Agenda
Item 2: **Report of activities of the GESEA and Subgroups**

a) Review of air navigation priorities in the ATM field
b) Deliverables and progress of SG1/SG2 working groups

REGIONAL GUIDE IMPLEMENTATION OF PBN PROCEDURES FOR VISUAL FLIGHT RUNWAY

(Presented by the GESEA)

SUMMARY

The purpose of this working papers is that the Meeting defines the implementation of the Guide for the implementation of PBN flight procedures to visual flight runway. The technical study carried out by the TF of the SAM/IG GESEA SG2 is analyzed.

References

- Reports of the workshops/meetings of the SAM Implementation Group (SAM/IG).
- Summary of SG1 GESEA SG2 GESEA PANS -OPS meetings
- RASG-PA ESC Reports

ICAO strategic objectives:	*A – Safety* *B – Air navigation capacity and efficiency* *E – Environmental protection*

1. Background

1.1 The meeting of Subgroup 2 /GESEA "PANS OPS" was agreed by SAM/IG/24 (Lima, November 2019) to be held in Bogota – Colombia in July 2020. However, the COVID 19 health emergency required that it be reprogrammed via virtual mode.

1.2 SG2 /GESEA conducted its virtual sessions between 16 July and 20 July 2020. The material, list of participants, and recordings of the deliberations are in the GESEA cloud available at the following link;

https://onedrive.live.com/?authkey=%21AvxOvPHYpEPdtzU&id=4B2F65A2BBF9F10F%21186741&cid=4B2F65A2BBF9F10F

2. Discussion

2.1 With regard to the implementation of PBN procedures to visual runway, which is part of the SG2/GESEA ToRs approved by SAM//IG/23, the meeting agreed that further work should be done on the development of criteria in a harmonized way, for which a Working Group (TF) was formed.

2.2 The SG2 approved the following actions for TF;

- The operation of the TF RNP APCH working group - Visual runway (later called TF PBN to visual runway) is ratified, with the Colombian rapporteurship, having expressed interest in joining the Argentina, Brazil, Chile, Avianca, LATAM, IATA group and also opening up to States wishing to support the activities.

- TF must develop and communicate its working plan, which makes it possible to assimilate the participation of specialists from States and Industry

2.3 Several industry players, including IATA and aircraft manufacturers, have expressed the need to extend PBN implementation for visual flight runway thresholds, taking into account exactly the operational safety aspects identified above.

2.4 In this line, the Regional Aviation Operational Safety Group – Pan America, RASG-PA, has been developing since 2019 a pilot project with the support of the aircraft manufacturer ATR and the State of Colombia, called "Turning VRF approaches into PBN", which aims to implement a PBN approach procedure on the visual runway of Guapi airdrome (domestic), where aviation with turboprop aircraft is developed. The project has resource support, use of simulators, etc.

2.5 The use of PBN in instrument approach design (IAP) provides greater flexibility for airspace planners/designers for the efficient use of airspace and facilitates access to airports through improved operational minimums, impacting air connectivity benefiting socio-economic development.

2.6 The provision of PBN procedures supports stabilized approximations and prescribes initial-intermediate-final approach segments – frustrated with proper obstacle protection, contributes to operational safety as it affects the reduction of collision incidents with controlled in-flight terrain/in-flight loss of control (CFIT/LOC-I).

2.7 Tf PBN to visual runway held seven virtual meetings, between 6 August and 22 October 2020 totalizing approximately 30 hours of session, plus the analysis and contributions made via email.

2.8 The deliverable of the Group is referred to as "Regional Guide on the Implementation of PBN Procedures for Visual Flight Runway" which is shown in the **Appendix** to this working paper.

3 Suggested action

3.1 The Meeting is invited to:

a) Analyse and express opinion on the material and studies carried out by TF PBN to visual runway, as shown in the Appendix to this working paper; and

b) discuss other considerations that the Meeting deems relevant.

APPENDIX

INTERNATIONAL CIVIL AVIATION ORGANIZATION

SOUTH AMERICAN REGIONAL OFFICE

REGIONAL GUIDE ON THE IMPLEMENTATION OF PBN VISUAL RUNWAY PROCEDURES

This document has been prepared by the GESEA/SG2 PBN Visual Runway Working Group.

