCAE WG-13 and was commonly referenced as AMJ 20X2. In May 1997, Revision 1 to AMJ 20X2 was expanded to include specific guidance on the approval and use of stand-alone GPS-based equipment for the purposes of conducting BRNAV operations. This document identifies those navigation system types and the criteria that may be used to determine acceptable means of compliance for operators holding Aircraft Operator Certificates issued by the Director General of Civil Aviation (DGCA) – Sri Lanka and conducting operations in European BRNAV airspace. Approval of Sri Lanka operators for European BRNAV operations is based on consideration of existing systems and previously completed airworthiness approvals, as described in the Aircraft Flight Manual (AFM), or an assessment process described in this document. In accordance

with ICAO co-ordinated regional agreements, operators must obtain an RNP-5 approval from the appropriate State of Registry or State of the Operator in order to operate in RNP-5 airspace/air routes. The RNP-5 criteria and a means of obtaining operational approval from the DGCA are described in the following sections of this document.

### **3. Applicability**

The guidance material contained in this document applies to all BRNAV/RNP-5 operations conducted under Aircraft Operators Certificates issued by the DGCA-Sri Lanka. When operating outside Sri Lanka airspace, aircraft must comply with ICAO Annex 2, when over the high seas and the regulations of another State when operating within that State's airspace. In compliance with the EUROCONTROL Convention, the BRNAV requirements do not apply to State aircraft when they are not operating under the provision of the International Civil Aviation Organisation (ICAO). In accordance with document EUROCONTROL Standard 003-93 Edition 1, tactical military aircraft are also exempt from the requirements.

### **4. Related publications**

#### **International Civil Aviation Organisation (ICAO)**

- ▶ Manual on Required Navigation Performance (RNP), ICAO DOC 9613-AN/937.
- ▶ Regional Supplementary Procedures Doc 7030/4, Fourth Edition.

#### **Joint Aviation Authorities (JAA)**

- ▶ AMJ 20X2 Revision 1, JAA Guidance Material on Airworthiness Approval and Operational Criteria for the use of Navigation Systems in European Airspace Designated for Basic RNAV Operations.
- ▶ EUROCONTROL Standard 003-93 Edition 1.

#### **Federal Aviation Administration (FAA)**

- ▶ AC 90-BRNAV (draft), Approval of US Operators and Aircraft to Operate in European Class 1 Airspace Designated for Basic Area Navigation (BRNAV)/Required Navigation Performance (RNP)-5.
- ▶ AC 20-121A, Airworthiness Approval of Airborne LORAN C Navigation Systems for use in the U.S. National Airspace System (NAS).
- ▶ AC 20-130(A), Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors.
- ▶ AC 20-138, Airworthiness Approval of Global Positioning System (GPS) Navigation Equipment for use as a VFR and IFR Supplemental Navigation System.
- ▶ AC 25-4, Inertial Navigation Systems (INS).
- ▶ AC 25-15, Approval of Flight Management Systems in Transport Category Airplanes.
- ▶ AC 90-45A, Approval of Area Navigation Systems for Use in the U S. National Airspace System.
- ▶ AC 90-94, Guidelines for Using GPS Equipment for IFR En Route and Terminal Operations and for Non precision Instrument Approaches.
- ▶ Order 8400.12A, Required Navigation Performance-10 (RNP-10) Operational Approval.

## 5. Definitions

**Area Navigation (RNAV):** This is a method which permits aircraft navigation along any desired flight path within the coverage of either station-referenced navigation aids or within the limits of the capability of self-contained aids, or a combination of both methods. For the purpose of this document, RNAV equipment is considered to be that equipment which operates by automatically determining aircraft position from one, or a combination, of the following sensors with the means to establish and follow a desired path—

- ▶ VOR/DME
- ▶ DME/DME
- ▶ INS\* or IRS
- ▶ LORAN C\*
- ▶ GPS\*

Equipment marked with an asterisk (\*) is subject to the limitations contained in paragraph 7.2.4. Due to the decommissioning of ground stations, on 30 September 1997, Omega is not considered eligible to support BRNAV/RNP-5 operations.

