International Civil Aviation Organization

WORKING PAPER

INSTRUMENT FLIGHT PROCEDURE PANEL

FIFTEENTH MEETING

(IFPP/15)

Virtual meeting, 28 March to 8 April, 2022

Agenda Item 3: Update on panel coordination activities

Final draft of the Circular on the use of RNP on visual manoeuvring with prescribed tracks

(Presented by the Secretariat)

SUMMARY

The FLTOPSP has been working on guidance to promote best practice for the development of visual procedures using RNP systems, variously referred to as RNAV Visual, Visual RNAV etc. The attached draft is the final outcome of the Panel work and has been accepted by FLTOPSP for publication.

Action by the IFPP/15 is in paragraph 3.

1. INTRODUCTION

1.1 Job card FLTOPSP.023 was approved by the ANC in 2015, and referred to the proliferation of different procedures published as RNAV Visual or Visual RNAV. This job card noted the lack of standardization of these procedures and proposed, initially to develop provisions for PANS OPS ad PANS ATM for their development.

1.2 To further the work a multi-disciplinary group comprising of FLTOPSP, ATMOPSP, IFPP and PBNSG was formed (FLTOPSP/3 Recommendation 4/12 refers). The draft circular in Appendix A is the outcome of this work.

2. DISCUSSION

2.1 Following initial discussions in the multi-disciplinary group, the focus of the work shifted from the development of PANS provisions to the drafting of a circular presenting guidance on best practice for developing RNAV Visual type approaches, now referred to as RNP (VPT). This guidance emphasises that

the development of this type of approach should only be considered after all other options have been reviewed and found to be inadequate. (both RNP APCH and RNP AR APCH should be considered).

2.2 The guidance in Part I of the circular is intended to be used where specific circumstances dictate that other options are not feasible, and additional safety benefit can be achieved from the development of the RNP (VPT) procedure. The applicability of such procedures is limited to approved operators.

2.3 In addition, Part II of the circular presents guidance for the development of operator proprietary procedures to assist with flying circling type approaches. These are intended to be transparent to the controller - i.e. the pilot will be cleared for a circling approach as normal and will opt to fly this using FMS/RNP system guidance.

2.4 After much discussion, the approach taken was to base the RNP (VPT) on an existing or new RNP AR APCH. This would ensure that design criteria are applied at the initial design stage. Additionally it was considered that the use of the RNP AR APCH criteria, with consequent development of additional AR approaches, might help to increase the use of this type of approach which in turn would provide more incentive for operators to gain approval. Prior experience of operating RNP AR-like approaches in visual conditions would be beneficial, and could further stimulate the increase in operator approvals by allowing the operator to gain a better understanding of the benefit of the RNP AR approach type.

2.5 The intent of the guidance in Part I is to ensure that the operation is protected (using existing PBN design criteria) at all points where the aircraft is likely to be in IMC, and that visual conditions would be required as an additional mitigation to operate on the RNP AR path without a full AR authorization. No new criteria are therefore required to develop procedures in line with the circular.

2.6 Guidance on the standardized presentation of the RNP (VPT) is also included to attempt to introduce some consistency in how these procedures are depicted. Additional guidance on authorization, operator procedures, ATC procedures and phraseology is further intended to promote a consistent approach to the development and implementation of the RNP (VPT).

3. ACTION BY THE IFPP/15

The IFPP/15 is invited to:

a) Note the information in this WP;

b) Review the attached draft circular on RNP (VPT) procedures and provide comments.

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Appendix A – Draft RNP (VPT) Circular

FOREWORD

This guidance has been developed to provide best practice and assistance to States and operators when developing procedures including an instrument path followed by a visual path defined by RNP waypoints to promote stabilized approach and prescribed visual maneuvering to a designated runway. This type of procedures has been previously referred to by a number of names, such as RNAV Visual, Visual RNAV or Visual.

The circular is divided into two parts – Part I addresses procedures which are developed by the ANSP in conjunction with an operator and are intended to be published for use. These procedures would be the subject of an ATC clearance and could be available for use by other suitably qualified and authorized operators.

Part II provides information on operator proprietary procedures which are intended to facilitate the execution of complicated visual maneuvers such as a circling approach. These procedures are intended to be 'transparent' to the local ANSP who would not either be aware of their use, or issue a clearance for them. They are intended to supplement the flight crew procedures only.

Before designing an RNP (VPT) and where possible, States should endeavor to design and publish procedures using criteria published in Doc 8168, *Procedures for Air Navigation Services — Aircraft Operations*, Volume II — *Construction of Visual and Instrument Flight Procedures* or the *Required Navigation Performance Authorization Required (RNP AR) Procedure Design Manual* (Doc 9905). For specific situations where this is not practical, the guidance in this Circular is intended to assist with the development and implementation of a procedure which can be used by authorized operators under certain limiting conditions.

Procedures developed using the guidance in this circular should only be made available to authorized operators.

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GLOSSARY

ACRONYMS AND ABBREVIATIONS

AIP	Aeronautical information publication
ANSP	Air navigation services provider
APCH	Approach
ATC	Air traffic control
ATCO	Air traffic control officer
ATM	Air traffic management
ATS	Air traffic services
FMS	Flight management system
GNSS	Global navigation satellite system
IFR	instrument flight rules
NAVAID	Navigation aid
PBN	Performance-based navigation
RF	Radius to fix
RNAV	Area navigation
RNP	Required navigation performance
RWY	Runway
SMS	Safety management system
STAR	Standard arrival
VF	Visual Fix
VPT	Visual maneuver with Prescribed Track

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DEFINITIONS

Development Operator. An operator who acts as a proponent for the development, coordination, and implementation of an RNP (VPT).

Missed Approach. For the purposes of this circular the missed approach is defined as an obstacle protected path starting at the Visual Fix which can be followed by the aircraft in case references to proceed visually are not achieved when reaching the Visual Fix.

Navigation specification. A set of aircraft and aircrew requirements needed to support performance-based navigation operations within a defined airspace. There are two kinds of navigation specification:

RNAV specification. A navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV e.g. RNAV 5, RNAV 1.

RNP specification. A navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP e.g. RNP 4, RNP APCH.

Operator. The person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Performance-based navigation (PBN). Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in designated airspace.

RNP route. An ATS route established for the use of aircraft adhering to a prescribed RNP navigation specification.

RNP system. An area navigation system which supports on-board performance monitoring and alerting.

Safety management system (SMS). A systematic approach to managing safety, including the necessary organizational structures, accountability, responsibilities, policies and procedures.

Visual Fix. The fix, marked by a waypoint, on the RNP (VPT) Procedure where the pilot must decide if the weather conditions are sufficient to continue along the RNP (VPT) path visually or follow the missed approach.

RNP (VPT) Procedure. An IFR procedure including an RNP instrument path followed by a visual path defined by waypoints to promote stabilized approach and prescribed visual maneuvering to a designated runway.

Chapter 1 - Introduction

1.1 OVERVIEW

1.1.1 Purpose and Scope

1.1.1.1 The purpose of this circular is to provide guidance to States and operators when developing IFR procedures including an RNP instrument path followed by a visual path defined by waypoints to promote stabilized approach and prescribed visual maneuvering to a designated runway.

1.1.1.2 Substituting a visual approach by an RNP (VPT) supplemented by the area navigation capabilities of the aircraft is often used as a way to improve the safety of the operation by providing track and vertical path guidance, assisting with the safe completion of the approach.

1.1.1.3 In other cases such procedures may be developed for environmental or efficiency reasons, where the publication of a preferred track for aircraft conducting a visual approach can be used to reduce noise impact to local residents, or to provide ATC with a predictable and repeatable path to assist with scheduling arrivals.

1.1.1.4 The intent of the guidance is two-fold. Firstly, best practice is presented in order to ensure that a well-defined systematic approach to the development and implementation of the approach is used, and to provide guidance on the assessment and testing process needed for a safe operation. Typical approval processes are also described for operators wishing to make use of the procedure. Secondly, the guidance is intended to provide some consistency in development and publication of the procedures. Lack of standardization of visual procedures supplemented by the use of RNAV systems has resulted in some confusion regarding the requirements to safely fly such procedures.

1.1.1.5 The guidance is presented in two parts. Part I looks at the process for developing procedures jointly with the ANSP and a lead operator, which are intended to be published and subject to ATC clearances. Part II deals with operator proprietary procedures which are intended solely for internal use and which remain transparent to the local ANSP.

1.1.2 Target audience

1.1.2.1 This publication will be useful to civil aviation authorities that oversee instrument procedure design and charting/publication organizations (both internal and external). It will also assist all stakeholders, including air operators, air navigation service providers, data houses, procedure design organizations, air traffic control officer (ATCO) and pilot training organizations, charting organizations and aircraft manufacturers with applicable aspects of the implementation.

1.1.2.2 This circular includes practical considerations for the development of the procedure, whether this is done by the ANSP or following an initiative taken by an operator. It also provides guidance on the authorization process for overseeing the development of the procedures.

PART I – Published Procedures

Chapter 1

Introduction

1.1 RNAV Visuals were originally developed as a means to provide some level of RNAV guidance to runways where existing instrument approach procedures could not be developed. These were always considered 'special' and required authorization for operators to use them.

1.2 Recently there has been an increase in the development of the RNAV Visual type procedure. In addition to the original intent of such procedures these are now also being promulgated for two specific reasons:

a) to create a new approach path for efficiency, noise or environmental issues, or
b) to enhance an existing Visual Maneuvering using Prescribed Track (VPT) or to replace a circling approach.

Some of these procedures have been published in the State AIP, without restriction, and intended for use by all aircraft.

1.3 The Flight Operations Panel of ICAO, under instruction from the Air Navigation Commission, was tasked to develop criteria and guidance for the development of the RNP (VPT) procedure. A multi-disciplinary group was established to work on this project including participants from the PBN Study Group, the ATM Operations Panel and the Instrument Flight Procedures Panel of ICAO.

1.4 Two issues needed to be resolved to facilitate the development of the RNP (VPT) procedure. One was the determination of obstacle clearance, the second related to establishing the ability of the aircraft intended to be operated on the procedure to successfully follow the route as designed.

1.5 To resolve the obstacle clearance issue it was decided to use as a baseline the RNP AR APCH navigation specification. This would provide clear criteria, as defined in the *Required Navigation Performance Authorization Required (RNP AR) Procedure Design Manual* (Doc 9905), for the development of the underlying procedure and ensure the designed route remained clear of terrain.

1.6 For aircraft operators who do not have an RNP AR APCH approval, a process would be needed to ensure an assessment is made of the aircraft intended for the operation to determine if these can be safely operated on the RNP (VPT) route, in limited visual conditions only. In following this path, it was clear that the RNP (VPT) procedure could not, therefore, be made publicly available for all operators since the operational assessment would be key to ensuring the correct operation on the intended route. They would need to be published as *authorization required*.