Draft Original

Version 3.2

29 October 2020

REGIONAL GUIDE ON THE IMPLEMENTATION OF PBN VISUAL RUNWAY PROCEDURES

RECORD OF AMENDMENTS

Version	**Date**	**Amendment**	**Pages**
Draft Original	28 October 2020		

TABLE OF CONTENTS

1 PURPOSE

1.1 The purpose of this Regional Guide is to provide a set of harmonised guidelines to guide States in the process of implementing PBN visual runway procedures, aimed at aircraft operators, PANS-OPS service providers, and ATS service providers.

2 JUSTIFICATION

2.1 The different quality assurance reports of air operations of different aircraft operators reveal the presence of some of the following inappropriate operating conditions or undesirable states when operating at airports with circling approach procedures (Doc 8168 Volume II), visual traffic pattern (downwind leg, base leg and final leg according to Doc 4444), or when operating at aerodromes without approach procedures, namely:

a) Descents during approach with excessive vertical speeds,
b) Inappropriate approach gradients,
c) Inadequate speeds and/or power settings,
d) Activation of unwanted terrain alerts,
e) Fuel consumption,
f) Reduced accessibility and number of operations

2.2 The use of PBN in the design of instrument approaches (IAPs) provides greater flexibility to airspace planners/designers for the efficient use of airspace and facilitates access to airports through the improvement of operational minima, which impacts on air connectivity that benefits socio-economic development.

2.3 The provision of PBN procedures supports stabilised approaches, prescribes initial-intermediate-final approach legs with due protection from obstacles, contributes to safety as it has an impact on the reduction of controlled flight into terrain/loss of control in flight (CFIT/ LOC-I) incidents.

2.4 ICAO Assembly Resolution A37-11: *Performance-based navigation global goals* promotes the implementation of approach procedures with vertical guidance (APV) (Baro VNAV and/or augmented GNSS), including LNAV-only minima, for all instrument runway ends.

2.5 Various industry players, including IATA and aircraft manufacturers, have expressed the need to extend PBN implementation to visual runway thresholds, precisely taking into account the aforementioned safety aspects.

3 SCOPE

3.1 The purpose of this guide is to provide, *inter alia*, design guidelines, navigation specifications, meteorological requirements and in-flight validation procedures for the development and safe application of PBN visual runway procedures.

3.2 This guide deals only with PBN flight procedures based on a straight-in approach to a visual runway.

3.3 The procedures developed based on the guidelines of this guide apply only to aircraft operators that have been approved by the CAA, in their operational specifications, to perform approach operations in the navigation specification required by the procedure.

3.4 It is important to underline that NOT only the guidelines of this guide may be used for the development of PBN visual runway procedures to be published in the State AIP, but also aircraft operators may propose for study and approval by the CAA, procedures of this type for any public or private aerodrome.

4 ACRONYMS AND DEFINITIONS

For the purposes of this guide, the following ICAO acronyms will apply:

CAA	Civil aviation authority
AFIS	Aerodrome flight information service
APV	Approach procedure with vertical guidance
AWOS	Automated weather observing system
CFIT	Controlled flight into terrain
LOC-I	Loss of control in-flight
OCA/H	Obstacle clearance altitude/height
OCS	Obstacle clearance surface
PBN	Performance-based navigation
RASS	Remote altimeter setting source
RNAV	Area navigation
SARPS	Standards and recommended practices
TIBA	Traffic information broadcast by aircraft
VSS	Visual segment surface

The following ICAO definitions apply in this document:

- Vertical path angle (VPA): Angle of the published final approach descent in baro-VNAV procedures.
- Area navigation (RNAV): A method of navigation which permits aircraft operation on any desired flight path within the coverage of the station-referenced navigation aids or within the limits of the capability of self-contained aids, or a combination of these.
- Visual runway: A runway intended for the operation of aircraft using visual approach procedures or an instrument approach procedure to a point beyond which the approach may continue in visual meteorological conditions.

5 INTRODUCTION

5.1 In the SAM Region, a significant number of the existing visual runways received such classification decades ago, when the PBN concept did not exist, and based on a combination of reasons, including:

a) Some difficulty for conventional PANS OPS design, given the topography of the site;

b) The demand for operations was not significant and there was no perceived problem with airport accessibility, and it was also considered unfeasible to invest in radio aids and lights to implement IAPs; and/or

c) All airport users at the time operated only in VFR and in daytime hours. The runway is limited to visual operations, due to certain obstacles in the aerodrome environment.