**Basic RNAV (BRNAV):** For the purposes of this document, Euro control/EUROCAE basic RNAV is defined as RNAV with an accuracy that meets RNP-5 for operations under IFR in that European airspace designated for BRNAV/RNP-5 operations.

**Global Positioning System:** This is a U.S. space-based positioning, velocity, and time system composed of space, control, and user elements. The space element consists of 24 satellites in six orbital planes. The control element consists of five monitor stations, three ground antennas and a master control station. The user element consists of antennas and receiver processors that provide positioning, velocity, and precise timing to the user.

**Pseudo-Range:** This is the determination of position, or the obtaining of information relating to position, for the purposes of navigation by means of the propagation properties of radio waves. The distance from the user to a satellite, plus an unknown user, clock offset distance. With four satellite signals it is possible to compute position and clock offset distance.

**Receiver Autonomous Integrity Monitoring (RAIM):** This is a technique whereby a civil GPS receiver/processor determines the integrity of the GPS navigation signals using only GPS signals or GPS signals augmented with altitude. This determination is achieved by a consistency check among redundant pseudo-range measurements. At least one satellite in addition to those required for navigation must be in view for the receiver to perform the RAIM function.

**Required Navigation Performance:** This is a statement of the navigation performance necessary for operation within a defined airspace.

**Required Navigation Performance Type (RNP Type):** This is a value typically expressed as a distance in nautical miles – longitudinal and lateral – from the intended position, which an aircraft would be in for at least 95 percent of the total flying time.

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## 6. Required Navigation Performance 5 (RNP-5) operational approval

### 6.1. Purpose

This document provides guidance to operators for obtaining operational approval of Required Navigation Performance 5 (RNP-5) capability and includes information on airworthiness and operational approvals processes. This document enables an applicant to be approved as capable of meeting the navigation element of Communications/Navigation/ Surveillance (CNS) requirements when and where RNP-5 is specified, in particular, within European airspace designated for Basic Area Navigation (BRNAV). It does not address communications or surveillance requirements that may be specified to operate on a particular route or in a particular area. Those requirements are specified in other documents such as Air Navigation Regulations and the International Civil Aviation Organisation (ICAO) Regional Supplementary Procedures Document (DOC 7030). This document satisfies the intent of ICAO Doc 9613-AN/937, Manual on Required Navigation Performance (RNP) First Edition - 1994.

## 7. Operational approval

### 7.1. General

A number of steps as outlined below must be completed before an operational approval is issued to an operator.

- ▶ aircraft eligibility for RNP-5 must be determined by the DGCA
- ▶ flight crew training and operating procedures for the navigation systems to be used must be identified by the operator and
- ▶ the operator database use, flight crew training and operating procedures must be evaluated by the DGCA to ensure the operator's readiness to conduct RNP-5 operations.

### 7.2. Determining eligibility and approval of aircraft for RNP-5

#### 7.2.1. Aircraft equipment

An aircraft may be considered eligible for BRNAV/RNP-5 approval, if it is equipped with ONE or more RNAV systems approved in accordance with the guidance contained in this document. In the event of system failure, the aircraft should be capable of reverting to navigation with ICAO Standard Navigation Aids such as ADF, VOR, DME, and NDB.

#### 7.2.2. Eligibility based on the aircraft flight manual.

RNAV-capable navigation systems which are installed on aircraft in accordance with the advisory material contained within FAA AC 90-45A, AC 20-130(A), AC 20-138 or AC 25-15, are considered to meet RNP4 and are acceptable for BRNAV/RNP-5 operations. Where reference is made in the AFM to the above advisory material or the corresponding specific levels of RNP, no further documentation is required as evidence of aircraft navigation system eligibility for use in European airspace designated for BRNAV/RNP-5 operations. However, paragraph 7.2.4 below should be reviewed for limitations, if any, associated with the use of these RNAV systems.

