NATO STANDARD

AATCP-1

NATO SUPPLEMENT TO ICAO DOC 8168-OPS/611 VOLUME II FOR THE PREPARATION OF INSTRUMENT APPROACH AND DEPARTURE PROCEDURE

Edition E Version 1
JUNE 2017

NORTH ATLANTIC TREATY ORGANIZATION

ALLIED AIR TRAFFIC CONTROL PUBLICATION

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NATO LETTER OF PROMULGATION

23 June 2017

1. The enclosed Allied Air Traffic Control Publication AATCP-1, Edition E, Version 1, NATO SUPPLEMENT TO ICAO DOC 81/68-OPS/611 VOLUME II FOR THE PREPARATION OF INSTRUMENT APPROACH AND DEPARTURE PROCEDURES, which has been approved by the nations in the AIR TRAFFIC MANAGEMENT – COMMUNICATIONS, NAVIGATION AND SURVEILLENCE ADVISORY GROUP, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 3759.

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Major General, LTUAF
Director, NATO Standardization Office

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS

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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
BGR	The Bulgarian Air Force will implement the standard's requirements only using instrument approach and departure procedures.
DEU	a) Instead of the final approach area for the AIRBORNE RADAR PROCEDURES (Chapter 7, § 7.1.5. 2.) DEU will use the following final approach area: The area considered for obstacle clearance begins at the final approach fix and ends at the runway threshold or missed approach point, whichever is encountered last and is centered on the final approach course. The optimum length is 5 NM. The maximum length is 10 NM. 1. The primary area is 1 NM wide on each side of the runway centre line of the runway at the approach end. It increases uniformly on each side of the extended centre line to 2,5 NM laterally, at a point 30 NM from the approach end of the runway. 2. The secondary area, which is on each side of the primary area, is zero NM wide at the approach end. It expands uniformly to 1 NM at each side of the primary area, at a point 30 NM from the approach end of the runway. b) Chapter 3 Paragraph 3.3.3. 4. (ILS CAT II/III Approach Minima)These values do not correspond to the current EU regulations (965/2012 Annex V Part - SPA SPA.LVO), which are applicable for the German Armed Forces. Furthermore the description for CAT III a/b approaches are missing. The visibility values and decision heights according to EU-OPS are used in the flight operation of the German Armed Forces DEU will apply the requirements of the EU regulation 965/2012 for arrivals and departures procedures to conduct Low Visibility Operations (LVO) CAT II and CAT III.
FRA	France will not implement the precision approach radar (PAR), airborne radar approach (ARA), visual climb over airport (VCOA) and helicopter criteria stated in AATCP-1(E) and will not use the identification methods adopted for instrument procedures in this edition. In general, France applies the International Civil Aviation Organization (ICAO)’s regulations for all national aircraft, including combat aircraft.

LVA	Latvia reserves rights to implement STANAG accordingly to airfield equipment, as an example - not to apply PAR (Precision Approach radar) or ARA (Airborne Radar Approach)
Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

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CHAPTER 1 - ADMINISTRATIVE

1.1. SCOPE

1.1.1. Purpose.

This publication establishes military unique criteria for instrument approach and departure procedures. The criteria shall be used to supplement *ICAO Doc 8168-OPS/611 – Procedures for Air Navigation Services – Air Operations (PANS-OPS); Volume II, – Construction of Visual and Instrument Flight Procedures*. Additionally, it provides guidance on approving, reviewing, coordinating and publishing of instrument procedures. These criteria are for application at all airports under the jurisdiction of this agreement, as agreed to by participating nations.

1.1.2. Use of AATCP-1.

This document is divided into three main subject areas: Administrative, Supplemented PANS-OPS Criteria and Additional Military Criteria. Throughout this document the reference to “PANS-OPS” applies to Volume II only. References to specific paragraphs, figures and tables apply only to this document unless otherwise stated.

1. Supplemented PANS-OPS Criteria**.** The criteria in chapter 2 of this document replace, amend or provide criteria in addition to specific paragraphs in PANS-OPS. Table 1 provides a quick reference to the criteria supplemented in PANS-OPS.

2. Additional Military Criteria. Additional military criteria in chapters 3 through 10 provide military unique criteria not addressed in PANS-OPS. Table 2 provides a quick reference to the additional criteria contained in this document.

3. Reserved Military Criteria. Throughout this document there are paragraphs reserved for future implementation of supplementary criteria. These criteria shall be added to this document in reserved paragraphs once adequate flight testing and coordination is completed.

Terms and Acronyms are identified in Annex B or in PANS-OPS.

Table 1. Supplemented PANS-OPS Criteria.

PANS-OPS *Supplemented Paragraph #*	**Criteria**	**AATCP-1 Page #**
Volume II	***Construction of Visual and Instrument Flight Procedures***	
2.1.1	PART I, SECTION 4, CHAPTER 9.4, Approach, and PART I, SECTION 3, CHAPTER 5	2-1
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1.1.3. **Word meanings.**

Word meanings as used in this manual:

1. **Shall** means that application of the criteria is mandatory.
2. **Should** means that application of the criteria is recommended.
3. **May** means that application of the criteria is optional.

1.2. APPROVAL AND RETENTION

1.2.1. Approval.

The determination for approval or disapproval of procedures shall rest with the appropriate national authority. The following minimum standards apply where standard instrument procedures are approved:

1. Airport. The airport landing surfaces must be adequate to accommodate the aircraft that can be reasonably expected to use the procedure. Runway lighting is required for approval of night instrument operations. The airport must have been found acceptable for IFR (IMC) operations. Where runways are not clearly defined, circling minima only shall be approved.

2. Navigation Facility. All electronic and visual navigation facilities used must successfully pass flight inspection.

3. Obstacle Marking and Lighting. Obstacles that create a hazard to air navigation should be marked and lighted insofar as is reasonably possible in accordance with instructions established by the appropriate national authority for Obstruction Marking and Lighting. Those penetrating the approach and transitional surfaces established for obstruction identification should be removed or made conspicuous. Normally, objects that are shielded need not to be removed or made conspicuous.

4. Weather Information. Destination minima may be approved when a general area weather report is available prior to commencing the approach and approved altimeter settings are available to the pilot prior to and during the approach consistent with communications capability.

5. Communications. Air-to-ground communications should be available at the initial approach fix minimum altitude and when the aircraft executing the missed approach reaches the missed approach altitude. At lower altitudes communications shall be required where essential to the safe and efficient use of airspace. Air-to-ground communications may be approved at locations that have a special need and capability. Other suitable means of point-to-point communication, such as commercial telephone, are also required to file and close flight plans.

1.2.2. Retention and cancellation.

Military procedures shall be retained or cancelled as required by the appropriate national authority.

1.3. RESPONSIBILITY AND JURISDICTION

1.3.1. Responsibility.

Responsibility for establishing instrument procedures shall be as directed by the appropriate national authority.

1.3.2. Jurisdiction.

The national authority is responsible for taking action in accordance with these criteria to establish or revise terminal instrument procedures when:

1. New facilities are installed.
2. Changes to existing facilities necessitate a change to an approved procedure.
3. Additional procedures are necessary.
4. New obstacles or operational uses require a revision to the existing procedure.

1.4. ESTABLISHMENT

1.4.1. Formulation.

Proposed procedures shall be prepared in accordance with PANS-OPS criteria and the applicable portions of this publication as determined by the type and location of the navigation facility and procedure to be used. To permit use by aircraft with limited navigational equipment, the complete procedure should be formulated on the basis of a single navigation facility whenever possible. However, the use of an additional facility of the same or different type in the procedure to gain an operational advantage is permitted.

1.4.2. Non-standard procedures.

The standards contained in PANS-OPS and these publications are based on reasonable assessment of the factors that contribute to errors in aircraft navigation and manoeuvring. They are designed primarily to assure that safe flight operations for all users result from their application. The dimension of the obstacle clearance areas are influenced by the need to provide for a smooth, simply computed progression to and from the en route system. Every effort shall be made to formulate procedures in accordance with these standards; however, peculiarities of terrain, navigation information, obstacles, defense against hostile threats or traffic congestion may require special consideration where justified by operational requirements. In such cases, nonstandard procedures that deviate from these criteria may be approved provided they are fully documented and an equivalent level of safety exists. A nonstandard procedure is not a substandard procedure, but is one that has been approved after special study of the deviation has demonstrated that no derogation of safety is involved. The appropriate national authority is the approving authority for nonstandard procedures. Military procedures that deviate from standards because of operational necessity and in which an equivalent level of safety is not achieved shall include a cautionary note to identify the hazard and shall be marked "MILITARY USE ONLY" and also, when applicable, “NON-STANDARD”.

