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This AIC includes 2 pages and 1 ATTACHMENT (3 pages).

## INTRODUCTION OF PRECISION RNAV (P-RNAV) IN VIENNA TERMINAL AIRSPACE

### 1. INTRODUCTION

1.1 This AIC provides:

- notification to aircraft operators concerning the introduction of Precision Area Navigation (P-RNAV) in Vienna Terminal Airspace;  
and
- background information on the introduction of P-RNAV in ECAC Terminal Airspace (see attachment).

### 2. HARMONISED RNAV REQUIREMENTS FOR RNAV OPERATIONS IN ECAC TERMINAL AIRSPACE

2.1 Consistent with the standardisation of RNAV application in the En Route Airspace of the member States of ECAC, there is a need to standardise the application of RNAV in ECAC Terminal Airspaces.

2.2 To these ends, ECAC member states are reviewing their RNAV terminal area operations with a view to ensuring **common** aircraft and operational approval requirements, **common** RNAV design criteria and principles and **common** ATS procedures on an ECAC-wide basis.

2.3 This harmonised initiative should result in the introduction of P-RNAV approval requirements for operations on specific ECAC Terminal Airspace RNAV procedures.

2.4 Austria's intentions regarding requirements for P-RNAV approval are explained in the sections which follow, with a view enabling operators to seek this approval.

### 3. INTRODUCTION P-RNAV PROCEDURES IN THE TERMINAL AIRSPACE OF VIENNA

In line with ECAC-wide agreement, Austria will introduce P-RNAV approval requirements in Vienna Terminal Airspace. Published RNAV terminal area procedures in this Terminal Airspace, which currently require solely B-RNAV capability, will, as from April 2005 require P-RNAV approval i.e. approval against JAA TGL-10 or equivalent.

At present RNAV procedures in Vienna Terminal Airspace require only B-RNAV capability since procedures are

- Either at or above MRVA or overlays of conventional procedures
- Radar monitored

### 4. P-RNAV APPROVAL REQUIREMENTS

4.1 For operation on P-RNAV terminal area procedures, operators and aircraft shall be approved in accordance with JAA Temporary Guidance Leaflet No. 10 (TGL-10): "Airworthiness and Operational Approval for Precision RNAV Operations in Designated European Airspace", or equivalent.

Note: In context, terminal area procedures exclude the Final and Missed Approach segments.

- 4.2 The Joint Aviation Authorities (JAA) and/or civil and military certification authority of the operator's State of Registry will specify the requirements necessary for operators to obtain approval to operate on ECAC RNAV terminal area procedures. In exceptional cases, where approval requirements are not available from the State of Registry or State of operator, ECAC Member States may require that the operators obtain certification from a Member State of ECAC.

## 5. FLIGHT PLANNING AND ATC PROCEDURES

[paras 5.1 & 5.2 are subject to ICAO approval (expected prior November 2003). Once approved, the paragraphs will be reflected in AIP.]

- 5.1 In addition to existing flight planning requirements, operators of aircraft approved for P-RNAV operations, shall, in addition to the designator "R", also insert the designator "P" in Item 10 of the flight plan.
- 5.2 Where a failure or degradation results in the aircraft being unable to meet the P-RNAV functionality and accuracy requirements before departure, the operator of the aircraft shall not insert the designator "P" in Item 10 of the flight plan. Subsequently, for a flight for which a flight plan has been submitted, an appropriate new flight plan shall be submitted and the old flight plan cancelled. For a flight operating based on a repetitive flight plan (RPL), the RPL shall be cancelled, and an appropriate new flight plan shall be submitted.
- 5.3 Pilots are required to inform ATC if they cannot accept a P-RNAV procedure for which they have been cleared.
- 5.4 Further information on associated ATC procedures as set out in ICAO Doc 7030/4 (EUR), such as R/T phraseology, will be provided through amendments to the National AIP.

## 6. ACCOMMODATION OF NON P-RNAV APPROVED AIRCRAFT ON TERMINAL AREA PROCEDURES OF VIENNA

For aircraft that are not approved for P-RNAV operations, conventional procedures will continue to be available in Vienna Terminal Airspaces.

and/or

radar vectors will be provided by ATC.

## 7. CONTACT DETAILS

- 7.1 For further information on this AIC and the P-RNAV requirements, the State Authority may be contacted:

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- 7.2 Additionally, for further information on aircraft and operator P-RNAV requirements the EUROCONTROL AMN User Support Cell may be contacted: tel +32-2-729-4781/4633, e-mail [amn.user.support@eurocontrol.int](mailto:amn.user.support@eurocontrol.int).

- 7.3 General information and reference documentation on the ECAC P-RNAV developments can be found on [www.ecacnav.com/p-rnav](http://www.ecacnav.com/p-rnav).

- END -

- 1 ATTACHMENT (3 pages).