1.7 Guidance is therefore needed to assist with the safe and standardized development of such procedures. The responsibility to ensure correct operation of the aircraft when flying the procedure would therefore rest with the operator, overseen by the State of the Operator to ensure the relevant operational assessment had taken place. Final authorization to conduct operations using the procedure could also be required from the local ANSP.

1.8 The Circular provides guidance to authorities and operators to allow non RNP AR approved operators to fly published RNP AR approaches in given visual conditions. The aim being to provide RNP guidance on flight paths, flown in visual conditions, optimized for efficiency, fuel saving, noise issues and safety especially in the domain of short final approach stabilization.

Chapter 2

RNP (VPT) based on an RNP AR path

2.1 INTRODUCTION

2.1.1 Since the introduction of the RNP AR APCH navigation specification, several States have introduced RNP AR procedures, either to allow for approaches in areas of complex terrain, or for reasons of efficiency and practicality. The number of RNP AR APCH approved operators remains fairly low, typically due to the increased costs associated with gaining and maintaining an RNP AR approval versus the limited benefit to be derived from the small number of RNP AR procedures available.

2.1.2 In some cases, operators, aerodromes or ANSPs (or other organization authorized for the development of instrument flight procedures) may have a desire to permit aircraft not approved to conduct RNP AR operations to also follow the prescribed track of such an approach. From an operator perspective this provides a better option than a pure visual approach resulting in less deviations from optimum route and descent path. For aerodromes and ANSPs it allows for predictable and repeatable paths to be flown by arriving aircraft which can then facilitate better efficiency in the terminal maneuvering area.

2.1.3 The proposal to use RNP AR procedure as the basis for the RNP (VPT) procedure is intended to assist with these requirements, while also helping to drive the development of new RNP AR approach procedures. As the number of available RNP AR approaches increases, there will be more incentive for operators to consider gaining an RNP AR approval. Additionally, the operational assessment described in Appendix A of this circular is intended to start operators on the path towards a process which will match that of the one used for RNP AR APCH, with flyability assessments and navigation database validation included in the tasks performed by the operator. This is intended to act as an introduction to RNP AR operations, further facilitating the increase in the number of RNP AR approved operators.

2.1.4 In general it is envisaged that the RNP (VPT) procedure will be based on existing RNP AR APCH procedures, as it was done for example in Gibraltar (see Appendix B). It is also possible that an ANSP or aerodrome operator may develop both an RNP AR procedure and corresponding RNP (VPT) procedure where none exist currently.

2.1.5 Figures 2-1 and 2-2 illustrate the intent of the RNP (VPT) based on an RNP AR Procedure.

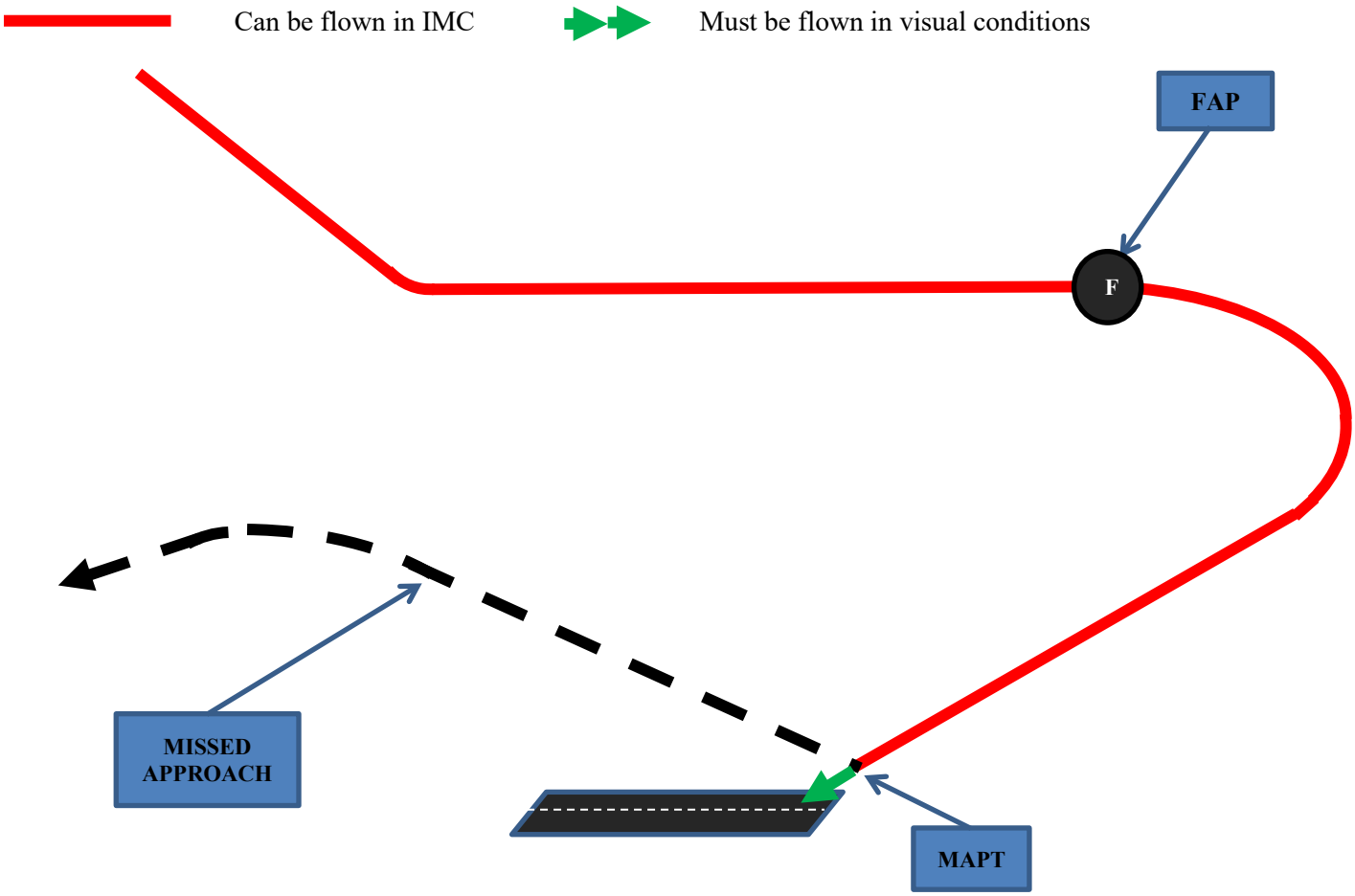


Figure 2-1 A typical RNP AR approach

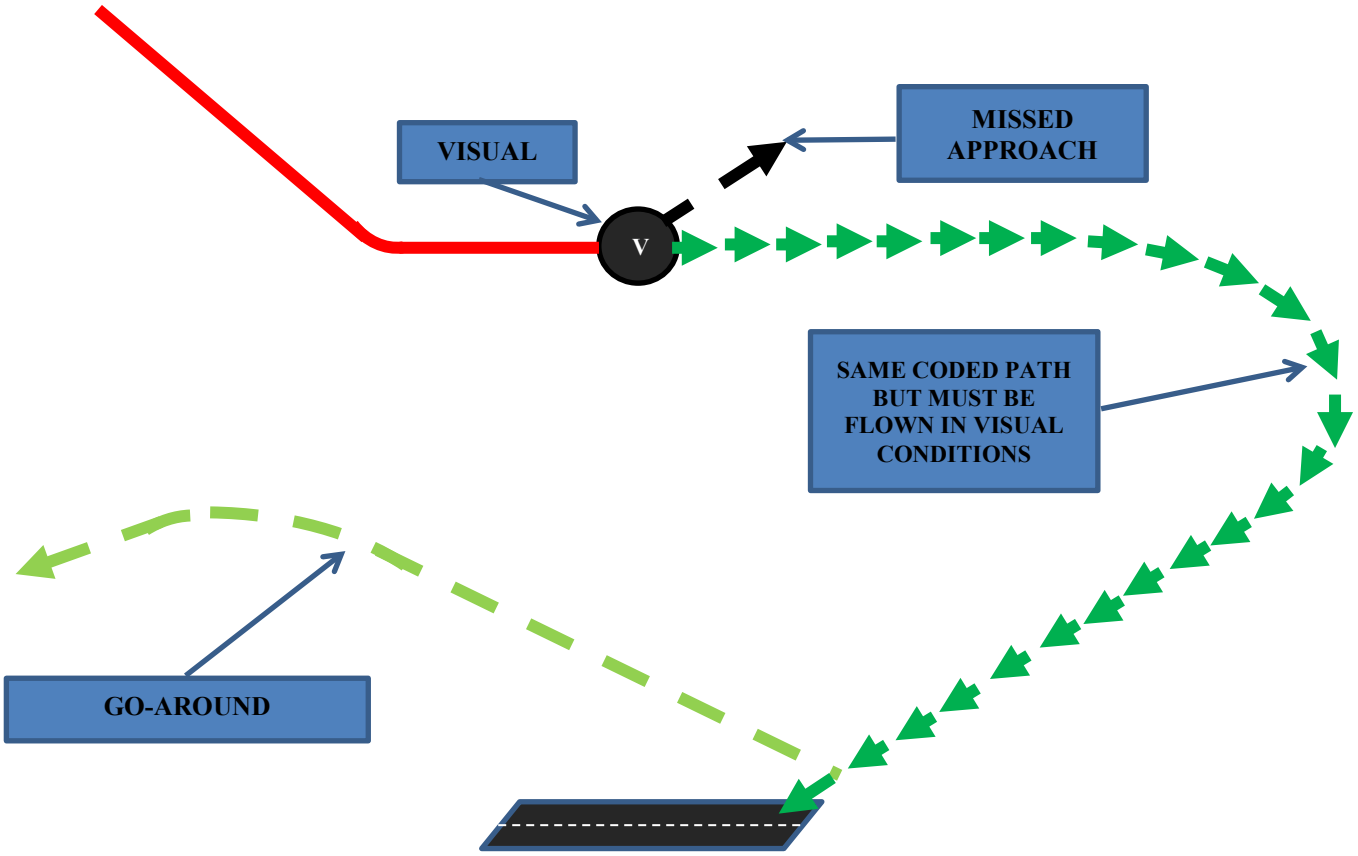


Figure 2-2 An RNP (VPT) procedure based on the RNP AR procedure shown in Fig. 2-1

2.2 PROCESS OUTLINE

2.2.1 There are two scenarios which could lead to the development of an RNP (VPT) procedure:

i. An ANSP wishes to implement an RNP (VPT) procedure for traffic flow, environment or other reasons.

ii. An operator requests the development of an RNP (VPT) procedure for increasing the accessibility to a certain aerodrome, typically where an RNP AR approach procedure already exists.

2.2.2 Both scenarios require the involvement of a development operator to assist in the development of the design and testing of the RNP (VPT) procedure.