1.4.3. **Changes.**

Changes in instrument procedures shall be prepared and forwarded for approval in the same manner as in the case of new procedures. Changes so processed shall not be made solely to include minor corrections necessitated by changes in facility frequencies, variation changes, etc. or by other minor changes not affecting the actual instrument procedure. Changes that require complete reprocessing are those that affect fix, course, altitude or published minimum.

1.5. COORDINATION

1.5.1. **Coordination.**

It is necessary to coordinate terminal instrument procedures to protect the rights of all airspace users.

1. Military Airports. All terminal instrument procedures established or revised, shall be coordinated with other airspace users as specified by the appropriate national authority. When a procedure may conflict with other military or civil activities the procedure shall be coordinated with those activities.

2. Air Traffic Control. Prior to establishing or revising terminal instrument procedures, the initiating office shall coordinate with the appropriate Air Traffic Control authority to insure compatibility with air traffic flow and to assess the impact of the proposed procedure on current or future air traffic programs.

3. Airspace Actions. Where action to designate controlled airspace for a procedure is planned, the airspace action should be initiated sufficiently in advance so that effective dates of the procedure and the airspace action shall coincide.

4. Notice to Airmen (NOTAM). A NOTAM to change minima shall be issued in case of emergencies; e.g., facility outages, facility out of tolerance conditions, new construction that penetrates critical surfaces, etc. NOTAM shall also be issued when:

   a. a supporting facility is added and a significant change in minima shall result, or

   b. any altitude in the procedure is modified as the result of construction or terrain, or

   c. a facility restriction is removed.

However, a new procedure may not be issued by NOTAM, except where military requirements dictate. The responsible Air Traffic Control facility shall be advised of the required NOTAM action prior to issuance and normal coordination shall be effected as soon as practicable.

1.5.2. Coordination conflicts.

Coordination conflicts shall be resolved as directed by the appropriate national authority.

1.6. PUBLICATION

1.6.1. Submission.

Terminal instrument procedures shall be submitted for approval as directed by the appropriate national authority. A record of coordination shall be maintained by the originating agency.

1.6.2. Effective date

Terminal instrument procedures and revisions thereto shall be processed in sufficient time to permit publication and distribution in advance of the effective date. Effective dates should normally coincide with scheduled airspace changes, except when safety or operational effectiveness is jeopardized. In case of emergency or when operational effectiveness dictates, approved procedures may be disseminated by NOTAM. (See Paragraph 150.d) Procedures disseminated by NOTAM must also be processed promptly in the normal fashion and published in appropriate terminal instrument procedures charts and as further directed by the national authority.

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CHAPTER 2 - SUPPLEMENTED PANS-OPS CRITERIA

2.1. SCOPE.

Specific criteria described in this chapter replaces, amends or provides criteria in addition to PANS-OPS and is identified by the appropriate PANS-OPS volume, part, chapter, paragraph number and heading.

1. Criteria in addition to the helicopter (CAT H) criteria in PANS-OPS and this supplement are specified in chapter 8 of this publication.

2. Military unique TACAN and High Performance Military Aircraft (HPMA) criteria are specified in chapter 4 and 5 of this publication, respectively.

2.1.1. Publication of descent angles and climb gradient.

1. VOLUME II, PART I, SECTION 4, CHAPTER 9.4, Approach
Publication of the descent angle or descent gradient shall be according to the following criteria.

a. For non-precision approach procedures with a final approach fix, the final approach descent gradient to the nearest one-tenth of a per cent and, in parentheses, descent angle to the nearest one-tenth of a degree shall be shown.

NOTE**:** For promulgation purposes and where there is an operational advantage to do so, in addition to the standard stated above, slopes may be expressed in feet per NM (ft/NM).

b. For precision approach procedures and Approach Procedure with Vertical guidance (APV), the reference datum height to the nearest half meter or foot and the glide path/elevation/vertical path angle to the nearest one-tenth of a degree shall be shown.

c. If the final approach descent gradient/angle for any type of instrument approach procedure exceeds the maximum value specified in the *Procedures for Air Navigation Services — Aircraft Operations* (PANS-OPS, Doc 8168), Volume II, Part I, Section 4, Chapter 5 and AATCP-1, Chapter 5, Paragraph 514 , a cautionary note shall be included.

NOTE : When a final approach fix is specified at the final approach point for ILS, a clear indication shall be given whether it applies to the ILS, the associated ILS localizer only procedure, or both. In the case of MLS, a clear indication shall be given when a FAF is specified at the final approach point.

2. VOLUME II, PART I, SECTION 3, CHAPTER 5

For promulgation purposes and where there is an operational advantage to do so, in addition to the standards in VOLUME II, PART I, SECTION 3, CHAPTER 5, climb angles/gradients may be expressed in degrees (º) or feet per NM (ft/NM).

2.1.2. **VOLUME II, PART I, SECTION 4, CHAPTER 1, TABLE I-4-1-1, Speeds for procedure calculations in kilometers per hour (km/h) [Helicopter].**

When final approach speeds of less than 165 km/h (CAT H) are used, annotate a maximum speed on the approach plate. For example, “Maximum Final Approach Speed 110 km/h”.

2.1.3. **VOLUME II, PART I, SECTION 4, CHAPTER 1, TABLE I-4-1-2, Speeds for procedure calculations in knots (kt) [Helicopter].**

When final approach speeds of less than 90 kt (CAT H) are used, annotate a maximum speed on the approach plate. For example, “Maximum Final Approach Speed 60 kt”.

2.1.4. **VOLUME II, PART I, SECTION 4, CHAPTER 3, PARAGRAPH 3.3, Initial Approach Segments (Other than Radar Vectors) Utilizing Straight Tracks and DME Arcs.**

For HPMA the MAXIMUM permissible gradient in the initial segment is 16,4% (1000ft/NM).

2.1.5. **VOLUME II, PART I, SECTION 4, CHAPTER 4, PARAGRAPH 4.3.1.1, Length [Helicopter].**

For CAT H, the length of the intermediate approach segment shall not be less than 1.9 km (1 NM) and not more than 9.3 km (5 NM). When the angle at which the initial approach course joins the intermediate course exceeds 30°, the MINIMUM length of the intermediate course is shown in table 1.

Table 1. Intermediate Segment Angle of Intercept vs. Segment Length.

Angle (°)	Minimum Length	
	(km)	(NM)
30	1.8	1.0
60	3.7	2.0
90	5.5	3.0
120	7.4	4.0

NOTE: This table may be interpolated.

2.1.6. VOLUME II, PART I, SECTION 2, CHAPTER 4, PARAGRAPH 4.6.6., Flight validation pilot qualifications and training

Licensing requirements in paragraph 4.6.6.1 do not apply for flight validation by military operators.

2.1.7. VOLUME II, PART I, SECTION 4, CHAPTER 5, PARAGRAPH 5.4.5.3.1, Remote altimeter setting.

In addition to the RASS adjustments in PANS-OPS, the following applies:

1. For procedures designed exclusively with PANS-OPS criteria, first determine the OCH (without RASS) based off the final and missed approach surfaces and then add the RASS adjustment.

2. Point in Space Approach. When the MAPt is more than 5 NM from the Point in Space altimeter setting source, RASS adjustment shall be applied. For application of the RASS formula in PANS-OPS, define “x” as the distance from the altimeter setting source to the MAPt.

3. Where a minimum altitude is dictated by the Minimum Reception Altitude (MRA), the MRA shall be increased by the amount of the RASS adjustment factor.

4. Where the altimeter is based on a remote source, the procedure shall be annotated or provided with a second set of minima, as appropriate.

NOTE: RASS does not apply to MSA, initial segments, feeder routes or other segments/routes based on enroute criteria.

2.1.8. VOLUME II, PART I, SECTION 4, CHAPTER 5, PARAGRAPH 5.4.6, Protection for the Visual Segment of the Approach Procedure.

In addition to the visual segment of the approach procedure standards in PANS-OPS, the following applies:

1. Apply a STANDARD visual area, as described below, to runways to which an aircraft is authorized to circle.

   a. Standard visual area: The area is the same as described in PANS-OPS paragraph 5.4.6.1.a).

   b. Standard slope for the Visual Segment: The slope originates at the height of the runway threshold at a point 60 m from the runway threshold and extends upwards at 5% surface out in the direction of the approach path.

   c. If the 5% surface is penetrated on circling runways, mark and light the penetrating obstacles or publish a note denying night circling to the affected runway.

NOTE: In addition, if a runway is served by an approach procedure not aligned with the runway centre line and is authorized for landing from a circling manoeuvre on an approach procedure to a different runway, it shall receive both standard and offset evaluations.

2. Obstacle Clearance.

   a. When evaluating a runway for approach procedure satisfying straight-in alignment criteria, apply the Visual Segment Surface (VSS) as described in PANS-OPS and an additional 5% surface.