5.2 With the passing of time, several airports have experienced an increase in operations and have had capacity and efficiency requirements that currently warrant the use of the visual runway, leading to the identification of the implementation of PBN procedures as a safe, timely and economic solution to meet the aforementioned objectives.

6 ATS CONSIDERATIONS

Aerodromes with ATC service

6.1 Separation of aircraft at ATC-serviced aerodromes where PBN visual runway procedures are implemented is in keeping with the methods outlined in Doc 4444 and/or applicable State regulations. The corresponding IAC must contain relevant information about the ATC, including working hours.

Aerodromes with AFIS

6.2 The provision of flight information at AFIS-serviced aerodromes where PBN visual runway procedures are implemented is in keeping with the methods outlined in ICAO Circular 211 and/or applicable State regulations. The corresponding IAC shall contain relevant information about the AFIS, including working hours.

Aerodromes with ATS

6.3 As required by applicable State regulations, the following applies at aerodromes without any ATS where PBN visual runway procedures are implemented:

a) aeronautical air-ground communication facilities will be established to provide safety-critical information, including meteorological information, condition of the runway and essential traffic; or

b) provision shall be made for the implementation of traffic information broadcast by aircraft (TIBA) procedures in accordance with ICAO Annex 11, Attachment B.

Airspace classification

6.4 Airspace classification is stipulated on the basis of ICAO Annex 11, and will be declared in accordance with the aforementioned ATS options. Therefore, the classification of airspace associated to the aerodrome shall be specified in the AD section of the State AIP and/or the corresponding IAC.

7 APPLICATION

7.1 General

These procedures are for the **exclusive use** of aircraft and flight crews approved in accordance with CAA requirements. The operation will be carried out in accordance with the PBN navigation specification set forth in the procedure (see 7.4 of this guide).

7.2 Design considerations

7.2.1 The procedure will be designed taking into account the provisions of ICAO Doc 8168 Volume II and/or Doc 9905 for procedures under RNP APCH, RNP AR APCH or A-RNP specifications, as appropriate. If necessary, a holding pattern will be established.

7.2.2 Operational minima

The lowest height to which it is possible to descend in instrument flight conditions when approaching a visual runway will depend on the complexity of the operational environment and the need for visual references to complete the approach safely.

The applicable OCH on a straight-in approach will be equal to or greater than 500 ft and visibility equal to or greater than 3000 metres. Further considerations on operational minima, relating to altimeter information, are shown in paragraph 7.2.6.

Note 1. – For the purposes of this guide, the 500 ft/3000 m minima cannot be reduced under considerations of runway markings and/or lights, airborne equipment, etc.

Note 2. - For safety reasons, States may determine the need to publish aerodrome operating minima, indicating the required minimum cloud base height (ceiling) and minimum visibility, for the purpose of visualising and avoiding obstacles in the aerodrome environment.

7.2.3 Obstacle clearance

Obstacle clearance will be applied using the areas and margins set out in Doc 8168 and Doc 9906.

For the purposes of this guide, section 5.4.6 of Doc 8168 Part 1, Volume II, concerning the protection of the visual segment of the approach procedure applies.

In case of penetration of the visual segment surface (VSS) on a visual runway, the procedure set forth in clause 5.4.6.4, which provides for the study and implementation of the corresponding mitigation measures, applies.

If none of the aforementioned mitigations are considered operationally acceptable, a determination is made as to whether the obstacles still penetrating the VSS require or induce the pilot to destabilise the approach in order to avoid them. To this end, the possible infringement of the obstacle clearance surface (OCS) will be assessed and action will be taken based on the following results:

a) If the OCS is penetrated, paragraph 5.4.6.6.1 applies.

b) If the OCS is not penetrated, the PBN flight procedure will continue to be designed and published, and ICAO provisions (see amendment 9 to Doc 8168) on publication of information on infringing obstacles are applied. (See note 2 below.)

In this context, it is underscored that the implementation of PBN flight procedures contributes to the avoidance of CFIT and LOC-I events, as compared to approaches without navigation guidance conducted in the aerodrome traffic pattern.