2.2.3 The development of such an RNP (VPT) procedure should typically be as follows:

1) If ANSP led, first design an RNP AR approach procedure; If operator led, there will likely be an existing RNP AR procedure to review.
2) Coordination between ANSP and development operator:
   a) Determine whether the RNP AR approach procedure is suitable as an RNP (VPT) procedure, typically by reviewing the characteristics of the RNP AR procedure with respect to:

i) Specific design characteristics of the RNP AR procedure
ii) Potential positioning of Visual Fix and missed approach route
iii) Consideration of intended fleet capability
iv) ATM considerations

3) Design the RNP (VPT) procedure

4) Test and validate the RNP (VPT) procedure

5) Publish the RNP (VPT) procedure, restricted to authorized operators, specifying the applicable fleet.

2.3 DEVELOPEMENT PROCESS

2.3.1 Coordination with development operator

2.3.1.1 A new RNP (VPT) procedure development can be an initiative of the ANSP, an Operator or an aerodrome operator. If the ANSP or the local aerodrome operator is at the initiative, they should approach an operator familiar with the environment to act as development operator. The development operator will be key to assisting the ANSP or aerodrome with the design and testing of the procedure to determine its suitability for the target users.

2.3.1.2 If an operator is the proponent of the new RNP (VPT) procedure, he will be associated in the development of the procedure.

2.3.1.3 An operator can initiate the RNP (VPT) process by contacting the local ANSP and the respective ATC facility and present its proposal for the RNP (VPT).

2.3.2 Design of the RNP (VPT) procedure based on the RNP AR Approach Procedure

2.3.2.1 Any new design RNP (VPT) procedure should be an overlay of an RNP AR approach procedure, ideally one which is compliant with the criteria described in Doc 9905. More complex RNP AR procedures could be used but the effect on applicability for RNP (VPT) procedure must be carefully considered.

2.3.2.2 Development of RNP (VPT) procedure is not guaranteed for all RNP AR procedures. The procedure must be evaluated by the ANSP and development operator to determine if an RNP (VPT) can be implemented. The design of the underlying RNP AR procedure will be important – the more complex the RNP AR procedure, the less likely it is to be usable as the basis for an RNP (VPT) procedure.

2.3.2.3 Obstacle clearance, as defined in PANS OPS Vol II, for the relevant navigation specification in use and the relevant phase of flight must be provided for all parts of the path intended to be followed in IMC conditions: Initial segment criteria apply up to Visual Fix and missed approach criteria apply from Visual Fix. Typically, RNP1 criteria should be considered. Radius-to-fix (RF) leg capability may also be necessary, depending on the design of the procedure.

2.3.2.4 The altitude and speed restrictions of the RNP AR Procedure should be reviewed for the RNP (VPT) procedure. The need to consider RNP 1 criteria down to the visual fix may require adjustments to the altitude constraints, which may also necessitate changes in the speed restrictions (for example on RF legs which may need to be flown at a different altitude than on the RNP AR procedure).

2.3.2.5 Visual Fix

2.3.2.5.1 As the RNP (VPT) procedure may commence in IMC, a Visual Fix must be defined. This is a waypoint on the procedure where the pilot must decide if the weather conditions are suitable to continue following the RNP (VPT) path with sufficient visual references to avoid any obstacles and complete a safe landing.

2.3.2.5.2 The Visual Fix, where visual conditions must be achieved, should be clearly indicated on the RNP (VPT) chart.

2.3.2.5.3 The position of the Visual Fix along the RNP AR procedure path is critical for the development of the RNP (VPT) procedure. The trade-offs in positioning the Visual Fix is to locate the Visual Fix close enough to the runway to allow visual maneuvering without overly restrictive meteorological conditions, while being able to protect the segment upstream of the Visual Fix according to the RNP1 navigation specification (or PBN capability of the operator), and to protect and publish a missed approach at the Visual Fix according to the constraints described in the chapter 2.3.2.6. The Visual Fix should be determined in coordination with the development operator and other stakeholders as required, taking into consideration the capabilities of the expected fleet, in particular the expected PBN capabilities of this fleet.

2.3.2.5.4 The Visual Fix must be located at/before the FAP of the RNP AR procedure. It is recommended that Visual Fix is one of the existing waypoints in the published RNP AR procedure, however it may also be a new waypoint along the RNP AR procedure not used in the development of the underlying RNP AR procedure.

2.3.2.6 Missed approach

2.3.2.6.1 For the situation where the visual conditions are not met at the Visual Fix, a missed approach should be developed. This is expected to follow the same process that would be needed in the development of a missed approach for any instrument procedure including coordination with ATC.

2.3.2.6.2 In designing the missed approach path, the following points need to be considered:
Two types of missed approach can be used depending on the local constraints. AN RNP (VPT) procedure is published with one or the other type. Type 1 is the preferred option as it alleviates the pilot's workload and improves predictability for the controller.

1) Type 1 missed approach: Follow the lateral RNP AR path to the runway and beyond, along the RNP AR missed approach without descending or while climbing. In this case the route must be possible to be flown in IMC by the non RNP AR approved aircraft, for example it must be possible to protect the route according to RNP 1 missed approach design criteria. *Refer to example chart (GIB).*

2) Type 2 missed approach: Quit the lateral RNP AR path and follow a different path. In this case this the missed approach cannot be coded as part of the RNP (VPT) procedure and should start with a simple heading and potentially also climb instruction to follow. Where climbing is required the path is protected following the general principles for missed approach provided in the Pans Ops. *Refer to example chart (NCE).*

2.3.2.7 Vertical Path

2.3.2.7.1 The vertical path to the runway should be included in the RNP (VPT) procedure and coded to enable guidance to the flight crew.

2.3.2.7.2 The FAP of the RNP AR procedure should be included in the RNP (VPT) procedure for information on the descent path.

2.3.2.7.3 The main concerns about RNP (VPT) procedure slope are:

i. The minimum slope of the RNP (VPT) procedure should match the underlying RNP AR;
ii. The RNP (VPT) procedure slope should match the VASI/PAPI slope if there is one.

In case the RNP AR procedure slope is different from the VASI/PAPI slope, the RNP (VPT) procedure slope should be determined in coordination with the development operator and other stakeholders.
The RNP (VPT) procedure slope must be published on the RNP (VPT) chart.

Note. See Annex 14 Vol I, 5.3.5 for additional information regarding the need for visual approach slope indicator systems.

2.3.2.7.4 Where a runway served by an RNP (VPT) procedure is be equipped with a visual or electronic vertical guidance system, e.g. a Visual Approach Slope Indicator (VASI/PAPI), the pilot should be notified by chart note or other means if the vertical profile of the RNP (VPT) procedure is not aligned with the Visual Approach Slope Indicator (VASI/PAPI) provided on for the runway.

Note. Doc 9905 only requires notification of difference in VASI/PAPI slope where this is greater than 0.2 degree from the approach slope.

2.3.2.8 Go-around procedure for visual phase of flight

2.3.2.8.1 After passing the Visual Fix, the missed approach path may no longer be available. In this situation the procedure must clearly specify, with a note on the chart, the actions to be taken by the crew. These instructions should include both lateral and vertical elements.

2.3.2.8.2 Where necessary, additional instructions should be provided for crew actions following a rejected landing (balked landing).

2.4 WEATHER REQUIREMENTS

2.4.1 For each RNP (VPT) procedure the development operator and local ATC facility must coordinate to determine appropriate ceiling and visibility values in relation with the determination of the location of the Visual Fix. Those values should be set high enough to minimize the risk of having to fly the missed approach.

2.4.2 Visual reference with the ground to ensure obstacle clearance must be maintained at all times after the Visual Fix, however visual reference with the airport is not required at all times.

2.4.3 Specific visual references may also be defined, such as the need to be visual with particular terrain/obstacle before commencing the visual part.

2.5 VALIDATION AND TESTING

2.5.1 The published RNP AR approach procedure will already have been assessed during the development. Subsequent additional validation is needed for specific RNP (VPT) elements. Typically, this will involve the Visual Fix location and subsequent missed approach. Also any modification to altitude and speed constraints will require re-validation of the procedure.

2.5.2 Validation of these additional elements should be carried out according to Doc 9906, Vol 5 Validation of Instrument Flight Procedures.

2.6 PUBLICATION AND CHARTING

2.6.1 CHART REQUIREMENTS

2.6.1.1 Procedure identification should be in accordance with the naming convention:

RNP A RWY XX (VPT)

2.6.1.2 PBN Requirements Box

2.6.1.2.1 The chart should include a PBN Requirements box stating the PBN navigation specification required for operation (typically RNP 1).

2.6.1.2.2 For procedures with RF path terminators, the note "RF Required" should also be included in the PBN Requirements box. This includes where RF is required in the visual part of the procedure.

2.6.1.2.3 The PBN Requirements box should also include the phrase "RNP to Visual Maneuvering on Prescribed Track".

2.6.1.3 Different type of lines are used to depict the different parts of the RNP (VPT) procedure:

i. Continuous lines depict the IMC part of the VPT RNAV flight segments from the IAF to the Visual Fix;

ii. Successive linear arrows depict the flight segments to be flown in visual conditions from the Visual Fix to the runway;

iii. Dotted lines depict the missed approach from the Visual Fix. A textual description is also provided on the chart;

2.6.1.4 The depiction of waypoints used for the construction of the RNP (VPT) procedure should be consistent with the use of fly-by and fly-over waypoints.

2.6.1.5 Any altitude/speed constraint resulting from the validation process and associated to a waypoint must be depicted.

2.6.1.6 Required weather conditions including ceiling, visibility and specific visual references (where needed) should be indicated on the chart.

2.6.1.7 Where necessary, restrictions (e.g. maximum wind, day-only) must be included as plain text.

2.6.1.8 The chart should clearly state that authorization is required (see 2.7).

2.6.1.9 The minimum temperature associated to the RNP AR procedure should be stated on the chart

2.6.1.10 A chart note should be provided if the VASI/PAPI does not align with the RNP (VPT) approach slope

2.6.1.11 Instructions for discontinuation of the approach (in line with 2.3.2.8) should be provided in note form.

2.6.2 PUBLICATION

2.6.2.1 Charts should be available in the AIP unless State regulations require them not to be. The relevant air traffic controllers should be provided with the approach chart. Use of the chart should be restricted to operators holding an authorization to operate on the procedure only.

2.6.2.2 The proposed coding table should also be published.

2.6.2.3 The AIP should specify any process which is necessary for foreign operator approval to conduct the RNP (VPT) procedure, for example providing evidence of an approval of the State of the Operator to conduct RNP (VPT) in accordance with this circular.