      (1) For ILS and (M)MLS procedures, if no obstacle penetrates the OAS, this evaluation shall be carried out only to establish if the eventual penetrating obstacles shall be marked and lighted and not for visibility determination.

      (2) For Helicopter procedures, this evaluation shall be carried out only to establish if the eventual penetrating obstacles shall be marked and lighted or depicted on the approach chart and not for visibility determination.

   b. When evaluating a runway for circling, apply only the 5% surface.

   c. When the straight-in descent angle is greater than 3.9°, apply only a VSS evaluation.

   d. For the 5% surface evaluation, calculate the surface height above threshold at any distance “d” from an extension of the area origin line.

e. Actions to be taken when penetrations to the VSS and/or 5% surfaces occur:

(1) If the VSS surface described in PANS-OPS is penetrated, take ONE of the following actions (See Paragraph 2.1.8.2.e.(2) below when the straight-in descent/GS angle is greater than 3.9°):

(a) Adjust the obstacle height below the surface or remove the penetrating obstacles.

(b) Limit minimum visibility to 1.2 km (see also Chapter 3 paragraph 3.3.4.1).

(2) If the straight-in runway 5% surface or a VSS for straight-in procedures with a descent/GS angle greater than 3.9° is penetrated, take ONE of the following actions:

(a) Adjust the obstacle height below the surface or remove the penetrating obstacles.

(b) Do not publish a VDP, limit minimum visibility to 1.6 km (see also Chapter 3 paragraph 3.3.4.1) and take action to have the penetrating obstacles marked and lighted.

(c) Do not publish a VDP, limit minimum visibility to 1.6 km (see also Chapter 3 paragraph 3.3.4.2) and publish a note denying the approach (both straight-in and circling) to the affected runway at night.

(3) If the 5% surface is penetrated on circling runways, mark and light the penetrating obstacles or publish a note denying night circling to the affected runway.

3. Visual Descent Point (VDP): For non-precision straight-in procedures publish a VDP as described below:

NOTE 1**:** When dual minima are published, use the lowest MDA to calculate the VDP distance.

NOTE 2: Publish a VDP for all straight-in non-precision approaches, except as follows:

(a) Do not publish a VDP associated with an MDA based on part-time or full time remote altimeter settings.

(b) Do not publish a VDP located prior to a stepdown fix.

(c) If the VDP is between the MAPt and the runway, do not publish a VDP.

a. For runways served by a Visual Glide Slope Indicator (VGSI), using the VGSI TCH, establish the distance from THR to a point where the lowest published VGSI glidepath angle reaches an altitude equal to the MDA. Use the following formula:

$$\text{VDP Distance} = \frac{MDA - (TCH + THR\,Elevation)}{Tan\,(VGSI\ \ Angle)}$$

b. For runways NOT served by a VGSI, using a TCH value of 15 m (50 ft), establish the distance from THR to a point where the greater of a 3° or the final segment descent angle reaches the MDA. Use the following formula:

$$\text{VDP Distance} = \frac{MDA - (TCH + THR\,Elevation)}{Tan\,(*\,Angle)}$$

* final segment descent angle or 3°, whichever is higher.

c. Marking VDP Location.

(1) For non-RNAV Standard Instrument Approach Procedures (SIAPs), mark the VDP location with a suitable fix. A suitable fix is one that is specified in PANS-OPS and whose fix error does not exceed 0.5 NM.

(2) For RNAV SIAPs, mark the VDP location with an along track distance (ATD) to the MAPt.

(3) If the final course is not aligned with the runway centre line, use the THR as a vertex, swing an arc of a radius equal to the VDP distance across the final approach course (See Figure 1). The point of intersection is the VDP (For RNAV procedures, the distance from the point of intersection to the MAPt is the ATD for the VDP).

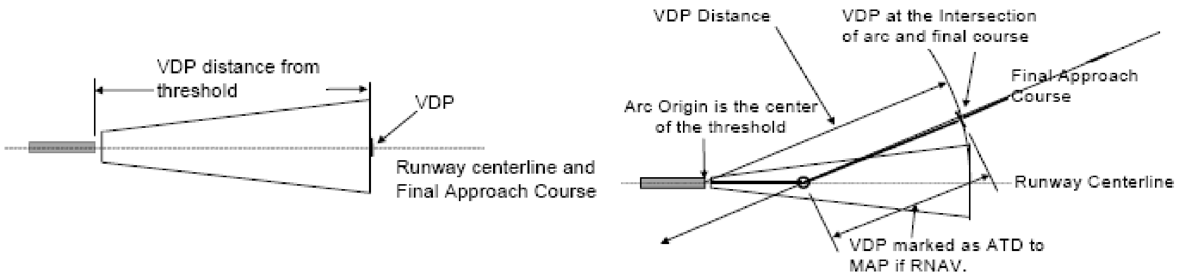

Figure 1. VDP LOCATION

2.1.9. VOLUME II, PART I, SECTION 4, CHAPTER 5, PARAGRAPH 5.5.6, Publication of OCA/H.

A DA/DH shall be published for each precision and APV instrument approach procedure and a MDA/MDH shall be published for each non-precision instrument approach and/or circling procedure.

2.1.10. VOLUME II, PART I, SECTION 4, CHAPTER 9, PARAGRAPH 9.5, Procedure Naming for Arrival and Approach Charts and PART II,SECTION 2 CHAPTER 1, PARAGRAPH 1.3.6, Promulgation.

The following exceptions/additions apply:

1. Surveillance Radar Approaches
For approaches using SRE equipment, the naming convention shall be “SRA”.
For example:
SRA RWY 04

2. HPMA procedures
Where HPMA procedures are required, the HPMA procedure identification shall be prefixed ‘HPMA’.
For example:
HPMA TACAN RWY 05.

3. Procedure identification for helicopters
Helicopter only procedures shall bear an identification that includes the term “COPTER”.
For example:
COPTER VOR 090, COPTER TACAN RWY 27.

2.1.11. VOLUME II, PART II, SECTION 1, CHAPTER 1, PARAGRAPH 1.4.8.7.7 Missed Approach Climb Gradient.

1. Given the unique military requirements and aircraft capability inherent to NATO, missed approach climb gradients in excess of 5% for precision segments would provide an operational advantage, allowing lower approach minima to locations where NATO has established operations not normally considered for precision capability.
NOTE: Such procedures would be “NON-STANDARD” in accordance with paragraph 141 and would require approval by national authorities.

2. Given that there is no clearly identifiable formula to derive the Y and Z constants and the current PANS-OPS OAS software limits the maximum missed approach climb gradient to 5%, use the formulas below in conjunction with the PANS-OPS OAS software to extrapolate the constants required for missed approach climb gradients in excess of 5%.

NOTE: Only applicable for ILS/MLS Category I procedures.
For Z:
A = -1 * (CG/100)
B = 0
C = -1 * (CG/100) * (900)
For Y:
$A = (A_{5.0P} – A_{4.0P}) * (CG – 5) + A_{5.0P}$
$B = (B_{5.0P} – B_{4.0P}) * (CG – 5) + B_{5.0P}$
$C = (C_{5.0P} – C_{4.0P}) * (CG – 5) + C_{5.0P}$
Where: $_{5.0P}$ = The applicable A, B or C constant for a 5% missed approach climb gradient
$_{4.0P}$ = The applicable A, B or C constant for a 4% missed approach climb gradient
CG = Desired missed approach climb gradient

NOTE: Use the PANS-OPS OAS software to determine the Y values (A, B and C) for missed approach climb gradients of 4% and 5 %.
For example:
For a precision approach procedure with a GPA of 2.5°, LOC/THR Distance of 2000 m, Reference Datum Height (RDH) of 15 m and a desired missed approach climb gradient of 7%, the constants would be:
Z Constants:
A = -1 * 7 / 100 = -0.070000
B = 0 = 0
C = -1 * 7/100 * 900 = -63.00
Y Constants :
A = (0.012476 - 0.014440) * (7 - 5) + 0.012476 = 0.008548
B = (0.204011 - 0.191159) * (7 - 5) + 0.204011 = 0.229715
C = (-23.25 - -20.84) * (7 - 5) + -23.25 = -28.07

2.1.12. VOLUME II, PART II, SECTION 1, CHAPTER 5, PAR.

PANS-OPS PAR criteria is replaced by the criteria specified in Chapter 6. Helicopter PAR (CAT H) criteria is replaced by the criteria specified in paragraph 8.4 of this publication.

2.1.13. VOLUME II, PART II, SECTION 2, CHAPTER 6, SRE.

The criteria for designing SRA procedures is specified in the ICAO Doc 8168 Volume II, Part II, Section 2, Chapter 6, SRE**.**

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CHAPTER 3 - ADDITIONAL MILITARY CRITERIA – LANDING MINIMA

3.1. SCOPE.

The landing minima contained in this chapter apply to all instrument procedures developed in accordance with PANS-OPS and this supplement.