Note 1. – These criteria could also be taken into account for instrument runways.

Note 2.- Appendix A to this guide contains a Brazilian AIC (free translation into English) entitled "Visual Segment Surface (VSS) of Instrument Approach Procedures", which can be taken as an example of best practice.

7.2.4 Coding tables

The drafting of the procedure coding table is the responsibility of the originator of the procedure and will be done in accordance with Doc 8697 and Doc 8168 Volume II for PBN approach procedures.

7.2.5 Departures and arrivals

The State will analyse the need to implement standard departure (SID) and standard arrival (STAR) procedures, and will establish the required take-off minima.

7.2.6 Altimetry information requirements

The instrument approach chart and the aerodrome information section in the AIP should contain all information concerning the applicable altimeter setting, as well as the source of such information (see also paragraph 7.6).

In this regard, the following applies:

a) The execution of a baro-VNAV instrument approach procedure requires having QNH information based on a local altimeter setting source (see Doc 8168, Volume II, Part 3, Section 4.1.4).

b) For the execution of LNAV-only instrument approach procedures, QNH information from a remote altimeter setting source (RASS) may be used. In this case, the percentage increase in OCH criteria (section 5.4.5 of Doc 8168, Volume II, Part 1) apply, which are limited to RASS sources located within 75 NM.

c) When the RASS source is located more than 75 NM from the aerodrome, LNAV-only instrument approach procedures, based on an OCH minimum equal to or greater than 1000 ft and visibility equal to or greater than 5000 metres, will be implemented.

Note: The local altimeter source and other relevant meteorological information can be obtained from an airport automated weather observing system (AWOS).

7.3 Flight operations

Flight rules and flight plan

7.3.1 The procedures implemented according to this guide are executed under instrument flight rules (IFR).

Normally, no distinction is required when filling out the flight plan form in boxes 8, 10, etc.

Phraseology

7.3.2 The implementation of PBN visual runway procedures normally does not require changes to ATS phraseology referred to in Doc 4444, Chapter 12; however, the State may establish special requirements regarding the applicable ATS phraseology during the execution of procedures designed under this guide.

Visual approach slope indicator systems

7.3.3 It is highly recommended that the implementation of PBN visual runway procedures contemplates the availability of visual approach slope indicators, given the importance of providing the pilot with adequate visual reference for the vertical flight.

The SARPS contained in ICAO Annex 14 and the corresponding State regulations establish the conditions for the use of these visual systems. Therefore, the State must contemplate periodic maintenance and calibration activities for these systems.

7.4 PBN visual runway operations approval process

The originator of the flight procedure design will make sure that the navigation specification requirement is established and clearly indicated on the approach chart, in accordance with the options referred to in paragraph 7.2.1 of this guide.

The user/operator interested in performing PBN visual runway approaches must obtain "aircraft and operator approval" to perform operations with the required navigation specifications, and must meet the requirements and process established by the regulatory authority of each State.

7.5 Validation of procedures

The instrument flight procedure validation process will be as defined by each State, in accordance with the requirements established in ICAO Doc 9906, Volume V - *Validation of instrument flight procedures*.

7.6 Publication and cartography

The procedures designed according to this guide will be published in an instrument approach chart (IAC), following the guidelines set out in Annex 4 - *Aeronautical charts*, Doc 8697 - *Aeronautical chart manual*, as well as the relevant regulations of each State.

The applicable OCH and visibility minima will be published in the aforementioned IAC, including any safety-related information.

8 FAMILIARISATION

8.1 Air operators and flight crews

Information on this type of procedures will be provided and published for air operators (including general aviation, military, etc.) and crews.

8.2 ATS personnel

ATS personnel (air traffic controllers or AFIS operators) will be briefed on these PBN procedures. This will include the characteristics of the procedure, as well as the meteorological minima for their application and the corresponding ATS operational procedures.

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Appendix A - Reference: Brazil's AIC on VSS

(Original AIC in Portuguese. This is a free translation into English)

BRAZIL
MINISTRY OF DEFENCE
AERONAUTICS COMMAND
AIRSPACE CONTROL DEPARTMENT

AIC N
X/20
05 NOV 20

VISUAL SEGMENT SURFACE (VSS) OF INSTRUMENT APPROACH PROCEDURES

Period of validity: From 5 November 2020 to PERM

1 PRELIMINARY PROVISIONS

1.1 PURPOSE

The purpose of this aeronautical information circular (AIC) is to disseminate the concept and application of the visual segment surface (VSS) of instrument approach procedures.