2.7 AUTHORIZATION

2.7.1 Authorization process

2.7.1.1 Operators wishing to conduct this type of approach should prepare the following evidence:

i. Details of the operational assessment process used to determine the ability to operate on each RNP (VPT) procedure, with the applicable aircraft types/variants.
ii. Training requirements for pilots to operate on these procedures.
iii. Operating procedures detailing normal and contingency procedures to be followed.
iv. The process for recording the operator's review, assessment and reporting on the procedures

2.7.1.2 An authorization to conduct RNP (VPT) procedure is required. This should be an authorization of the operator's processes (safety assessment, aircraft eligibility, training, operating procedures) and not a procedure specific authorization.

2.7.1.3 The proposed operators process is defined in the table in Appendix A. The State of the Operator should be satisfied that the operator has the capability to conduct all parts of the process, in particular the flyability assessment and review of the navigation database, before granting such an authorization.

2.7.1.4 Any limitations on the authorization granted to the operator should be clearly stated.

2.7.1.5 The State of the Operator should include in its surveillance plan the verification of effective implementation of the operator's processes, as described above.

2.7.1.6 Any operator wishing to fly an existing RNP (VPT) procedure should be authorized by the State of the Operator to conduct RNP (VPT) operations, and then seek authorization from the local ANSP where required.

2.7.2 PBN Capabilities of the Operator

2.7.2.1 For all operations related to the use of an RNP (VPT) procedure, the operator must have an authorization to conduct PBN operations consistent with the navigation specification used in the design of the procedure down to the Visual Fix and along the missed approach route. This would typically be RNP 1 or A-RNP.

2.7.2.4 For the visual part of the RNP (VPT) it is expected that the operator would have authorization to conduct RNP APCH with vertical guidance.

2.7.2.3 For RNP (VPT) designed with RF legs in the instrument portion of the procedure, the operator must have authorization to operate using RF legs associated with either RNP 1, A-RNP or RNP APCH.

Chapter 3 – Operational Considerations

3.1 Operational assessment

3.1.1 In common with the normal operator process to review a new destination, the potential use of an RNP (VPT) procedure should be assessed as part of the operators Safety Management System (SMS).

3.1.2 This review should determine the need for additional measures in relation to conducting operations using the RNP (VPT), as described in 3.1.4.1-3.1.4.4.

3.1.3 The operator should consider the following when making this assessment:

i. The complexity of the procedure
ii. Terrain
iii. Operating environment
iv. Crew familiarity with the destination
v. Crew experience with the type of procedure published

3.1.4 Depending on the outcome of the assessment the operator may determine the need for any or all of the following additional measures.

3.1.4.1 Crew Briefing materials

Additional briefing material, highlighting the nature of the operation and any specific items relevant to the operation, should be provided where deemed necessary by the operational assessment.

3.1.4.2 Specific training requirements

Where the operator assessment highlights specific issues with conducting the operation based on the procedure, or deems it necessary to ensure crew familiarity with the procedure prior to operation, a dedicated training module should be provided, as part of the crew recurrent training, to address these areas.

3.1.4.3 Standard Operating Procedures

Specific procedures may need to be developed to ensure crew operation in line with the published procedure. These should be included in the Operations Manual.

3.1.4.4 Simulator or Flight demonstration

3.1.4.4.1 As no specific airworthiness criteria are associated with the aircraft eligibility for RNP (VPT) procedures, he operator is responsible for demonstrating the capability of the aircraft intended to be used for the operation. The operator should analyze the impact of any changes to the aircraft configuration that may affect the previously established eligibility of the aircraft. (e.g. updates to navigation systems).

3.1.4.4.2 The operator should demonstrate that the procedure is flyable with the intended equipment (e.g. autopilot engaged, manual flight with flight director or manual flight without flight director). A representative flight simulation training device (FSTD) or the intended aircraft should be used to demonstrate the flyability of the procedure.

Note 1. For more information on FSTD qualification, see Doc 9625, Manual of Criteria for the Qualification, Volume 1 — Aeroplanes

Note 2. Avionic equipment and software configurations vary between aircraft even of the same type, with newer airframes often incorporating more advanced functionality than older aircraft. For this reason, the demonstration intended to show flyability should be on an FSTD which matches the configuration of the aircraft intended for the operation, specifically one which matches the on-board avionics and navigational equipment.

3.1.4.4.3 In this context flyable means ensuring the ability of the aircraft to follow the intended path throughout all segments (including the missed approach) under both normal and abnormal operating conditions. This should include the intended level of automation, given due consideration of the expected weather conditions (wind, temperature etc.).

3.1.4.4.4 For the operator demonstration in the simulator, consideration of any likely aircraft failure during the visual part of the RNP (VPT) procedure can also be included. If the flyability assessment is done in VMC conditions using the aircraft, failure considerations cannot be tested during the assessment, but should be assessed separately in relation to potential issues during the approach.

3.1.4.4.5 Details of the assessment required and the considerations needed for the flyability assessment are included in Appendix A.

3.2 Flight Crew Procedures and Training

3.2.1 Operating procedures

3.2.1.1 Pilots should not fly an RNP (VPT) unless it is retrievable by procedure name from the on-board navigation database and conforms to the charted procedure.

3.2.1.2 The manual entry, or creation of new waypoints is not permitted. Additionally, pilots should not change the database waypoint type for a fly-by to a flyover, or vice versa.

3.2.1.3 Pilots should request the RNP (VPT) on initial contact with the ATC unit, unless previously coordinated. Pilots can refuse or accept a RNP (VPT) procedure if proposed by ATC.

3.2.1.4 Pilots should use an adequate method to adhere to the intended flight track and to achieve an appropriate level of performance.

3.2.1.5 Pilots should decide at the VF at the latest if the weather conditions are suitable to continue visually and follow the RNP (VPT) path to avoid any obstacles and complete a safe landing. If the weather conditions are unsuitable, the pilot must execute the missed approach procedure. If the missed approach involves the discontinuation of the lateral part of the approach, the pilot cannot follow the FMS flight plan and must manually initiate the missed approach.

3.2.1.6 After the VF, the pilot monitoring should monitor lateral and vertical deviation above and below the vertical path. Action should be taken if the lateral and vertical trajectory is not followed as published.

3.2.1.7 During the visual segment the pilot flying should monitor the progress of the aircraft using instruments and visually.

3.2.3 Contingency procedures

The operator's flight crew contingency procedures should address aircraft and RNP system component failures affecting the aircraft's lateral and vertical performance (e.g. loss of the GNSS signal in space, the

flight director or autopilot). The flight crew should understand the impacts of significant failures on the aircraft performance the RNP (VPT) operation requires and how the failure affects their ability to safely comply with the procedural path.

3.2.4 Flight Crew Training

3.2.4.1 Operators should ensure that they have adequately trained their pilots on RNP (VPT) procedures.

3.2.4.2 Theoretical training should address the RNP (VPT) concept, and include as a minimum material detailing following concepts:

i. Use of RF Legs (where these are intended to be included in the procedures)
ii. Normal and contingency procedures to follow when operating on the RNP (VPT)
iii. Standard phraseology related to operation on the procedure.
iv. Requirements specified on the RNP (VPT) chart

3.2.4.3 Simulator based training should allow for the successful completion of the approach to landing, and also cover scenarios such as loss of visual reference / missed approach procedure due to other considerations.

3.2.4.4 For RNP (VPT) procedures, when indicated by the flight operations safety assessment, training should include specific familiarity with the individual RNP (VPT) procedure to be used.

3.3 ATC PROCEDURES AND TRAINING

3.3.1 ATC Procedures

3.3.1.1 Controllers should receive training on these procedures from ATS management.

3.3.1.2 Controllers should provide separation in respect of aircraft following an RNP (VPT) approach in accordance with the requirements established by the ATS authority. These requirements should reflect those established for aircraft following a conventional instrument approach.

Note.- Refer to PANS-ATM 6.5.6 for procedures for sequencing and spacing aircraft following instrument approaches.

3.3.1.3 RNP (VPT) procedure clearance should be issued by the controller before the Initial Approach Fix (IAF).

3.3.1.4 The use of vectoring and direct to instructions should be consistent with RNP AR APCH procedures, described in Doc 9613, Volume II, Part C, Chapter 6.2.6. An ATS unit equipped with surveillance system should, where possible, provide flight path monitoring to aircraft flying a RNP (VPT).

3.3.1.6 The controller should not propose an RNP (VPT) procedure when meteorological conditions are below the published minimum values. The controller may suspend RNP (VPT) operations at any time.

3.3.1.7 Flight crew may accept or decline an RNP (VPT) offered by the controller for any reason. Flight crew may request the RNP (VPT) when meteorological conditions are above the published minimum values .

3.3.2 Controller training requirements

3.3.2.1 Theoretical training should be the same as for RNP AR and include as a minimum material detailing following concepts:

i. Basic PBN, navigation specifications, navigation accuracy, alerting

ii. Use of RF Legs (where these are intended to be included in the procedures)
iii. Use of vectoring and direct to instructions for RNP AR APCH operations and in particular, use of vectoring and direct-to instructions towards the Visual Fix.
iv. When surveillance is available, training must include vectoring skills, highlighting that vectors must not be provided towards any part or any waypoint constitutive of the RF leg. Standard phraseology related to operation on the procedure.
v. Action to be taken if a pilot has not reported terrain or airport in sight when overflying the Visual Fix
vi. The minimum meteorological requirements for the conduct of RNP (VPT) procedures

3.3.2.2 Simulator based training is recommended to allow controllers to familiarize with procedure, phraseology, missed approach, local environment and flight path monitoring

3.4 PHRASEOLOGY

3.4.1 Standard phraseology should be employed to avoid any misunderstanding by flight crew and ATC. In the examples below, suffix A is used to match PAN-OPS Vol II Part I Chapter 9 convention, considering most frequent case when RNP (AR) and RNP (VPT) are published for the same QFU.

3.4.2 Proposed standard phraseology for normal operations is shown in the table below:

Scenario	**Pilot**	**ATC**
Pilot request on initial contact with approach control	REQUEST RNP ALPHA APPROACH RUNWAY 09	
Response to initial contact by approach controller (when clearing the aircraft for the procedure)		CLEARED RNP ALPHA APPROACH RUNWAY 09, REPORT VISUAL FIX
	VISUAL FIX	
Approach controller		CONFIRM VISUAL?
Visual conditions as specified on the procedure chart are met	VISUAL	
Approach controller		CONTACT TOWER 119,25
On initial contact with tower controller	VISUAL	
Tower controller in charge		CONTINUE AS CLEARED; or REPORT FINAL; or RUNWAY 09, WIND (..), CLEAR TO LAND

3.4.3 Proposed standard phraseology in case of degraded conditions is shown in the table below:

Scenario	**Pilot**	**ATC**
RNP (VPT) NOT AVAILABLE		
On initial contact with approach control	REQUEST RNP ALPHA APPROACH RUNWAY 09	
Response to initial contact		NEGATIVE, PROCEED FOR …

VISUAL REFERENCES NOT ACHIEVED AT THE VISUAL FIX		
Approach controller		CONFIRM VISUAL?
Visual references not achieved at the Visual Fix	NEGATIVE, GOING AROUND	
INTERRUPTION OF THE APPROACH ONCE PASSED THE VISUAL FIX		
Issue encountered after the Visual Fix	GOING AROUND	GO AROUND

_____

ATTACHMENT TO PART I

RNAV Visual Procedures

A-1 Introduction

A1.1 A number of States have published procedures which are referred to as Visual RNAV, RNAV visual or some other variation of this term. In particular the US published RNAV Visual procedures based initially on FAA order 8260.55 and 8260.60. Many States have now published similar procedures, however no standard design requirements exist and each procedure may be subtly different in its implementation.