3.2. APPLICATION.

The minima specified in this chapter are the lowest permitted by the criteria contained in PANS-OPS and this supplement that can be approved for publication at any location for the type of navigational facility/system and available lighting systems concerned.

1. For each procedure a specific set of minima shall be specified, taking into consideration the following items:

    a. The various conditions according to PANS-OPS and this supplement stated in the procedure (i.e. straight-in and circling as required).

    b. The aerodrome operating status such as runway markings/lighting, approach lighting system and other factors based on individual circumstances.

2. The elements of minima are:

    a. Decision Altitude/Height (DA/DH) or Minimum Descent Altitude/Height (MDA/MDH) based upon OCA/OCH values as calculated according to PANS-OPS and/or additional criteria specified in this supplement.

    b. Visibility/RVR.

NOTE: In addition a ceiling value equal to or greater than the height of the DA/MDA above the aerodrome elevation should be specified. Where ceilings are not specified, the height of the straight-in DA/MDA above the threshold elevation or Touchdown Zone Elevation (TDZE) or the aerodrome elevation in circling approaches shall be shown in the procedure.

3. Additional minima may be specified in separate directives published by the national authority.

3.3. AERODROME MINIMA

3.3.1. Publication

Minima should be published for each approach category that can be accommodated at the specific location. Where the landing surface is not adequate or other restrictions, that prohibit certain categories of aircraft from making instrument approaches at the airport, exist, the term “NA” (not authorized), instead of minima, shall be entered. The published values for precision approach procedures and APV are DA/DH and for non-precision instrument approach procedures MDA/MDH, visibility (or RVR) and a ceiling value (See Paragraph 3.2.2). The following applies:

1. The published DA/DH for precision approach procedures and APVs shall be equal to or higher than the OCA/OCH. The minimum DH for the various types of precision approaches and APVs is published in Table 1;

2. The published MDA/MDH for non-precision approach procedures shall be equal to or higher than the OCA/OCH and shall be expressed in 10 ft increments by rounding upas appropriate. The minimum MDH for the various types of non-precision approaches is published in Table 1 ;

3. The published MDA/MDH for visual manoeuvring (circling) approach procedures shall be equal to or higher than the OCA/OCH and shall be expressed in 10 ft increments by rounding up appropriate. The minimum MDH is published in Table 6 ;

4. The published DH/MDH may be referenced to the TDZE, as long as a note is placed on the procedure. (See Paragraph 3.2.2.2.) ;

5. The RVR will be published in m and visibility in km ;

6. Published ceiling values rounded to the next higher 100 ft increment.

Table 1 System minima

Facility	DH/MDH	Lowest minima (ft)	Lowest RVR (m)
ILS/MLS/GLS Cat I	DH	200	550
PAR	DH	200	550
APV LPV	DH	250	600
APV LNAV/VNAV	DH	250	600
RNAV LNAV only	MDH	300	750
Localiser with or without DME	MDH	250	750
SRA (terminating at ½ NM)	MDH	250	750
SRA (terminating at 1 NM)	MDH	300	750
SRA (terminating at 2 NM or more)	MDH	350	750
VOR	MDH	300	750
VOR/DME	MDH	250	750
TACAN	MDH	250	750
NDB	MDH	350	750
NDB/DME	MDH	300	750
VDF	MDH	350	750

3.3.2. **Altitude**

1. Obstacle Clearance Altitudes/ Heights (OCA/OCH). See *PANS-OPS Volume* II, *Part I, Section 1, Chapter 1, Definitions*.

a. **MOC and OCA/OCH adjustments:** See *PANS-OPS Volume II, Part I, Section 4, Chapter 5, Paragraph 5.4.5*. In addition the following may applies:

(1) **Precipitous Terrain.** See *PANS-OPS Volume II, Part I, Section 2, Chapter 1, Paragraph 1.7.* When procedures are designed for use in areas characterized by precipitous terrain, in or outside of mountainous areas, consideration must be given to induced altimeter errors and pilot control problems that result, when wind of 20 Knots or more move over such terrain. Where these conditions are known to exist, MOC should be increased by as much as 100 per cent. Procedure specialists and approving authorities should be aware of the hazards involved and make appropriate additions, based on their experience and good judgement, to limit the time in which an aircraft is exposed to lee-side turbulence and other weather phenomena associated

with precipitous terrain. User comments should be solicited to obtain the best available local information.

(2) **Remote Altimeter Setting Source (RASS).** See Paragraph 233 and PANS-OPS Volume II, Part I, Section 4, Chapter 5, Paragraph 5.4.5.3.

NOTE: Adjustments to OCA/OCH are made after the basic obstacle clearance has been determined, but before rounding off to the published MDA/MDH or DA/DH.

2. Touchdown Zone Elevation (TDZE). When TDZE is used for reference heights, a note shall be placed on the procedure, e.g. “Heights are from TDZE”.

3. Minimum Descent Altitude/Height (MDA/MDH). See PANS-OPS Volume II, Part I, Section 1, Chapter 1, Definitions.

4. Decision Altitude/Height (DA/DH). See *PANS-OPS Volume II, Part I, Section 1, Chapter 1, Definitions.* In addition, the following applies*:*

a. **DECISION ALTITUDE (DA)**. The DA shall be established with respect to the approach obstacle clearance OCA/OCH plus the applicable margin or lower limit requirements specified in Table 1, PANS-OPS or national documents.

b. **DECISION HEIGHT (DH).** The DH is the value of the DA expressed in ft above the threshold elevation or the TDZE.

3.3.3. Visibilities

1. Publication of Runway Visual Range (RVR)/Visibility
RVR shall be published for straight-in approach procedures when the following requirements are met with respect to the runway to be used:

a. RVR equipment is installed to the runway in accordance with the applicable Standard.

b. High Intensity Runway Lights (HIRL) are installed to the runway in accordance with appropriate standards published in STANAG 3316 Airfield lighting.

c. Precision/Non-precision instrument runway markings. See STANAG 3158 Day Marking of Airfield Runways and Taxiways.

A visibility value shall always be published regardless of the availability of a RVR value. The RVR/Visibility relevant for a No Approach Lighting System (NALS, See Table 2) shall always be published on the publication template, even if there is an approach lighting system. This RVR/Visibility is necessary for the situations where the existing approach lighting system is (partly) unserviceable.

2. Criteria for establishing RVR/Visibility. (Ref Table 4)

a. In order to qualify for the lowest allowable values of RVR/Visibility detailed in Table 4 (applicable to each approach grouping) the instrument approach shall meet at least the following facility requirements and associated conditions:

(1) Instrument approaches with designated vertical profile up to and including 4,5° for Category A and B aeroplanes, or 3,77° for Category C, D and E aeroplanes, unless other approach angles are approved by the Authority, where the facilities are:

(a) ILS/MLS/GLS/PAR; or

(b) APV; and

where the final approach track is offset by not more than 15° for Category A and B aeroplanes or by not more than 5° for Category C, D and E aeroplanes.

(2) Instrument approaches with a nominal vertical profile, up to and including 4,5° for Category A and B aeroplanes, or 3,77° for Category C, D and E aeroplanes, unless other approach angles are approved by the Authority where the facilities are NDB, NDB/DME, VOR, VOR/DME, TACAN, LOC, LOC/DME, VDF, SRA or RNAV/LNAV, with a final-approach segment of at least 3NM, which also fulfil the following criteria:

(a) The final approach track is offset by not more than 15° for Category A and B aeroplanes or by not more than 5° for Category C, D and E aeroplanes; and

(b) The FAF or another appropriate fix where descent is initiated is available, or distance to THR is available by FMS/RNAV or DME; and

(c) If the MAPt is determined by timing, the distance from FAF to THR is ≤ 8NM.

(3) Instrument approaches where the facilities are NDB, NDB/DME, VOR, VOR/DME, TACAN, LOC, LOC/DME, VDF, SRA or RNAV/LNAV, not fulfilling the criteria in paragraph 2.a.(2) above, or with an MDH ≥ 1 200 ft.

3. Determination of RVR/Visibility minima for Category I, APV and non-precision approach operations

a. The minimum RVR/Visibility shall be the highest of the values derived from

(1) Table 3 or Table 4; or

(2) from the formula (for procedures with a FAF):

Required RVR/visibility (m) = (Distance MAPt to THR) – length of approach lights (m) but not greater than the maximum values shown in Table 4, where applicable.

b. The values in Table 3 are derived from the following formula[1].

Required RVR/visibility (m) = [((DH/MDH (ft) × 0,3048)/tanα] – length of approach lights (m)

Note 1: α is the calculation angle, being a default value of 3.00 degrees increasing in steps of 0.10 degrees for each line in Table 3 up to 3.77 degrees and then remains constant.

Note 2: The default value for the length of the approach lights is equal to the minimum length of the various systems described in Table 2.