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### **7.2.3. Eligibility not based on the aircraft flight manual**

Under some circumstances, the operator may not be able to determine the aircraft's equipment eligibility from the AFM, or requires an RNP-5 time limit extension for non-radio updated INS-based RNAV systems beyond 2 hours from alignment. In this case the operator should consult the DGCA with regards to an assessment of its RNAV equipment for RNP-5 eligibility. Normally this can be determined by reviewing the AFM. However, when other methods of eligibility are proposed the operator must present the equipment proposed to be used, evidence of its performance, crew operating procedures, bulletins and any other pertinent information to the DGCA. If the DGCA cannot determine the equipment is eligible they may elect to request assistance from the FAA or product/equipment manufacturer.

### **7.2.4. Limitations on the use of navigation systems**

The following navigation systems, although having RNAV capability, require limitations on their use for BRNAV/RNP-5 operations.

#### **a. Inertial Navigation Systems (INS)**

Those INS systems, approved in accordance with FAA AC 25-4, that comply with the functional criteria in Appendix 3, but do not use automatic radio updating of aircraft position, may be used for a maximum of 2 hours from the last alignment/position update. Consideration may be given to specific INS configurations – such as triple mix – where either equipment or aircraft manufacturer's data justifies extended use from the last on ground position update. Those INS systems, approved in accordance with FAA AC 90-45A, that comply with the functional criteria in Appendix 3, but do not use automatic radio updating of aircraft position must use the manufacturer's or a CAA approved flight crew procedure to accomplish position updates.

#### **b. LORAN C**

Use of LORAN C, in compliance with FAA AC 20-121A, is considered as an acceptable means to comply with BRNAV, only in those areas of European airspace and on routes having acceptable LORAN C coverage. LORAN users must refer to the AFM, Operations Specification or Letter of Authorisation to determine if operational use of the Loran system is limited to a specified LORAN C Operational Area.

#### **c. GPS**

GPS systems acceptable for BRNAV/RNP-5 operations include those approved in accordance with FAA AC 20-138 or 20-130A. Integrity should be provided by RAIM or an equivalent means within a multi-sensor navigation system. VOR, DME or ADF capability needs to be installed and operative. The operator should determine that the intended route-of-flight is serviced by an appropriate ground-based navigation aid.

### **7.3. Approved aircraft/system list**

The DGCA will maintain a list of aircraft/navigation systems that have received RNP-5 approval. It will not be used as a means of determining qualifications for approval. The list will be maintained for statistical purposes only.



## **8. Operational criteria for GPS-based operations**

### **8.1. General criteria**

For GPS-based operations, the flight crew should be familiar with use of the GPS stand-alone equipment for the normal and non-normal operating procedures detailed in paragraphs 8.2 and 8.3.

### **8.2. Operations Manuals and checklist**

The operator must revise their operations manual and checklists to include information on standard operating procedures providing navigation operating instructions and contingency procedures including weather deviations. MEL should also be updated to address the RNP5 requirements.

### **8.3. Normal procedures**

The procedures for the use of GPS stand-alone navigational equipment on BRNAV/RNP-5 routes should include the following:

- a. During pre-flight planning, if 24 satellites are projected to be operational for the flight, then the aircraft can depart without further action. If, however, 23 or less satellites are projected to be operational, then the availability of GPS integrity (RAIM) should be confirmed for the intended flight route and time. This should be obtained from either—
  - a prediction program that is provided in the GPS unit installed in the aircraft
  - a prediction program run outside the aircraft or from an alternative method that is acceptable to the CAA
- b. Dispatch should not be made in the event of predicted continuous loss of RAIM of more than 15 minutes duration for any part of the intended flight (The number of satellites may be reduced by one to 23 or 22 respectively if baro-aiding is incorporated into the GPS unit. Prediction programs should use the same algorithms as those in the aircraft GPS units)
- c. When a navigation database is installed, the database validity should be checked before the flight (Validity is ascertained from the current AIRAC cycle)
- d. Navigation equipment suitable for the route of flight – VOR, DME, and ADF – should be selected so as to allow immediate cross-checking or reversion in the event of loss of GPS navigation capability.