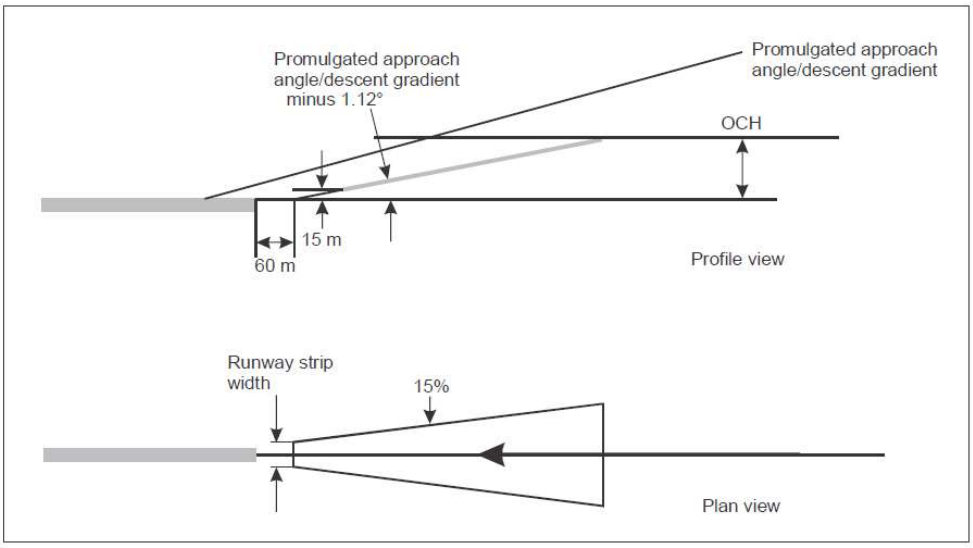
1.2 SCOPE

The provisions contained in this AIC apply to all those who, in the course of their activities, use the air navigation procedures published by DECEA.

2. VISUAL SEGMENT SURFACE (VSS)

2.1. The visual segment surface (VSS) is a surface constructed in accordance with the specifications of ICAO Doc 8168/PANS-OPS, Volume II, the purpose of which is to identify obstacles that may affect the execution of an instrument approach procedure (except a circling approach).

2.2. Basically, the VSS refers to the final approach leg of an approach procedure between the MDA/DA of the procedure and the runway threshold. See figure below:



2.3. When the VSS is penetrated by obstacles, an aeronautical study will be conducted to determine what mitigation measures must be taken to ensure continued safety. The mitigation measures normally adopted are:

a) Publicise the obstacle in the relevant aeronautical publications (AIP AD2.23, ROTAER, GEOAISWEB, etc.) for proper flight planning and situational awareness of pilots;
b) Mark and/or illuminate the obstacle;
c) Increase the operational minima of the procedure;
d) Offset the runway threshold;
e) Increase the vertical path angle (VPA) of the approach procedure;
f) Suspend the approach procedure until the obstacle is removed or lowered.

Note: One or more of these situations can be combined to increase the efficiency of mitigation actions and avoid excessive restrictions in the operation. In most cases, the adoption of the first two options listed above is sufficient to mitigate risk. The following is an example of a publication associated with the infringement of the VSS of an approach procedure.

VSS INFRINGED – EXAMPLE OF PUBLICATION

VISUAL SEGMENT SURFACE INFRINGED: PROC RNAV (GNSS) RWY 22: BUILDING 0.4 NM BEFORE RWY 22 ELEV 3118', TO THE RIGHT OF APPROACH CENTRELINE.

3. MEASURES TAKEN BY THE PILOT IN CASE OF INFRINGEMENT OF VSS

3.1. If the procedure is still in force, it means that the necessary measures have already been taken to ensure the safety of operations and no pilot action is required for manoeuvring to avoid obstacles infringing the VSS.

4. FINAL PROVISIONS

4.1 Cases not provided for in this CBA will be resolved by the Head of the Operations subsection of the Airspace Control Department.

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