Note 3: The values derived from the above formula have been rounded to the nearest 50 metres up to a value of 800 metres RVR and thereafter to the nearest 100 metres.

Note 4: The DH/MDH intervals in Table 3 have been selected to avoid anomalies caused by the rounding of the calculated OCA(H).

Note 5: The height intervals, referred in Note 4 above, are 10 feet up to a DH/MDH of 300 feet, 20 feet up to a DH/MDH of 760 feet and then 50 feet for DH/MDH above 760 feet.

Note 6: The minimum value of the table is 550 metres.

c. With the approval of the Authority, the formula in 3.b above may be used with the actual approach slope and/or the actual length of the approach lights for a particular runway.

d. The visual aids comprise standard runway day markings (STANAG 3158) and approach and runway lighting (runway edge lights, threshold lights, runway end lights and in some cases also touch-down zone and/or

[1] Source for the notes following the formula: Leaflet No 44 "JAR-OPS 1 AMT Section 2 updated to incorporate section 2 text proposals from suspended JAA NPAs", http://www.jaat.eu/publications/a&gm/TGL-44.pdf.

runway center line lights). The approach light configurations acceptable are classified and listed in Table 2.

e. Notwithstanding the requirements in paragraph 3.3.3.3.d, the authority may approve that RVR values relevant to a Basic Approach Lighting System (BALS) are used on runways where the approach lights are restricted in length below 210m due to terrain or water, but where at least one cross-bar is available.

Table 2 Approach lighting systems

Approach lighting systems	
OPS Class of Facility	**Length, configuration and intensity of approach lightings**
FALS (full approach lighting system)	ICAO: Precision approach CAT I Lighting System (HIALS ≥ 720m) distance coded centreline, Barrette centreline
IALS (intermediate approach lighting system)	ICAO: Simple approach lighting system (HIALS 420 -719 m) single source, Barrette
BALS (basic approach lighting system)	Any other approach lighting System (HIALS, MIALS or ALS 210 - 419 m
NALS (no approach lighting system)	Any other approach lighting system (HIALS, MIALS or ALS < 210 m) or no approach lights

Table 3 RVR/Visibility v. DH/MDH

DH or MDH			Class of Lighting Facility							
			FALS		IALS		BALS		NALS	
Feet			m	km	m	km	m	km	m	km
200	—	210	550	0.8	750	0.8	1 000	1.0	1 200	1.2
211	—	220	550	0.8	800	0.8	1 000	1.0	1 200	1.2
221	—	230	550	0.8	800	0.8	1 000	1.0	1 200	1.2
231	—	240	550	0.8	800	0.8	1 000	1.0	1 200	1.2
241	—	250	550	0.8	800	0.8	1 000	1.0	1 300	1.3
251	—	260	600	0.8	800	0.8	1 100	1.1	1 300	1.3
261	—	280	600	0.8	900	0.9	1 100	1.1	1 300	1.3
281	—	300	650	0.8	900	0.9	1 200	1.2	1 400	1.4
301	—	320	700	0.8	1 000	1.0	1 200	1.2	1 400	1.4
321	—	340	800	0.8	1 100	1.1	1 300	1.3	1 500	1.5
341	—	360	900	0.9	1 200	1.2	1 400	1.4	1 600	1.6
361	—	380	1 000	1.0	1 300	1.3	1 500	1.5	1 700	1.7
381	—	400	1 100	1.1	1 400	1.4	1 600	1.6	1 800	1.8
401	—	420	1 200	1.2	1 500	1.5	1 700	1.7	1 900	1.9
421	—	440	1 300	1.3	1 600	1.6	1 800	1.8	2 000	2.0
441	—	460	1 400	1.4	1 700	1.7	1 900	1.9	2 100	2.1
461	—	480	1 500	1.5	1 800	1.8	2 000	2.0	2 200	2.2
481	—	500	1 500	1.5	1 800	1.8	2 100	2.1	2 300	2.3
501	—	520	1 600	1.6	1 900	1.9	2 100	2.1	2 400	2.4
521	—	540	1 700	1.7	2 000	2.0	2 200	2.2	2 400	2.4
541	—	560	1 800	1.8	2 100	2.1	2 300	2.3	2 500	2.5
561	—	580	1 900	1.9	2 200	2.2	2 400	2.4	2 600	2.6
581	—	600	2 000	2.0	2 300	2.3	2 500	2.5	2 700	2.7
601	—	620	2 100	2.1	2 400	2.4	2 600	2.6	2 800	2.8
621	—	640	2 200	2.2	2 500	2.5	2 700	2.7	2 900	2.9
641	—	660	2 300	2.3	2 600	2.6	2 800	2.8	3 000	3.0
661	—	680	2 400	2.4	2 700	2.7	2 900	2.9	3 100	3.1
681	—	700	2 500	2.5	2 800	2.8	3 000	3.0	3 200	3.2
701	—	720	2 600	2.6	2 900	2.9	3 100	3.1	3 300	3.3
721	—	740	2 700	2.7	3 000	3.0	3 200	3.2	3 400	3.4
741	—	760	2 700	2.7	3 000	3.0	3 300	3.3	3 500	3.5
761	—	800	2 900	2.9	3 200	3.2	3 400	3.4	3 600	3.6
801	—	850	3 100	3.1	3 400	3.4	3 600	3.6	3 800	3.8
851	—	900	3 300	3.3	3 600	3.6	3 800	3.8	4 000	4.0
901	—	950	3 600	3.6	3 900	3.9	4 100	4.1	4 300	4.3
951	—	1 000	3 800	3.8	4 100	4.1	4 300	4.3	4 500	4.5
1 001	—	1 100	4 100	4.1	4 400	4.4	4 600	4.6	4 900	4.9
1 101	—	1 200	4 600	4.6	4 900	4.9	5 000	5.0	5 000	5.0
1 201 and above			5 000	5.0	5 000	5.0	5 000	5.0	5 000	5.0

Table 4 Minimum and maximum applicable RVR/visibility for all instrument approaches down to CAT I minima (lower and upper cut-off limits)

Facility/conditions	RVR/Vis (m)	Aeroplane category				
		A	B	C	D	E
ILS, MLS, GLS, PAR and APV	Min	According to Table 3				
	Max	1 500	1 500	2 400	2 400	2400
NDB, NDB/DME, VOR, VOR/DME, TACAN, LLZ, LLZ/DME, VDF, SRA, RNAV/LNAV with a procedure which fulfils the criteria in paragraph 313.b.1.(b):	Min	750	750	750	750	750
	Max	1 500	1 500	2 400	2 400	2400
For NDB, NDB/DME, VOR, VOR/DME, TACAN. LLZ, LLZ/DME, VDF, SRA, RNAV/LNAV: — not fulfilling the criteria in paragraph 313.b.1.(b): above, or — with a DH or MDH ≥ 1200 ft	Min	1 000	1 000	1 200	1 200	1200
	Max	According to Table 3				

4. ILS Cat II/III approach minima

a. General. Category II/III approach minima may be lower than those minima in Table 4,provided that the associated requirements for equipment and facilities defined in ICAO Annex 3, Chapter 4, Annex 10 Vol. I Chapter 3 and Annex 14 Vol. I Chapter 5 are met. In addition, special authorization and flight crew qualification for Category II/III operations is the responsibility of the military authority in accordance with national regulations and ICAO and/or NATO documents.

b. Lighting System. The installed lighting system must meet the requirements contained in STANAG 3316 “Airfield Lighting”, with regard to the desired ILS Category.

c. RVR Equipment. RVR equipment must be installed for approval of the lowest ILS CAT II/III minima. When RVR equipment is not available or serviceable, revert to the lowest Category I landing minima; not less than DH/VIS 200 ft/ 800m (2600 ft).

d. CAT II Approach Minima. CAT II procedures are intended for precision instrument approach and landing operations with a DH not lower than 30m (100 ft) and RVR not less than 350 m. The lowest CAT II DH/RVR values are 100 ft/350 m (1200 ft). See Table 5, lowest authorized CAT II minima allowed for DH values greater than 100 ft.

e. CAT III approach minima. CAT III approach minima may be lower than 100 ft with an RVR not less than 200 m (700 ft) in accordance with ICAO Annex 6. Operations with no decision height may only be conducted when equipment, facilities support operations and operators have approval for CAT III operations with no decision height.

Table 5 Lowest CAT II Minima

Decision Height	CAT II RVR / Aeroplane Category A-D
100 ft – 120 ft	350 m
121 ft – 140 ft	400 m
141 ft and above	450 m

Note 1 : Consider raising minima as necessary based on environmental factors in the vicinity of the airport or other ICAO/NATO requirements.

Note 2 : Consider adding a note to the procedure publication alerting aircrews to the special authorization requirement, for example “ILS CATEGORY II/III SPECIAL AIRCREW & AIRCRAFT CERTIFICATION REQUIRED.”