## BACKGROUND INFORMATION

### 1. INTRODUCTION

- 1.1 Two levels of area navigation (RNAV) accuracy are described in the ICAO Air Navigation Plan (European Region, Doc. 7754) Part I, Assumed Operating Parameters:
- a. **Basic RNAV (B-RNAV)**, having a navigation performance equal to or better than a track keeping accuracy of  $\pm 9.3$  km ( $\pm 5$  NM) for 95% of the flight time of all aircraft using Basic RNAV equipment.
  - b. **Precision RNAV (P-RNAV)**, having a navigation performance equal to or better than a track keeping accuracy of  $\pm 1.85$  km ( $\pm 1$  NM) for 95% of the flight time of all aircraft using Precision RNAV equipment.
- 1.2 The requirement for the carriage of on-board Basic RNAV (B-RNAV) equipment was mandated from April 1998 in enroute airspace of the ECAC States. The minimum equipment and installation requirements for the approval for B-RNAV implementation, described in Joint Aviation Authorities (JAA) Temporary Guidance Leaflet (TGL) No.2 (rev.1), were specifically intended for **en-route operations**.
- 1.3 Since the implementation of B-RNAV for en route in 1998, there has been an increasing demand for the application of RNAV in Terminal Airspace and many States have published RNAV terminal area procedures. This has generally been done to ensure connectivity to the en-route B-RNAV ATS route network. For the most part, these procedures require only the operation of B-RNAV aircraft systems which, for reasons stated below, are not considered suitable for TMA operations.
- 1.4 B-RNAV certification can be achieved with very limited minimum navigation capability. Specifically:
- The minimum system does not contain a database. This results in the need, in equipment meeting the minimum requirement, for waypoints to be entered by hand with an attendant high risk of data input errors.
  - A minimum system needs to have the capability of establishing a route of only four waypoints. The need to enter additional waypoints during a procedure will generate a high workload, is error prone and hence a safety hazard.
  - The minimum system allows for the use of stand alone Inertial Navigation Systems up to two hours from alignment. This could result in a cross track error of up to 5NM on first engagement.
  - The minimum system does not have to have 'fly-by' functionality.
  - Furthermore, the simplest systems with their installations identified in JAA TGL No. 2 (rev.1), could result in limited human-machine interface<sup>1</sup> that could have a detrimental effect on a pilot's ability to fly complex terminal procedures.
- 1.5 While many systems approved to the B-RNAV standard are capable of achieving accuracy better than the  $\pm 5$  NM requirement, it cannot be assumed that these systems meet the certification requirements necessary to safely fly RNAV procedures in Terminal Airspace due to the limitations in functionality detailed above.
- 1.6 Based on the above, it has been recognised that Basic RNAV approval requirements are not adequate for Terminal Airspace RNAV operations such as RNAV SIDs and STARs. These shortcomings have been selectively resolved by various ECAC States on a, non-harmonised basis, which has resulted in a variety of disparate national rules, requirements and procedure design principles for RNAV in the TMA. **This variety is recognised not to be without safety implications.**

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<sup>1</sup> restricted displays of cross track error (CDI) and complex access to RNAV functions due to limited Control and display unit space are examples of limitations potentially affecting pilot workload in Terminal Airspace

## 2. REQUIREMENTS FOR ECAC TERMINAL AIRSPACE RNAV OPERATIONS

- 2.1 As a means of overcoming the above shortcomings in Terminal Airspace in a consistent manner, EUROCONTROL, in co-operation with the ECAC Member States and JAA, has produced a plan for the implementation of P-RNAV operations where operational requirements justify the application of RNAV (see body text of AIC A 9/03).
- 2.2 Precision RNAV (P-RNAV) provides the navigational performance and functionality required for RNAV terminal area procedures. The ECAC States have agreed that P-RNAV is an important means of solving the current Terminal Airspace RNAV situation.  
Note: Whilst no ECAC-wide mandate for the carriage of P-RNAV is foreseen, some States may require P-RNAV certification for IFR operations in notified terminal airspace in order to improve airspace use, reduce costs and minimise environmental impact.
- 2.3 To this end, **at the latest by November 2004**, aircraft operating on RNAV terminal area procedures in major ECAC Terminal Airspace will be subject to the following requirements.
- For RNAV procedures which include route segments below the appropriate Minimum Flight Altitude (e.g. Minimum Sector Altitude (MSA); Minimum Radar Vectoring Altitude (MRVA)), **P-RNAV** approval will be required.
  - For RNAV procedures which do not include route segments below the appropriate Minimum Flight Altitude (e.g. Minimum Sector Altitude (MSA); Minimum Radar Vectoring Altitude (MRVA)), and designed in accordance with en-route design principles, **B-RNAV** approval may suffice. Otherwise, except where explicitly stated that the carriage of P-RNAV certified equipment is not required<sup>2</sup>, the only acceptable alternative for such RNAV procedures is P-RNAV.
  - Other (non-major) ECAC Terminal Airspace will comply with this approach **at the latest by April 2005**.
  - Specific time scales for P-RNAV introduction in Austria can be found under § 3 of the main text of this AIC.
- 2.4 For operation on P-RNAV terminal area procedures, the operators and aircraft shall be approved in accordance with JAA Temporary Guidance Leaflet No. 10 (TGL No. 10): "Airworthiness and Operational Approval for Precision RNAV Operations in Designated European Airspace", or equivalent. Pilots are responsible for ensuring that they do not operate on procedures for which they do not have operational approval.
- 2.5 The FAA (USA) is in the process of developing an equivalent of JAA TGL-10. For further information on the FAA (USA) P-RNAV equivalent requirements, please contact FAA publications.