### **8.4. Non-normal procedures in the event of loss GPS RAIM capability**

The flight crew should be familiar with the operating procedures and actions required in the event that the GPS equipment indicates a loss of RAIM or the integrity alarm limit has been exceeded indicating an erroneous position. The operating procedures should include the following—

- a. In the event of loss of the RAIM detection function, the GPS equipment may continue to be used for navigation. The flight crew should cross-check the aircraft position, where possible, with VOR, DME, and NDB information to confirm an acceptable level of navigation performance. Otherwise, the flight crew should revert to an alternative means of navigation.

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- b. In the event that the alarm limit has been exceeded, the flight crew should revert to an alternative means of navigation.

## **9. Pilot knowledge**

Pilots should be knowledgeable in the following areas—

- a. RNP definition as it relates to BRNAV requirements in European airspace;
- b. airspace where RNP-5 is required;
- c. changes to charting and documents to reflect RNP-5;
- d. navigation equipment required to be operational for flight in designated BRNAV airspace;
- e. flight planning requirements;
- f. contingency procedures for occurrences such as equipment failure;
- g. en route, terminal, and approach procedures applicable to RNAV; and
- h. the information in this document.

## **10. Contingency procedures**

### **10.1. Expected flight crew actions**

Pilots should notify ATC of conditions such as equipment failures and weather conditions that may affect the ability of the aircraft to maintain position within the designated RNP-5. In this case, flight crews should state their intentions, co-ordinate a plan of action, and obtain a revised ATC clearance. If unable to notify ATC and obtain an ATC clearance prior to deviating from the RNP airspace, the flight crew should follow established contingency procedures as defined by the region of operation, and obtain an ATC clearance as soon as possible.

### **10.2. Air Traffic failure response actions**

When advised that an aircraft is unable to maintain a designated level of RNP, Air Traffic will adjust separation as necessary and co-ordinate with other Air Traffic facilities.

## **11. Flight plans**

Effective from the date of BRNAV implementation, Sri Lanka-registered aircraft filing flight plans into European BRNAV designated airspace are expected to comply with the European BRNAV airspace requirements. Approved operators should indicate approval for RNP-5 operations by annotating field 10 – Equipment – of the ICAO flight plan with the letter "R". If there are any other flight plan annotations required by individual States, operators should make appropriate annotations.

## **12. Validation test**

The following is intended to provide broad guidance for Validation Tests when approving an air carrier operator that plans to conduct operations in European BRNAV/RNP-5 airspace. The DGCA will consider each application on its own merit and apply judgement when developing validation test requirements. The DGCA will communicate the objective, duration, and number of validation test flights required to the operator during the initial stages of the approval process.

### **12.1. Validation for operators previously approved for navigation with specific RNAV systems**

If an operator is previously approved to navigate with a specific RNAV system, validation tests may NOT require a validation flight. If a review of the operator's application shows that it has addressed the guidance contained in this document, the validation test may be considered complete.

### **12.2. Validation tests for operators requesting approval for RNAV systems new to the operator**

If an operator has not been previously approved to use a specific RNAV system, then in addition to a review of the application package, the DGCA may observe at least one validation flight. If this flight is conducted in domestic airspace it may be a revenue flight.

## **13. Application Procedure**

The operator shall submit the following details to the DGCA when seeking approval for RNP-5 operations.