3.3.4. **Efffect of obstacles**

Visibility minima must be at or above certain values when obstacles penetrate the visual segment of approach procedures. See Paragraph 2.1.8.2. To establish visibility:

1. Lower than 1.2 km, no obstacle shall penetrate the VSS slope of 1.12° less than the promulgated approach procedure angle.

2. Lower than 1.6 km, no obstacle shall penetrate the 5% slope or VSS when the straight-in descent/GS angle is greater than 3.9° (See Paragraph 2.1.8.2.e.(2)).

3.3.5. **Circling**

The MDH for circling shall be the higher of:

1. The published circling OCH for the aeroplane category; or
   a. The minimum circling height derived from Table 6 below; or

   b. The DH/MDH of the preceding instrument approach procedure.

2. The MDA for circling shall be calculated by adding the published aerodrome elevation to the MDH.

3. The minimum visibility for circling shall be the higher of:
   a. The minimum visibility derived from the Table 6 below; or

   b. The RVR/Visibility derived from the Table 3 and Table 4 for the preceding instrument approach procedure

Table 6 Minimum visibility and MDH for circling vs aeroplane category

	Aeroplane category				
	A	B	C	D	E
Minimum MDH (ft)	400	500	600	700	800
Minimum meteorological visibility (m)	1500	1600	2400	3600	3600

3.3.6. **Safe Altitude 100 NM**

A safe altitude may be established within 185 km (100 NM) radius from Aerodrome Reference Point (ARP). If established, one altitude shall be published for the entire area. A Safe Altitude is a minimum altitude that provides at least 300 m (984 ft) of obstacle clearance in non-mountainous areas and 600 m (1968 ft) of obstacle clearance in mountainous areas. For publication, this altitude shall be rounded to the next higher 50 m or 100 ft increment as appropriate. This altitude shall be identified on published procedures as “SAFE ALTITUDE 100 NM xxxx”.

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CHAPTER 4 - ADDITIONAL MILITARY CRITERIA – TACAN

4.1. SCOPE.

Military unique criteria are for instrument approach and departure procedures that are normally flown by military type aircraft and aircrews and serve a specific operational requirement. This chapter provides criteria for TACAN procedure construction.

4.1.1. Tacan Approach Procedures.

TACAN approach procedures shall be developed in accordance with the VOR criteria specified in *PANS-OPS, Volume II, Part II, Section 2, Chapter 4, VOR or NDB WITH FAF.* Additionally, the following criteria apply:

1. FIX TOLERANCE OVERHEADING A STATION. TACAN tolerances are the same as VOR as specified in *PANS-OPS, Volume II, Part 1, Section 2, Chapter 2, Paragraph 2.5.1*, except that the semi-angle of the cone of ambiguity is 60°.

NOTE: This angle may be reduced to actual values based on flight inspection reports.

2. FINAL APPROACH SEGMENT ALIGNMENT. *PANS-OPS, Volume II, Part I, Section 4, Chapter 5, paragraph 5.2, “Alignment“* applies, except that for a straight-in approach, the angle formed by the final approach track and the runway centre line shall not exceed 30° for all aircraft categories. The minimum crossing point of the final approach track with the runway centre line may be the runway threshold.

3. MINIMUM OCH. The minimum OCH in PANS-OPS, Volume II, Part I, Section 4, Chapter 5, Table I-4-5-3 does not apply to TACAN.

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CHAPTER 5 - ADDITIONAL MILITARY CRITERIA – HIGH PERFORMANCE MILITARY AIRCRAFT

5.1. SCOPE.

Military unique criteria are for instrument approach and departure procedures that are normally flown by military type aircraft and aircrews and serve a specific operational requirement. Specific HPMA criteria described in this chapter replaces, amends or provides criteria in addition to PANS-OPS and the other chapters in this document and, when applicable, are identified by the appropriate PANS-OPS volume, part, chapter, paragraph number and heading.

5.1.1. High Performance Military Aircraft (HPMA).

1. **HPMA** are defined as aircraft that can normally and safely fly instrument procedures with the following parameters:

   a. Bank Angle: Minimum 30° for all segments, with a bank establishment time of 5 sec;

   b. Maximum rate of descent for Initial Segment: 1000 ft/NM ;

   c. Missed approach climb gradient: 6% (3.43°) with a maximum transition time (X) of 10 sec;

   d. Departure climb gradient: 8.75% (5°).

   e. Height loss 30 m for precision approach procedures.

2. **HPMA** performing ILS procedures shall have these maximum aircraft dimensions:

   a. Wing span: 30 m

   b. Vertical distance between the flight paths of the wheels and the GP antenna: 6 m

5.1.2. General principles.

For aircraft performance requirements all HPMA are contained within one aircraft category named CAT HPMA. To determine the visibility, refer to Paragraphs 3.3.3, using Category D.

5.1.3. Turn construction parameters.

See Table 1. For the specific application of the parameters in table 1 see the applicable paragraphs below. The rate of turn associated with the stated bank angle values in table 1 shall not be greater than 3º per second.

Table 1. Turn Construction Parameters

Segment or fix of turn location	*Speed (IAS)*[1]	*Altitude/height*	*Wind*	*Bank angle*	*FTT*			
					c (seconds)			
					Bank establishment time	*Pilot reaction time*	*Outbound timing tolerance*	*Heading tolerance*
Departure	650 km/h [2] (350 kt)	Turn at altitude/height: Specified altitude/height Turn at turn point: A/D elevation + height based on 36.4% climb from DER,, or level of the next segment.	95% omni-directional wind or 56 km/h (30 kt) for wind spirals	30°	5	3	N/A	N/A
Holding	555 km/h[1] (300 kt)	Specified altitude	ICAO standard wind[4]	30°	5 For template	3 For template	10	5°
Initial approach – reversal and racetrack procedures	555 km/h (300 kt)	Specified altitude	ICAO standard wind[4] or statistical wind	30°	5	3	10	5°
Initial approach – DR track procedures	555 km/h (300 kt)	Specified altitude	ICAO standard wind[4] DR leg; – 56 km/h (30 kt)	30°	5	3	N/A	5°
IAF, IF, FAF	See Table 5-2 Use initial approach speed for turn at IAF or IF Use maximum final approach speed for turn at FAF.	Specified altitude	95% omni-directional wind or 56 km/h (30 kt)	30°	5	3	N/A	N/A
Missed approach	See Table 5-2[3]	A/D elevation + 300 m (1000 ft)	56 km/h (30 kt)	30°	5	3	N/A	N/A
Visual manoeuvring using prescribed track	405 km/h (220 kt)	A/D elevation + 300 m (1000 ft)	46 km/h (25 kt)	30°	N/A	N/A	N/A	N/A
Circling	405 km/h (220 kt)	A/D elevation + 300 m (1000 ft)	46 km/h (25 kt)	30°	N/A	N/A	N/A	N/A

GENERAL NOTES:
Note 1.— The conversion from IAS to TAS is determined using a temperature equal to ISA plus 15º C at the corresponding altitude. Holding procedures are an exception; the calculation formula includes

correction for compressibility and appears in PANS OPS, Volume II, Part II, Section 4, Appendix A to Chapter 1.

Note 2.— Where operationally required to avoid obstacles, reduced speeds as slow as 465 km/h (250 kt) IAS may be used, provided the procedure is annotated “Departure turn limited to _______ km/h (kt) IAS maximum”.

Note 3.— Where operationally required to avoid obstacles, reduced speeds as slow as 465 km/h (250 kt) IAS may be used, provided the procedure is annotated “Missed approach turn limited to _______km/h (kt) IAS maximum.”

Note 4.— ICAO standard wind = 12h + 87 km/h (h in 1000 m), 2h + 47 kt (h in 1000 ft).

5.1.4. **Departures.**

1. VOLUME II, PART I, SECTION 3, CHAPTER 2, PARAGRAPH 2.6, *Obstacle Identification Surface (OIS)*

The obstacle identification surface (OIS) is a sloping surface used to identify obstacles in the departure area. For straight departures the origin of the OIS is 5 m (16 ft) above the Departure End of Runway (DER). For omnidirectional departures several OIS are considered as described in *PANS OPS, VOLUME II, PART I, SECTION 3, CHAPTER 4, Omnidirectional Departures.* The OIS gradient is 7.95 %.