## 3. P-RNAV BENEFITS

- 3.1 As explained in section 1 above, existing RNAV application in ECAC Terminal Airspaces is characterised by national and/or local variations to address specific requirements. Whilst these varying applications have been approved by national authorities (usually for national use), the variety of national operational approval requirements and national ATC procedures has certain safety implications from an ECAC-wide perspective.
- 3.2 As such, the ECAC-wide consistency brought about by common P-RNAV application will enhance the safety of RNAV operations in Terminal Airspace by addressing, in particular,
- Common Airworthiness and Operational approval;
  - Common ATC procedures.

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<sup>2</sup> Where equipment is approved in accordance with JAA TGL No.3 or TGL No. 3 (rev.1) for GPS procedures in RNAV Terminal operations, States may continue to authorise their use on such procedures until 2010 (at the latest), subject to appropriate safety assessments being undertaken. For these procedures it should be clearly annotated that P-RNAV certification is not required. Approval against TGL No.3 or TGL No.3 (rev.1) does not constitute P-RNAV approval.

- 3.3 Given the ECAC-wide consistency offered by common P-RNAV application, the absence of 'national' RNAV applications means that RNAV terminal area procedures will be available for use for all operators and not only 'national' operators – thus spreading the benefits detailed at 3.5 (below).
- 3.4 Above and beyond the ECAC-wide safety advantages that P-RNAV provides, the enhanced accuracy capability of P-RNAV approved aircraft means that less airspace is required to accommodate P-RNAV terminal area procedures. As such, capacity and environmental benefits can be obtained e.g. specific SIDs/STARs can be designed to accommodate different environmental requirements for night and day operations.
- 3.5 Viewed from a European strategic perspective, the application of P-RNAV in ECAC Terminal Airspace is to be viewed as a pragmatic step towards RNP RNAV application which will form the basis of RNAV terminal area procedures in the future.

#### **4. NAVIGATION INFRASTRUCTURE, RESPONSIBILITY OF OPERATORS**

- 4.1 Until 2010, it is expected that ECAC Member States will continue to provide the VOR/DME infrastructure necessary to enable operators to meet the required system use accuracy for B-RNAV and some P-RNAV operations. Operators should be aware that the continued maintenance of VOR beyond 2010 is not guaranteed. The available radio-navigation aid infrastructure for RNAV other than DME and GNSS may thereafter be limited.
- 4.2 The navigation system use accuracy achievable by an RNAV system is normally dependent upon both the radio-navigation aid infrastructure and the airborne equipment. It is the responsibility of the operator to ensure that the required system use accuracy can be achieved during operation on assigned RNAV terminal area procedures. It is the responsibility of the State to provide operators with information about relevant radio-navigation aids availability along P-RNAV routes.
- 4.3 Where position derived from GNSS is the only input to the RNAV system, it is incumbent upon operators to confirm that appropriate coverage from GNSS is provided for the intended flight. For this purpose recognised software and/or internet tools may be used.

#### **5. FUTURE DEVELOPMENTS**

- 5.1 Increasing dependence upon RNAV operations is expected in the coming 10 years. To enable RNAV to become the only method of navigation and to support the longer term transition to a GNSS environment, it is essential that RNAV systems offer at least the same level of integrity and continuity of function as offered by existing navigation equipment (e.g. VOR). It is also essential that consistent functional performance can be obtained. To this end RNAV equipment specifications have been published by EUROCAE and RTCA. (EUROCAE ED 75A/RTCA Do 236A refers) and equipment meeting these specifications is designated RNP-RNAV. RNP-RNAV equipment is expected to be capable of meeting the requirements of JAA TGL No. 10.
- 5.2 Subject to an appropriate business case being developed, it is anticipated that a decision on the mandatory carriage of RNP-RNAV equipment will be made by ECAC Member States by the end of 2003. The implementation of RNP RNAV is not foreseen before 2010.
- 5.3 Operators should be aware that the JAA TGL-10 requirements are not sufficient to meet the future RNP-RNAV requirements. Therefore, operators equipped with RNAV Systems not meeting JAA TGL No. 10, and wishing to re-equip to enable operation on RNAV terminal area procedures are recommended to take due account of the expected requirement for RNP-RNAV.