A1.2 While the intent of this circular is to propose a standard methodology for the development of RNP(VPT) procedures, it is likely that procedures will continue to be developed and used which do not meet the design guidelines provided in Part I. The intent of this attachment is to provide familiarity with these procedures and indicate to a State/Operator how to ensure they can safely operate on them.

A1.3 A typical RNAV Visual can be described as follows:

- Contains an IFR segment to a Visual Fix.
- May include the Initial and/or Intermediate and or Final Approach segments, or none – such is the variety of these procedure types.
- Does not conform to a standard Circling procedure.
- Circling minima is not published.
- Has a Prescribed Track, invariably designed to provide an aligned path to the runway.
- Is not necessarily aligned with or based on a pre-existing conventional procedure.
- Is usually published by the State – therefore it can be assumed that a degree of IFP design/validation and State approval has been conducted.

A-2 Procedure Identification

A2.1 Existing procedures are published as RNAV Visual (or similar), however they rely on RNP capability.

A-3 Operational Assessment

A3.1 Aircraft operators are recommended to review the design of existing RNAV Visual procedure. The operator should focus on the specific requirements and determine whether these are acceptable through a safety operational assessment.

A3.2 The guidelines provided in Part I, Chapter 3, 3.1 *Operational Assessment* should also be used by the operator to ensure safe operation on the RNAV Visual procedure, even where these are not developed in accordance with the guidelines provided.

PART II – Operator proprietary procedures

Chapter 1

Introduction

1.1 Complex maneuvers, such as circling, remain the only option to access certain runways. The procedures are typically rare and often challenging. Operators conducting such maneuvers generally see an increase in events recorded through their flight data analysis programs compared to other approach operations. Many operators have reviewed the safety case, and have determined that the overall safety of the operation can be enhanced with the addition of guidance provided by the RNP system for both lateral and vertical paths.

1.2 RNP coded trajectories allow for increased use of automation (Flight Directors/Autopilot) thereby reducing the workload and risk associated with flying these approaches with only visual guidance.

1.3 For the purposes of part II of this circular, the entire procedure remains a circling procedure with rules/requirements stated in PANS-OPS and PANS-ATM.

1.4 Procedures developed by the operator are intended to be used by flight crew in a manner which is transparent to the local ANSP. When issued with a clearance to conduct a circling approach, for example, the crew will execute the procedure in a manner which is consistent with what the ANSP is expecting (remaining within the prescribed circling area at all times and respecting the altitude constraints), however they will do so by use of the proprietary RNP guidance developed by the operator. Such procedures are not published and will not be the subject of an ATC clearance.

1.5 The guidance provided in Part II is intended to highlight best practice in the development of such proprietary procedures, however it should be noted that there may be other methods which could be used to develop similar procedures and that provide equivalent safety. This guidance is not intended to exclude the use of such alternative processes.

1.6 It should be noted that the ability to develop and use such procedures is highly dependent on the capabilities of the aircraft intended for the operation. There may be situations where the aircraft functionality does not permit such a procedure to be safely developed and operated.

1.7 OPERATIONAL CONSIDERATIONS

1.7.1 In developing the operator specific procedure, consideration is given to the functionality of the on-board system and the operating procedures preferred by the operator.

1.7.2 One possibility is to develop a combined coding that incorporates both the initial approach procedure and the subsequent circling maneuver. This has the advantage of being usable by aircraft with only one flight plan available in the FMS, and also does not require the pilot to switch between active and secondary flight plans during the operation. The disadvantage of this design is that it is not possible to include the missed approach of the initial approach procedure, however in general analysis shows that completion of the approach, rather than executing the missed approach procedure, is far more common. Also, providing a combined coding would not be possible where the instrument approach (conducted in IFR) is an ILS.

1.7.3 The lack of a coded missed approach path can be managed with mitigations including:

- Flying with basic means of navigation in e.g. flying a heading or tracking a radial
- Using the FMS "direct to" function to fly directly to a waypoint or NAVAID
- Flying the missed approach according to the database coding by using the prepared backup flight plan (secondary or route 2)
- Displaying flight crew programmable lines and indications on the navigation display

1.7.4 The alternative is to develop a coded path specifically for the circling maneuver and to store this as a secondary flight plan (where available). This allows for retention of the missed approach procedure, and also provides the flexibility to add the circling maneuver following an ILS approach. After flying the ILS and leveling off at the circling MDA at the visual fix, the flight crew switches from the ILS procedure to the operator coded circling procedure. The operator coding provides guidance from the visual fix lateral and vertical guidance to the threshold of the landing runway. At the threshold, the most appropriate flight track is provided to join and follow the published missed approach of the preceding missed approach.

1.7.5 The separate procedure option provides a simpler method which can be used in all situations, however it results in a more complex operational procedure (switching of flight plans in the FMS) which results in higher workload at a critical flight phase. Additionally aircraft systems limitations may make the separate coding method impossible to implement.

1.7.6 The higher workload introduces by the separate procedure method can be mitigated, to some extent, by the use of well-designed and clear standard operating procedures.

1.8 Both options are acceptable and the specific design selected should be considered with these points in mind. The comparative advantaged/disadvantages are shown in Table 1-1.

Separate coded procedure (Circling procedure executed separately after instrument approach)	
Advantages	Disadvantages
• Easier to design, chart and code than a combined procedure • Missed approach at MAPt of instrument approach remains available • Independent of preceding instrument approach	• Higher workload for the flight crew during a critical phase at low altitude, since a switch from a backup flight plan (secondary flight plan/ route 2 flight plan) with recoupling of flight guidance and automation is required (the flight plan switching is particularly demanding for approaches where a turn towards the next waypoint is required while performing a level off at the visual fix to remain in the circling area or on the prescribed track). • Only possible for aircraft/FMS with a backup flight plan
Combined Procedure (Instrument approach and circling procedure combined into one contiguous coding)	
Advantages	Disadvantages
• Less workload for the flight crew during a critical phase at low altitude, since there is no switch required from a backup flight plan (secondary flight plan/ route 2 flight	• More difficult to design, chart and code than a separate procedure • Only possible when the NAVAID or sensor of the instrument approach

plan) • Enables aircraft/FMS without backup flight plan function to use these procedures as well • Feasible for procedures where a turn is required while performing the level off at the MDA	procedure is used as primary means of navigation for the instrument approach procedure. • Missed approach coding at the MAPt of the instrument approach procedure is not available.

Chapter 2

RNP guidance to enhance visual manoeuvring (circling) without prescribed tracks

2.1 INTRODUCTION

2.1.1 Typical circling maneuvers provide a protected circling area within which the aircraft is expected to remain, but do not specify precise tracks to follow in order to complete the approach. Such procedures are referred to as *circling without prescribed tracks* for this reason.

2.1.2 For a typical circling procedure, this process can be standardized to a great extent, using pre-defined templates to generate waypoints matching the circling approach pattern.

2.2 DESIGN CONSIDERATION – CIRCLING APPROACH

2.2.1 The following example shows the development of a template to construct a circling procedure, based on the requirements of PANS OPS Vol II. The example is based on a Category C commercial air transport aircraft and uses figures which are representative of the characteristics of such aircraft. Based on the construction principle of this example, the operator can create coding solutions for different entries into the circling area.

2.2.2 The RNP flightpath is designed in accordance with the appendix *Visual Maneuvering Using Prescribed Track* (I-4-7-App) contained in PANS OPS Vol. 2. While this appendix is intended for the construction of VPT procedures based on "clearly defined visual references" it provides a template flightpath that is known to be compatible with the published PANS OPS circling minima. Consequently, obstacle clearance is assured at or above the published circling minima and the track is valid for the same range of meteorological conditions as required by PANS OPS. As with a conventional circling procedure, descent below the circling MDA/H must not occur until the landing threshold has been visually identified.

2.2.3 The lateral track for typical circling VPT procedure is defined in the PANS OPS appendix and is a geometric construction referenced to the landing threshold as shown in Figure 1.

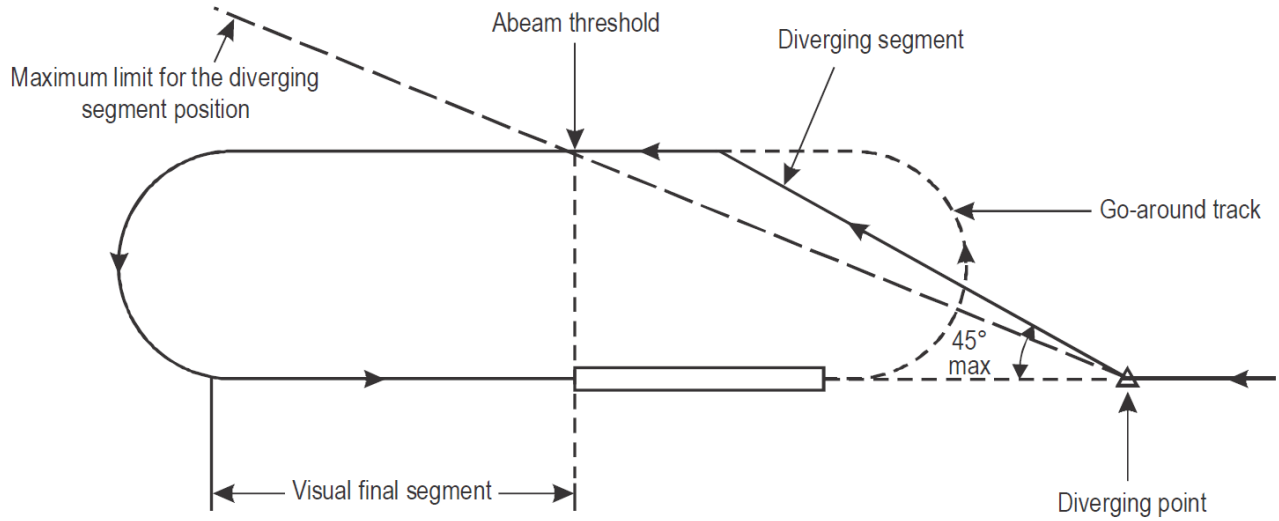


Figure 1 PANS OPS Standard Track General Case. PANS OPS Vol. 2 Fig. I-4-7-App2

2.2.4 The PANS OPS requirements allow flexibility around the selection of the diverging point and the heading of the diverging segment. In this example, the diverging point is fixed at 1.5NM from the threshold of the runway used for the initial approach. The procedures also use a diverging segment offset by 45° from the initial approach which is typical of manufacturer recommendations for conducting the circling approach, and is the maximum offset allowed by PANS OPS. Straight segments should be designed by TF path terminators.