2. VOLUME II, PART I, SECTION 3, CHAPTER 2, PARAGRAPH 2.7, *Procedure Design Gradient (PDG)*

a. The procedure design gradient (PDG) is the published climb gradient measured from the origin of the OIS (5 m (16 ft) above DER). Provided no obstacles penetrate the OIS the PDG is the OIS gradient plus 0.8 %. (8.75 %).

b. Where the 7.95 % OIS is penetrated, the departure route should be adjusted to avoid the penetration. If this is not possible then the PDG may be increased to provide the minimum obstacle clearance above the penetration (0.8 % of the distance from the DER). (See Figure 1.)

c. A PDG in excess of 8.75 % (5°) and the altitude to which the increased gradient extends shall be promulgated.

d. Where the PDG is increased to avoid a penetrating obstacle, the PDG shall be reduced to 8.75 % at the point past the critical obstacle where obstacle clearance of 0.8 % of the distance from the DER can be provided. (See Figure 1.)

e. An increased gradient that is required to a height of 60 m (200 ft) or less, (normally due to low, close-in obstacles) shall not be promulgated. (See Figure 2.) The position and elevation/height of close-in obstacles penetrating the OIS shall be promulgated (*See Volume II, Part I, Section 3, Chapter 5, “Published information for departure procedures”*).

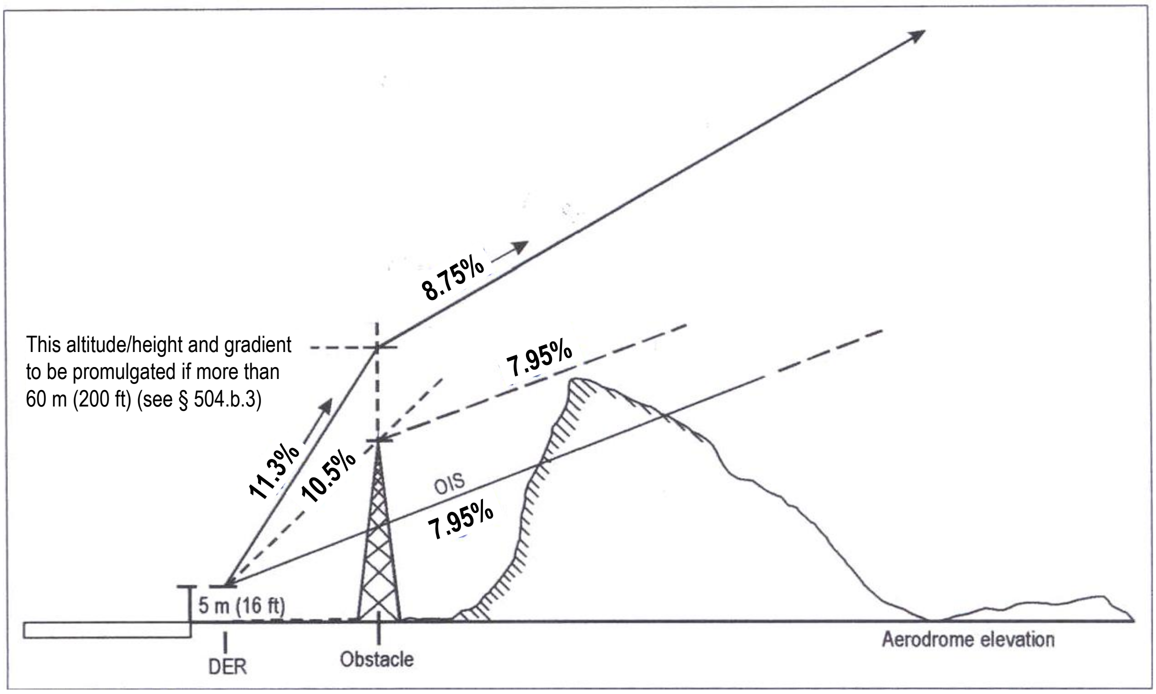

Figure 1. Procedure Design Gradient.

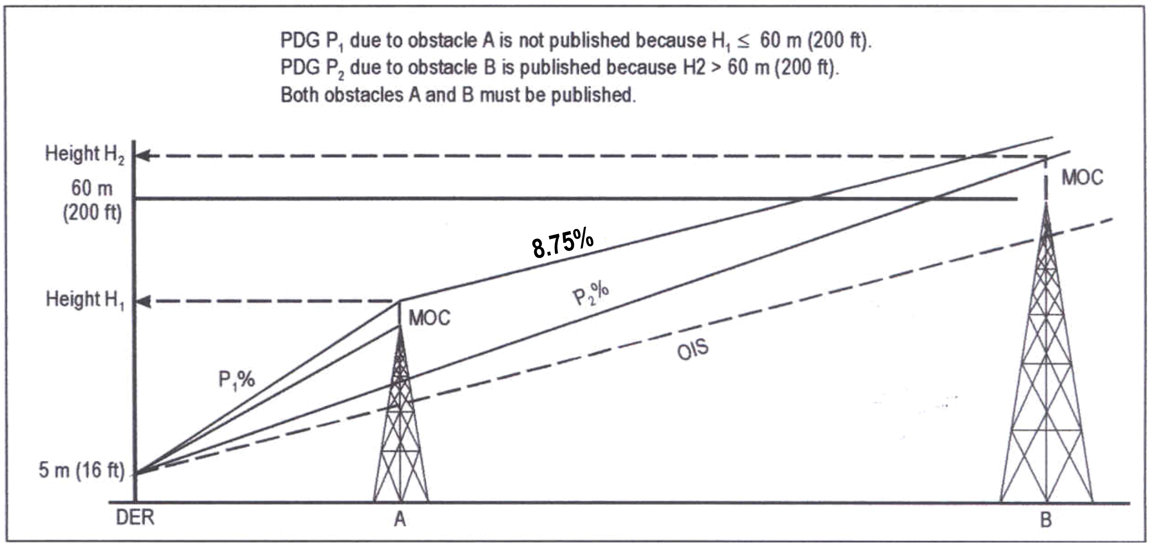

Figure 2. Close-in Obstacles

3. VOLUME II, PART I, SECTION 3, CHAPTER 2, PARAGRAPH 2.8, *Average Flight Path*.

Does not apply to HPMA.

4. VOLUME II, PART I, SECTION 3, Appendix to CHAPTER 3, *Guidance on Environmental Issues*.

Does not apply to HPMA**.**

5.1.5. General criteria for approach and arrival procedures.

1. VOLUME II, PART I, SECTION 4, CHAPTER 1, TABLE I-4-1-1, Speeds (IAS) for procedure calculations in kilometres per hour (km/h).

Table 2 below specifies speeds for HPMA procedures.

Table 2. HPMA Speeds (IAS) for procedure calculations in kilometres per hour (km/h)

Aircraft category	*Range of speeds for holding, initial approach, reversal, racetrack, intermediate*	*Range of final approach speeds*	*Max speeds for visual manoeuvring (circling)*	*Max speeds for missed approach*	
				Intermediate	*Final*
HPMA	465/555	165/345	405	555	650

2. VOLUME II, PART I, SECTION 4, CHAPTER 1, TABLE I-4-1-2, Speeds (IAS) for procedure calculations in knots (kt).

Table 3 below specifies speeds for HPMA procedures.

Table 3. HPMA Speeds (IAS) for procedure calculations in knots (kt)

Aircraft category	*Range of speeds for holding, initial approach, reversal, racetrack, intermediate*	*Range of final approach speeds*	*Max speeds for visual manoeuvring (circling)*	*Max speeds for missed approach*	
				Intermediate	*Final*
HPMA	250/300	90/185	220	300	350

5.1.6. **Approach Segments.**

VOLUME II, PART I, SECTION 4, CHAPTER 3, TABLE I-4-3-1, maximum/minimum descent to be specified on a reversal or racetrack procedure.

Table 4 specifies maximum descent for a reversal or racetrack procedure.

Table 4. Maximum/minimum descent to be specified on a reversal or racetrack procedure

		Maximum	*Minimum*
Outbound track	HPMA	1000 ft/NM	N/A
Inbound track	HPMA	1000 ft/NM	N/A

NOTE: When timing is used recalculate maximum descent gradient from ft/NM to ft/min for specified altitude.

5.1.7. **Intermediate Segments.**

1. VOLUME II, PART 1, SECTION 4, CHAPTER 4, PARAGRAPH 4.3.1.1, *Length*.

The optimum length of the segment is 7.4 km (4 NM). The maximum length is 19 km (10 NM) and the minimum length is 5.6 km (3 NM).

2. VOLUME II, PART 1, SECTION 4, CHAPTER 4, PARAGRAPH 4.3.3, *Procedure altitude/height and descent gradient.*

The maximum descent gradient is 5.2 %. The last 5.6 km (3 NM) prior to the FAF or FAP should be a flat section.

5.1.8. **Final Segments*.***

VOLUME II, PART I, SECTION 4, CHAPTER 5, PARAGRAPH 5.3.1.2, *Maximum descent gradient/angle.*

The maximum descent gradient for non-precision procedures with FAF is 6.5%.

5.1.9. **Missed Approach Segments.**

1. VOLUME II, PART I, SECTION 4, CHAPTER 6, PARAGRAPH 6.1.6.2.2, Transitional distance with a MAPt defined by a navigation facility or fix.