- a. Aircraft (Make, Model, Series and Registration);
- b. Navigation Equipment (list all including number by name, and type/manufacture/model);
- c. Communication Equipment (list by type/manufacturer/model);
- d. BRNAV time limit (The maximum time of hours between navigation system updates proposed);
- e. Revised pages of the relevant Manuals to give effect to the requirements of this document; and
- f. Details about flight crew training organized to meet the requirements of this document.

**14. Form of approval**

RNP-5 operational approvals will be issued as either an Operations Specification amendment or a Letter of Authorisation and will identify any conditions or limitations on operations in RNP-5 airspace, such as required navigation systems or procedures, limits on time, routes or areas of operation. A sample Operations Specification amendment and a Letter of Authorisation are at Appendix 1.

H.M.C.Nimalsiri,  
Director General of Civil Aviation and  
Chief Executive Officer.

Civil Aviation Authority of Sri Lanka,  
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Sri Lanka.

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## Appendix 1 - Sample operations specification and letter of authorisation for RNP-5 operations

### 1. Draft operations specification amendment

#### W.X.Y. Navigation/communication systems

(z) Operation within *[state RNP-5 airspace or RNP-5 routes as applicable]* Required Navigation Performance 5 (RNP-5) airspace is authorised, provided that such operation is in accordance with applicable requirements, as detailed in ICAO Document 7030/4 "Regional Supplementary Procedures".

### Appendix - Required Navigation Performance (RNP) Airspace

The following aircraft are authorised for RNP-5 operations as defined in paragraph W.X.Y

(z):

**Aircraft:** *[make, model, and registration mark]*

**Navigation systems:** *[type, manufacturer, model, and time limit]*

### 2. Draft letter of authorisation

*[file reference] [date]*

*[organisation name]*

*[address]*

Dear Sir/Madam

#### APPROVAL TO OPERATE IN RNP-5 AIRSPACE

Approval is hereby granted for the following operator, aircraft and navigation systems to operate on designated RNP-5 routes and in designated RNP-5 airspace with the stated RNP-5 time limit.

**Operator:** *[name]*

**Aircraft:** *[make, model, and registration mark]*

**Navigation systems:** *[type, manufacturer, model, and time limit]*

**Designated RNP-5 routes/airspace:** *[specify]*

*[signature]*

*[name]*

*[title]*

*Civil Aviation Authority of Sri Lanka*

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## **Appendix 2 - GPS integrity monitoring (RAIM) prediction program**

Where a GPS Integrity Monitoring (RAIM) Prediction Program is used as a means of compliance with paragraph 8.2 of this document , it should meet the following criteria—

- a. The program should provide prediction of availability of the integrity monitoring (RAIM) function of the GPS equipment, suitable for conducting RNP-5 (BRNAV) operations in designated European airspace.
- b. The prediction program software should be developed in accordance with at least RTCA DO 178B/EUROCAE 12B, level D guidelines.
- c. The program should use either a RAIM algorithm identical to that used in the aircraft equipment, or an algorithm based on assumptions for RAIM prediction that give a more conservative result.
- d. The program should calculate RAIM availability based on a satellite mask angle of not less than 5 degrees, except where use of a lower mask angle has been demonstrated to be acceptable to the DGCA.
- e. The program should have the capability to manually designate GPS satellites which have been notified as being out-of-service for the intended flight.
- f. The program should allow the user to select—
  - i. the intended route and declared alternates
  - ii. the time and duration of the intended flight

### **Appendix 3 - Required functions**

The following system functions are the minimum required to conduct BRNAV/RNP-5 operations—

- a. Continuous indication of aircraft position relative to the track to be displayed to the pilot flying on a navigation display situated in their primary field-of-view. In addition, where the minimum flight crew is two pilots, indication of aircraft position relative to track to be displayed to the pilot-not-flying on a navigation display situated in their primary field-of view
- b. display of distance and bearing to the active (To) waypoint
- c. display of ground speed or time to the active (To) waypoint
- d. storage of a minimum of four waypoints
- e. appropriate failure indication of the RNAV system, including the sensors