2.2.5 The radius of the turn from the downwind to the final segment is calculated using the following relationship:

$$R = \frac{TAS^2}{68625 \tan \varphi}$$

Where:

φ The bank angle. Set to 25° in accordance with the PANS OPS requirements.

TAS The true airspeed. Converted from the visual maneuvering IAS in PANS OPS Vol 2. Table I-4-1-2 (as an example here, 180kt for approach category C aircraft) unless a lower maximum IAS for the circling minima is published. The IAS is converted to TAS with the following parameters:

- Altitude: Aerodrome elevation + 1000 ft
- Temperature: ISA +15°C

Turns should be designed by RF to create a predictable and consistent path.

2.2.6 The final segment is calculated to give 30 seconds straight final segment based on the maximum IAS for final approach from PANS OPS Vol 2. Table I-4-1-2 (160kt for approach category C aircraft) converted into a TAS using the following parameters:

- Altitude: aerodrome elevation + 1000 ft
- Temperature: ISA +15°C

This corresponds to a 1.4NM straight final segment at a sea-level aerodrome.

2.2.7 The vertical path for the VPT circling procedure typically consists of two segments (shown in Figure 2):

- A level segment flown at or above the published circling minima (rounded up to the next 10ft).
- A descent at the published final approach path angle to a point 50ft above the runway threshold.

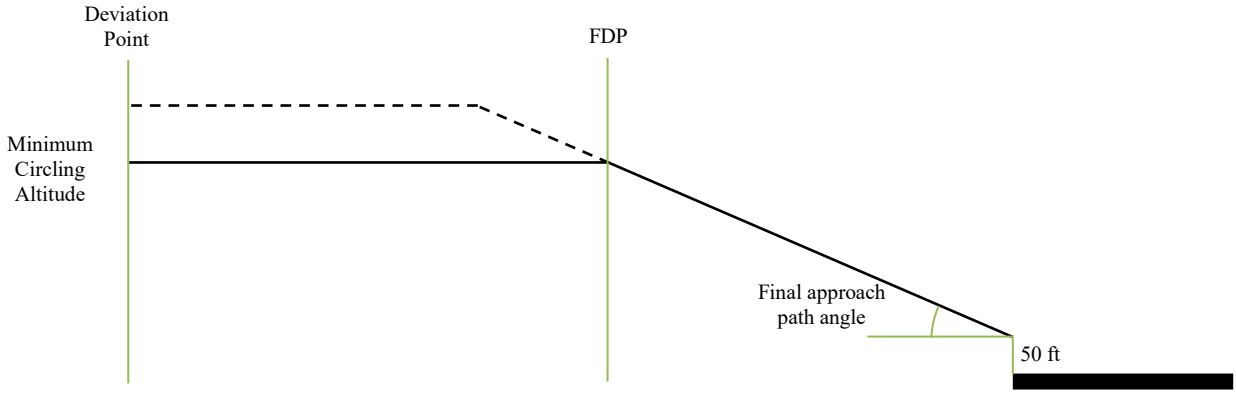


Figure 2 Vertical profile construction

2.2.8 A Final Descent Point (FDP) is defined at the point where the final approach path intersects the circling altitude (not necessarily aligned with the runway track). The construction of the procedure is flexible and allows circling at above the circling minima.

2.2.9 In line with PANS OPS Vol I, 6.4 "Missed Approach Procedure While Circling", from the THR, both the most appropriate flight track to join the missed approach from the preceding instrument approach and the remaining portion of the official missed approach itself may be included as well.

2.2.10 Alternatively, the circling procedures may end with a manual termination leg from the runway threshold. The manual termination leg follows the runway heading until the crew intervene. Adding this leg ensures that the crew have lateral and vertical guidance during go-around initiation. By following the runway heading, initial obstacle clearance is assured as the go-around performance will exceed the take-off performance for the same runway (due to lighter weight and higher initiation height). The flight crew needs to take appropriate action to join the missed approach from the preceding instrument approach.

2.3 LIMITATIONS

2.3.1 The circling procedures produced by this process are valid for PANS OPS circling minima only.

2.3.2 These circling procedures do not have any built-in low temperature correction and operators would need to apply their cold temperature correction policy to the use of the RNP circling.

2.4 DATABASE CODING

2.4.1 The operator is responsible for the development, by its navigation database provider, of proprietary RNP Circling coding.

2.4.2 Operators may wish to implement a naming convention for the custom waypoints that adheres to standard practice for RNAV waypoint naming. An example of this is as follows:

XX##C

Where:

XX Is the last two characters in the airport ICAO code (MJ in LIMJ for Genoa)
Is the order of the waypoint counted in steps of 10, except the FDP which is given a designator 5 greater than the preceding waypoint.

C For circling

2.4.3 The latitude and longitude of each waypoint is found by projecting the flight path described above back from the published threshold coordinates of the landing runway.

2.4.4 All waypoints up to and including the FDP are defined with an altitude constraint of at or above (+) the circling minima (rounded up to the next 10ft).

2.4.5 The FDP and all subsequent waypoints include a vertical angle constraint which should, where possible, be equal to the PAPI/VASIS angle.

2.4.7 Where possible, the first waypoint of the circling coding should be the intersection of the vertical path of the original instrument approach procedure and the circling MDA. The next waypoint should be the diverging point.

2.4.8 The procedure should be coded in the navigation database as RyyF where:

R Is the Approach Procedure Type - RNP
yy Is the runway identifier of the landing runway
F Is the multiple approach identifier selected by the operator

Example:

RNP 22 F
(FMS restriction – may show as RNV)

2.4.9 For a combined procedure it is advised to use the underlying instrument procedure coding provided by the navigation database data provider including the initial approach segments for optimum interoperability with AIP published procedures. This coding should then be merged to the first waypoint of the circling coding as mentioned in 2.4.7.

2.5 WEATHER REQUIREMENTS

2.5.1 The RNP coding is a mapping of an existing circling approach therefore the published minima remain applicable.

2.5.2 The requirement to maintain visual reference with the runway environment at all times is retained.

2.6 OPERATOR ASSESSMENT

2.6.1 Following the construction of an RNP circling, as described in this chapter, the operator will need to conduct an assessment of the flyability the procedure for operational use.

2.6.2 The process should follow that outlined in the operational assessment in Appendix A.

2.7 CHARTING

2.7.1 The operator is responsible for the development and subsequent amendment, by its chart provider, of proprietary RNP Circling charts respecting the criteria and layout of the official approach charts.

2.7.2 Operator charts for circling approaches developed in accordance with Part II of this circular are not for publication in the AIP and are intended for internal use only.

2.7.3 Procedure identification should be chosen to be unambiguous and enable positive identification of the required chart. For a separate procedure, an example would be:

Company RNP CIRCLING RWY XX

and for a combined procedure, an example would, on a VOR A procedure, be:

VOR A Company RNP CIRCLING RWY XX

2.7.4 A note stating the FMS procedure name as selected in 2.4.8, should be included on the chart to unambiguously identify the FMS coding.
Note: Operators will need to ensure they have included identification of the relevant procedure from the navigation database, as the FMS may not be able to display the procedure identification to match the chart

2.7.5 PBN Requirements Box

2.7.5.1 The chart should include a PBN Requirements box stating the PBN navigation specification required for operation (typically RNP 1).

2.7.5.2 For procedures with RF path terminators, the note "RF Required" should also be included in the PBN Requirements box. This includes where RF is required in the visual part of the procedure.

2.7.6 Continuous lines depict any IFR/IMC part of the RNP circling. Successive linear arrows depict the flight segments to be flown in visual conditions from the divergence point to the runway.

2.7.7 The chart should include the all waypoints and tracks available in the RNP coding. If a missed approach out of the circling area is coded, as indicated in 2.2.9, this should also be shown.

2.7.8 Typically the missed approach used at the visual fix in a circling procedure would be the missed approach of the initial instrument approach procedure. These would not be depicted on the circling chart.

2.7.9 Any altitude/speed constraint resulting from the operator assessment process and associated to a waypoint must be depicted.

2.7.10 Required weather conditions including ceiling, visibility and where necessary maximum wind or daylight condition should be depicted on the circling chart.

2.7.11 For a combined procedure, the following should be considered for charting:

2.7.11.1 The operator chart should show all indications and notes from the original instrument chart. This includes also the published missed approach.

2.7.11.2 The missed approach text box should include both the instrument approach missed approach text as the circling approach missed approach text

2.7.11.3 The profile view should start with the instrument approach procedure, then indicate the circling down to the landing threshold. If required, a note "not to scale" should be used.

2.7.11.4 The profile view should indicate both the start point of missed approach of the instrument approach and the missed approach of the circling approach.

2.7.11.5 The profile view should indicate the initial VPA and if changed along the flight track, the changed VPA as well. A level segment VPA should be omitted.

Chapter 3

RNP guidance to enhance visual maneuvering (circling) with prescribed tracks procedure

3.1 INTRODUCTION

3.1.1 There may be situations where an existing conventional procedure is published in accordance with the provisions of PANS OPS Vol II, Part I, Appendix to Chapter 7, but where these are not of the form of a standard race-track circling pattern.

3.1.2 Additional examples of common tracks for use in such procedures are shown in Figure I-4-7-App-1 of the Appendix to Chapter 7 in PANS OPS Vol II, however the use of this guidance is not limited to these examples and may be considered in additional cases.

3.1.3 In these instances it is intended that the same basic process outlined in Chapter 2 could be used, whereby RNP coded trajectories could be developed to match the track specified on the conventional procedure allowing for increased use of automation and subsequent reduction in workload.

3.1.4 As for circling procedures without prescribed track described in Chapter 2, these would have no impact on the local ANSP who would clear the aircraft to conduct the circling approach as normal.

3.1.5 Development of the RNP coding for such guidance would remain the responsibility of the operator, along with the need to develop procedures for flight crew on the safe use of the RNP guidance.

3.2 DESIGN CONSIDERATION – PRESCRIBED TRACKS

3.2.1 Straight segments should be designed by TF path terminators

3.2.2 Turns should be designed by RF path terminators to create a predictable and consistent path

3.2.3 The designed track should remain as close as practical to the published path.

3.3 LIMITATIONS

3.3.1 These procedures do not have any built-in low temperature correction and operators would need to apply their cold temperature correction policy.

3.4 DATABASE CODING

See chapter 2, 2.4

3.5 WEATHER REQUIREMENTS

3.5.1 The RNP coding is a mapping of an existing prescribed track. Therefore, the published minima or ceiling and visibility remain applicable.

3.6 OPERATOR ASSESSMENT

See chapter 2, 2.6

3.7 CHARTING

3.6.1 Operator charts developed in accordance with Part II of this circular are not for publication in the AIP and are intended for internal use only.

3.6.2 Procedure identification should be chosen to be unambiguous and enable positive identification of the required chart. . For a separate procedure, an example would be:

Company RNP VPT RWY XX

and for a combined procedure, an example would on a VOR A procedure be:

VOR A Company RNP VPT RWY XX

Note: For operator developed procedures in line with the guidance in this chapter, the operator is responsible to ensure adequate training to enable the selection of the correct approach chart.

Chapter 4

AUTHORIZATION

4.1 The process for generating RNP coding mapped to an existing circling procedure with or without prescribed track is relatively straightforward for separate procedures but can be complex for combined procedures.

4.2 Operators wishing to develop or adopt this type of approach for their own use should demonstrate to the State of the Operator that they have sufficient capacity to oversee the safe development and operation of this type of procedure. To this end, they should prepare the following evidence:

i. Details of the design process to map the RNP route to the existing circling procedure with or without prescribed tracks,
ii. Details of the operator assessment process to be conducted for each new RNP coding produced, specifying which aircraft types and equipment are covered by the assessment
iii. Training requirements for pilots to operate on these procedures
iv. The operating procedures detailing the normal and contingency procedures to be followed
v. The process for recording the operator's review, assessment, reporting on and maintenance of the procedures

4.3 Once the State of the Operator is satisfied with the operator's process, it will authorize the operator to develop additional RNP coding on existing circling procedures with or without prescribed tracks.

4.4 Any limitations on the authorization granted to the operator should be clearly stated.

4.5 The State of the Operator should conduct regular checks to verify the correct functioning of the operator's processes as described above.

4.6 The operator's process to assess the safety of the proposed RNP coding for a circling with or without prescribed tracks is described in Appendix A.

5 Flight Crew Procedures and Training

5.1 Normal operating procedures

5.1.1 Pilots should not fly an Operator Proprietary Procedure unless it is retrievable by procedure name from the on-board navigation database and conforms to the charted procedure.

5.1.2 The manual entry, or creation of new waypoints is not permitted. Additionally, pilots should not change the database waypoint type for a fly-by to a flyover, or vice versa.

5.1.4 Pilots should use an adequate method to adhere to the intended flight track and to achieve an appropriate level of performance.

5.1.5 During the visual segment the pilot flying should monitor the progress of the aircraft using instruments and visually.

5.2 Contingency procedures

The operator's flight crew contingency procedures should address aircraft and RNP system component failures affecting the aircraft's lateral and vertical performance (e.g. loss of the GNSS signal in space, the flight director or autopilot). The flight crew should understand the impacts of significant failures on the aircraft performance on the procedure requires and how the failure affects their ability to safely comply with the procedural path.

5.3 Flight Crew Training

5.3.1 Operators should ensure that they have adequately trained their pilots on Operator Proprietary procedures.

5.3.2 Theoretical training should address the Operator Proprietary Procedure concept, and include as a minimum material detailing following concepts:

i. Use of RF Legs (where these are intended to be included in the procedures)
ii. Normal and contingency procedures to follow when operating on the Operator Proprietary Procedure
iii. Standard phraseology related to operation on the procedure.
iv. Requirements specified on the Operator Proprietary Procedure chart
v. For combined procedures, the lack of the standard missed approach and the proposed mitigation.

5.3.3 Flight simulation training device (FSTD) based training should allow for the successful completion of the approach to landing, and also cover scenarios such as loss of visual reference and missed approach due to other considerations.

5.3.4 For Operator Proprietary procedures, when indicated by the flight operations safety assessment, training should include specific familiarity with the individual Operator Proprietary procedure to be used.

5.4 ATC PROCEDURES AND TRAINING

4.2.1 No specific ATC procedures or training is required since the operator proprietary procedures are intended to be used by the operator on receipt of a clearance to perform a circling approach.

Appendix A (to entire circular) Checklist for Operators Process

Item	Description / notes
Aircraft Eligibility	Purpose is to define the minimum navigation performance of the aircraft.
1. Aircraft Equipment	
○ Aircraft equipment certification for ▪ RNP 1 or A-RNP ▪ RNP APCH with vertical guidance.	
○ RF capability	If RF is required on the procedure, aircraft should be certified for RF
It has to be noted that only the RNP AR certification guarantees that the aircraft is capable to fly a RF leg in the final approach segment. As a consequence if the aircraft is "only" certified for RNP APCH or RNP 1 with RF, a flyability check will have to be performed (refers to the section operational assessment) to assess the capability of the aircraft to follow a RF in descent considering the associated speed constraints. This assessment will need to be redone in all cases of change to the aircraft configuration, such as changes to the navigation equipment or upgrade to software related to the flight management and guidance systems.	
Operational Authorization	Purpose is to define the operator capability.
2. Operator authorization	
○ Aircraft certified for ▪ RNP 1 or A-RNP ▪ RNP APCH with vertical guidance. ▪ RF capability (if required)	Operator must have authorization from State of the Operator to conduct operations using the required navigation specifications
Operational Assessment	It consists in identifying the particularities of the procedure which may impact operations and checking the flyability of the RNP (VPT).
1. Characteristics of the procedure affecting flight operations	• Use of RF in visual segment • Position of the Visual Fix and missed approach procedure • Vertical constraints and speed constraints, including coding and required configuration • Bank angle For each characteristic, the operator should determine whether it impacts on operating procedure, briefing and crew's training. Identification of those particularities has to be considered for the flyability check.

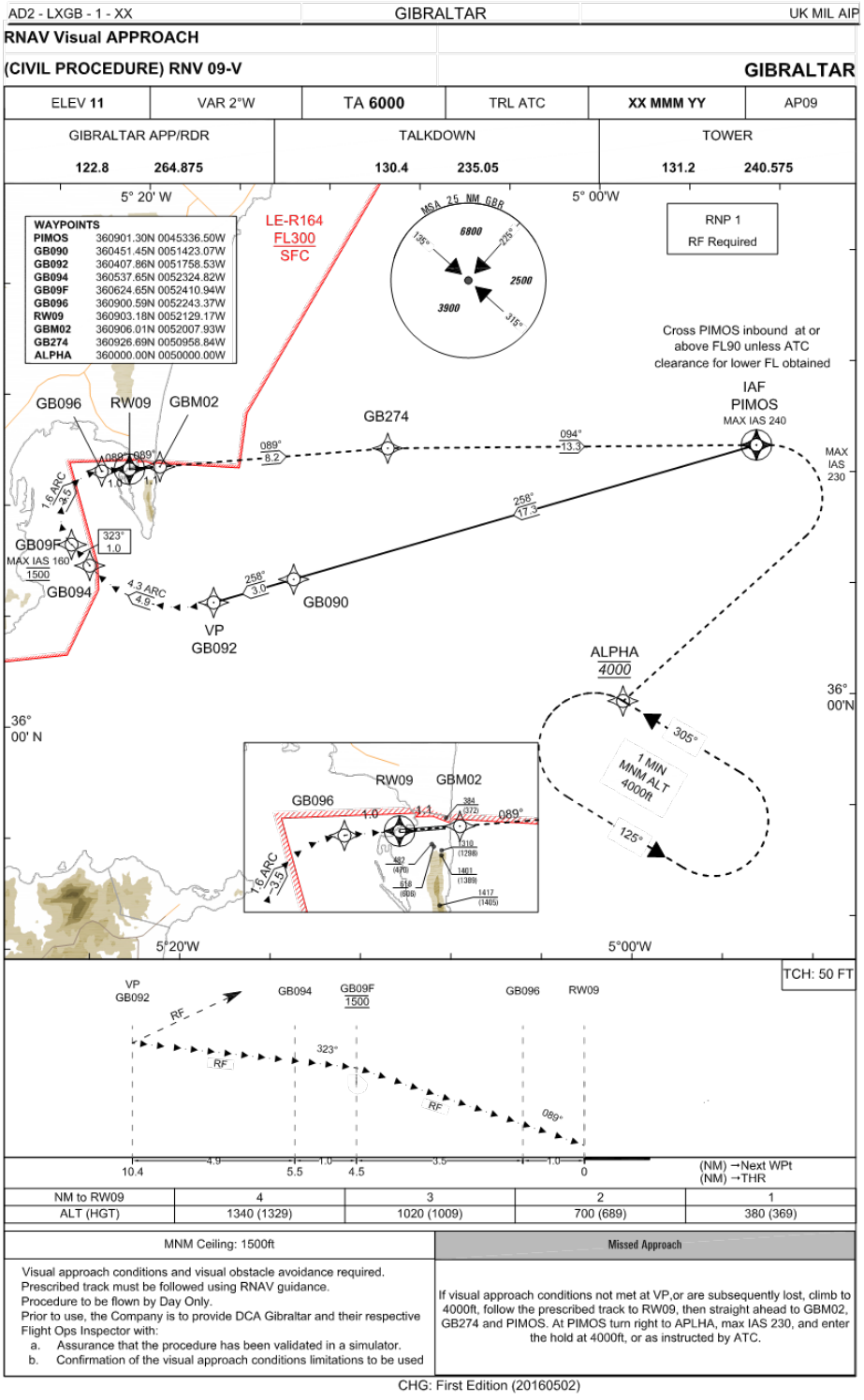
Item	Description / notes
2. Operating conditions	• Wind effects – crosswind, tailwind, turbulence • Temperature effects • Day/night operations • Loss of visual reference
3. Failure conditions	• Engine failure • GNSS loss/downgrade • Autoflight/guidance • Balked landing
4. Flight crew operations	• Barometric altimeter setting • Use of automation • Human factors - Task sharing, CRM • Decision at Visual Fix • Maintaining visual
5. Flyability of the procedure	The operator must check the flyability of the approach for each of its aircraft types before flying the approach procedure. Purpose is to check adequacy of the path coding considering the characteristics and operating conditions affecting the flight path (Items 1 – 4). Any modification of the FMS or other aircraft functions which impacts PBN capabilities requires a reassessment of the flyability of the procedure. This may be done by analysis. Assessment of changes to navigation data – Possible reassessment after amendment to Navigation data for procedure This check will lead the operator to determine the appropriate operating mode.

Item	Description / notes
	The flight simulation training device (FSTD) used to check the flyability of the procedure has to be representative of the aircraft. The RNP system of the FSTD has also to be representative of the aircraft. The use of an FSTD is particularly recommended when the RNP (VPT) procedure includes a RF in final and the aircraft has not been certified for that purpose.
	The flyability check can also be done in VMC provided that the operator has determined the operational conditions associated to this check (flight crew composition, preflight briefing dedicated to the particularities of the procedure to be assessed, and evaluation report).
Operating procedures	
1. Flight preparation procedures to ensure the availability of RNP operational capability must be established	MEL (item GNSS, Nav database, FMS) should take into account RNP (VPT) According to avionics/SOP : RAIM prediction Check navigation database validity
	Notes: Operating procedures developed to operate PBN should apply to RNP (VPT).
2. The RNP (VPT) procedure must be coded in the navigation database and selected by name (pilots are not allowed to build or modify these procedures manually)	
3. For procedures designed in accordance with Part I of this circular, the RNP (VPT) must be requested at first contact with the controller and can only be initiated on ATC clearance.	By accepting an RNP (VPT) clearance, pilots accept the requirements and responsibilities associated with a visual approach clearance, e.g., visibility minimums and cloud clearances.
4. For procedures designed in accordance with Part I of this circular, the pilot must ensure that the required weather conditions (ceiling and visibility) are met before requesting the RNP (VPT) procedure.	
5. The flight crew task sharing shall include the continuous maintenance of visual references from the visual fix to ensure separation from terrain	Should be recalled during the approach briefing

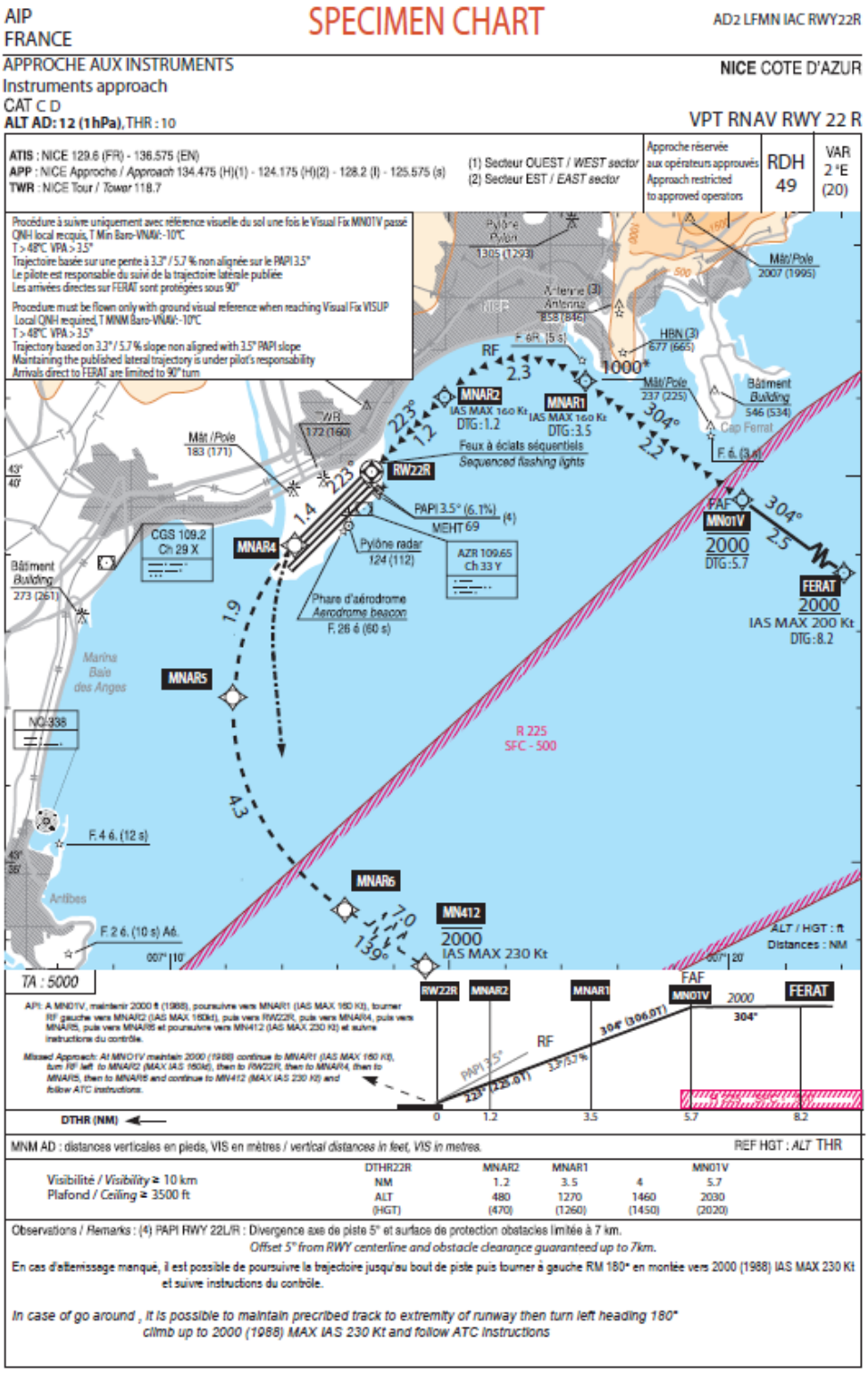
Item	Description / notes
and, depending on the applicable airspace classification, possible VFR traffic.	
6. After the visual fix, the stabilization criteria for a visual approach must be respected.	
7. Reportable event	Any anomalous system behavior related to the approach should be reported
Flight Crew training	Operators should determine the training need deemed necessary for this type of operations.
8. Phraseology	
9. Theoretical training	Description of RNP (VPT) Operating procedures
10. RNP (VPT) practical training	According to Operator's PBN experience

Appendix B – Example RNP (VPT) procedures based on an existing RNP AR created in accordance with Chapter 2

Gibraltar



Nice


AIP
FRANCE
SPECIMEN CHART
AD2 LFMN IAC RWY22R
APPROCHE AUX INSTRUMENTS
Instruments approach
CAT C D
ALT AD: 12 (1hPa), THR : 10
NICE COTE D'AZUR
VPT RNAV RWY 22 R
ATIS : NICE 129.6 (FR) - 136.575 (EN)
APP : NICE Approche / Approach 134.475 (H)(1) - 124.175 (H)(2) - 128.2 (I) - 125.575 (s)
TWR : NICE Tour / Tower 118.7
(1) Secteur OUEST / WEST sector
(2) Secteur EST / EAST sector
Approche réservée aux opérateurs approuvés
Approach restricted to approved operators
RDH 49
VAR 2°E (20)
Procédure à suivre uniquement avec référence visuelle du sol une fois le Visual Fix MN01V passé
QNH local requis, T Min Baro-VNAV: -10°C
T > 48°C VPA > 3.5°
Trajectoire basée sur une pente à 3.3° / 5.7 % non alignée sur le PAPI 3.5°
Le pilote est responsable du suivi de la trajectoire latérale publiée
Les arrivées directes sur FERAT sont protégées sous 90°
Procedure must be flown only with ground visual reference when reaching Visual Fix VISUP
Local QNH required, T MNM Baro-VNAV: -10°C
T > 48°C VPA > 3.5°
Trajectory based on 3.3° / 5.7 % slope non aligned with 3.5° PAPI slope
Maintaining the published lateral trajectory is under pilot's responsability
Arrivals direct to FERAT are limited to 90° turn
Pylône Pylon 1305 (1293)
Mât/Pole 2007 (1995)
Antennes Antennas 858 (846)
HBN (3) 677 (665)
Mât/Pole 237 (225)
Bâtiment Building 546 (534)
Cap Ferrat
F. 6 R. (5 s)
RF 2.3
1000*
MNAR2
IAS MAX 160 Kt
DTG: 1.2
MNAR1
IAS MAX 160 Kt
DTG: 3.5
Feux à éclats séquentiels
Sequenced flashing lights
223°
1.2
304°
2.2
Mât/Pole 183 (171)
VB 172 (160)
RW22R
PAPI 3.5° (6.1%) (4)
MEHT 69
223°
1.4
MNAR4
CGS 109.2 Ch 29 X
Pylône radar 124 (112)
AZR 109.65 Ch 33 Y
Phare d'aérodrome Aerodrome beacon F. 26 é (60 s)
PAF
MN01V
2000
DTG: 5.7
304°
2.5
FERAT
2000
IAS MAX 200 Kt
DTG: 8.2
Bâtiment Building 273 (261)
1.9
MNAR5
Marina Baie des Anges
NQ 338
R 225
SFC - 500
4.3
F. 4 é. (12 s)
MNAR6
7.0
139°
MN412
2000
IAS MAX 230 Kt
Antibes
F. 2 é. (10 s) Aé.
ALT / HGT : ft
Distances : NM
TA : 5000
RW22R
MNAR2
MNAR1
FAF
MN01V
2000
FERAT
304° (306.01°)
304°
RF
PAPI 3.5°
3.3°/5.7 %
223° (225.01°)
0
1.2
3.5
5.7
8.2
DTHR (NM)
MNM AD : distances verticales en pieds, VIS en mètres / vertical distances in feet, VIS in metres.
REF HGT : ALT THR
DTHR22R
MNAR2
MNAR1
MN01V
Visibilité / Visibility ≥ 10 km
Plafond / Ceiling ≥ 3500 ft
NM
1.2
3.5
4
5.7
ALT
480
1270
1460
2030
(HGT)
(470)
(1260)
(1450)
(2020)
Observations / Remarks : (4) PAPI RWY 22L/R : Divergence axe de piste 5° et surface de protection obstacles limitée à 7 km.
Offset 5° from RWY centerline and obstacle clearance guaranteed up to 7km.
En cas d'atterrissage manqué, il est possible de poursuivre la trajectoire jusqu'au bout de piste puis tourner à gauche RM 180° en montée vers 2000 (1988) IAS MAX 230 Kt et suivre instructions du contrôle.
In case of go around , it is possible to maintain precribed track to extremity of runway then turn left heading 180° climb up to 2000 (1988) MAX IAS 230 Kt and follow ATC instructions

Appendix C - Example VPT circling procedure created in accordance with Chapter 3

Genoa (LIMJ/GOA)

Fix Id	PT	FAF MAP	Fix Lat	Fix Long	Alt Cd	Alt	Vert Ang	COT Lat	COT Long
MJ10C	IF		N44-24-08.20	E008-53-28.26	+	1360			
MJ20C	TF		N44-22-35.70	E008-49-42.14	+	1360			
MJ30C	TF		N44-23-10.19	E008-46-46.37	+	1360			
MJ35C	RF	F	N44-23-55.86	E008-45-42.10	+	1360	3.3	N44-24-13.85	E008-47-10.68
MJ40C	RF		N44-25-17.50	E008-47-35.00	+	546	3.3	N44-24-13.85	E008-47-10.68
RW10	TF	M	N44-24-55.52	E008-49-27.07		59	3.3		
HM Manual termination leg follows runway track									