Transitional distance (X) with a MAPt defined by a navigation facility or fix is based on 10 sec of flight at a TAS based on the highest final approach speed for CAT HPMA (See Tables 2 and 3), at the aerodrome elevation with a temperature of ISA + 15°C and a tailwind of 19 km/h (10 kt).

2. VOLUME II, PART I, SECTION 4, CHAPTER 6, PARAGRAPH 6.1.6.3.1, *Transitional distance with a MAPt defined by distance.*

Transitional distance (X) with a MAPt defined by distance is based on 10 sec of flight at the appropriate TAS, at the aerodrome elevation with a temperature of ISA + 15°C and a tailwind of 19 km/h (10 kt).

3. VOLUME II, PART I, SECTION 4, CHAPTER 6, PARAGRAPH 6.2.2.2*, Climb gradient in the intermediate phase.*

The nominal climb gradient (tan Z) of the missed approach surface is 6.0 %.

4. VOLUME II, PART I, SECTION 4, CHAPTER 6, PARAGRAPH 6.2.2.3*, Obstacle clearance in the intermediate phase.*

The MDA/MDH for the nominal 6 % must always be published on the instrument approach chart. If additional gradients are specified in the constructions of the missed approach procedure, they and their associated MDA/MDH values must be published as alternative options.

5.1.10. **Visual Mannoeuvring (Circling) Aera.**

1. VOLUME II, PART I, SECTION 4, CHAPTER 7, PARAGRAPH 7.2.1, *Method for defining the area.*

Example values appear in Tables 5 and 6.

Table 5. Example of determining radii for visual manoeuvring (circling) area for aerodromes at 1000 ft MSL (SI units)

Category of aircraft/IAS (km/h)	*HPMA/405*
TAS (km/h) at 2000 ft MSL + 46 km/h wind factor	478
Radius (r) of turn (km)	3.10
Straight segment (km) (This is a constant value independent of aerodrome elevation)	0.56
Radius (R) from threshold (km)	6.76
NOTE.- *Radius from threshold (R) = 2r + straight segment*	

Table 6. Example of determining radii for visual manoeuvring (circling) area for aerodromes at 1000 ft MSL (non-SI units)

Category of aircraft/IAS (kt)	*HPMA/220*
TAS (kt) at 2000 ft MSL + 25 kt wind factor	258
Radius (r) of turn (NM)	1.67
Straight segment (NM) (This is a constant value independent of aerodrome elevation)	0.3
Radius (R) from threshold (NM)	3.65
NOTE.- *Radius from threshold (R) = 2r + straight segment*	

2. VOLUME II, PART I, SECTION 4, CHAPTER 7, PARAGRAPH 7.2.2*, Parameters.*

The parameters on which visual manoeuvring (circling) radii are based are as follows:

a. Speed: 405 km/h (220 kt)

b. Wind: ± 46 km/h (25 kt) throughout the turn.

c. Bank Angle: 30°

3. VOLUME II, PART I, SECTION 4, CHAPTER 7, PARAGRAPH 7.3, *Obstacle Clearance*.

For HPMA the MOC and OCH lower limits in table 7 apply.

Table 7. MOC and OCA/H for visual manoeuvring (circling) approach.

Aircraft category	*Minimum obstacle clearance m (ft)*	*Lower limit for OCH above aerodrome elevation m (ft)*	*Minimum visibility km*
HPMA	90 (300)	165 (550)	3.2

4. VOLUME II, PART I, SECTION 4, Appendix to Chapter 7, VISUAL MANOEUVRING USING PRESCRIBED TRACK, Table I-4-7-App-1, *Semi-width of the corridor.*

For HPMA, the semi-width of the corridor in table 8 applies.

Table 8. Semi-width of the corridor

Aircraft category	HPMA
semi-width of the corridor (w) metres (ft)	 2 100 (6890)

NOTE: The minimum MOC and OCA/H in table 5-7 applies.

5.1.11. ILS Procedures.

1. VOLUME II, PART II, SECTION 1, CHAPTER 1, PARAGRAPH 1.1.3, *Standard conditions.*

Maximum aircraft dimensions are assumed to be in the following table 9:

Table 9. Maximum aircraft dimensions

Aircraft category	*Wing Span (m)*	*Vertical distance between the flight paths of the wheels and the GP antenna (m)*
HPMA	30	6

For CRM or OAS use standard conditions with a wing span of 60 m. If necessary use the appropriate formula to reduce the OAS constants for a 30 m wing span value, *PANS OPS, VOLUME II, PART II, SECTION 1, CHAPTER 1, Paragraph 1.4.8.7.3.specific aircraft dimensions*

2. VOLUME II, PART II, SECTION 1, CHAPTER 1, PARAGRAPH 1.5, *Missed approach segment.*

a. Due to limitations in the OAS constants the nominal climb gradient (tan Z) of the missed approach surface is 5.0 %. For higher climb gradient of the missed approach surface. (See Paragraph 2.1.11)

b. The DA/DH for the nominal 6 % using the 5% OAS constants must always be published on the instrument approach chart. If additional gradients are specified in the constructions of the missed approach procedure, they and their associated DA/DH values must be published as alternative options.

c. Publication information:

(1) Missed approaches are flown with a standard climb gradient of 6% with the use of 5% OAS constants. The standard ILS missed approach surface has a climb gradient of 5%, due to the limitations of the OAS constants.

(2) It shall be a standard procedure if the missed approach climb gradient is equal to or more than 6% due to a leading obstacle outside the precision segment, but in the final part of the missed approach. This means that the obstacle survey in the precision segment is done with a missed approach surface with the 5% OAS constants. Two or more sets of minima shall be published with their respective climb gradients (for the 6% climb gradient and for the other higher climb gradient value(s)).

(3) It is a “NON-STANDARD” procedure if the missed approach climb gradient is equal to or more than 6% due to a leading obstacle inside the precision surfaces. This means that the obstacle survey in the precision segment is done with a missed approach surface using extrapolated constants for OAS for a climb gradient more than 5%. This procedure shall be published on a separate chart with the associated minima and their respective climb gradients.

3. VOLUME II, PART II, SECTION 1, CHAPTER 1, TABLE II-1-1-2, *Height loss/altimeter margin.*

For precision approaches, the height loss margin using pressure altimeter for HPMA is 30 m (100 ft).

5.1.12. **PAR Procedures.**

See Chapter 6.

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CHAPTER 6 - ADDITIONAL MILITARY CRITERIA – PRECISION APPROACH RADAR (PAR)

6.1. SCOPE.

In addition to the standards in PANS-OPS, VOLUME II, PART II, SECTION 1, CHAPTER 5, the following applies.

6.1.1. System Components.

A PAR system consists of a precision approach radar facility that meets the requirements for the operating agency.

6.1.2. Inoperative Components.

Failure of azimuth and range information renders the entire PAR inoperative. When the glide slope feature becomes inoperative, the PAR may revert to a non-precision approach system and non-precision minima apply. The criteria for designing radar non-precision approaches are included in PANS-OPS, VOLUME II, PART II, SECTION 2, CHAPTER 6, SRE.

6.1.3. Lost communications procedures.

The PAR procedure shall include instructions for the pilot to follow in the event of a loss of communications with the radar controller. Alternate lost communications procedures shall be established for use, where multiple approaches are authorized.

6.1.4. Slope.

The following criteria shall apply to the selection of the glide slope angle and threshold crossing height.

1. Glide Slope Angle. The optimum glide slope angle is 3°. Angles less than 2.5° or more than 3.5° shall not be established without the authorization of the approving authority. The PAR glide slope angle shall be within 0.20° of the non-radar precision instrument approach/ VGSI glide slope angle and the RPI shall be within plus or minus 15m (50 ft) (10m (32 ft) for PAPI) of the non-radar precision approach RPI and/ or VGSI runway reference point (RRP).

Note: Where PAR serves a runway that is also served by ILS and/or VASI-PAPI, the PAR, ILS and VASI-PAPI glide slope angles should coincide.

2. Glide Slope Threshold Crossing Height. The optimum threshold crossing height is 15m (50 ft). The MAXIMUM height is 18m (60 ft). A height as low as 10m (32 ft) for military airports may be used at locations where special considerations of the glide path angle and antenna location are required. Where the glide slope threshold

crossing height exceeds 18m (60 ft), consideration shall be given to the relocation of the landing threshold to insure effective placement of the approach light system.

CHAPTER 7 - ADDITIONAL MILITARY CRITERIA – AIRBORNE RADAR APPROACH (ARA)

7.1. SCOPE.

Additional Airborne Radar Approach (ARA) criteria provided in this chapter are procedures for specially equipped aircraft and for locations where an operational requirement exists. The use of these procedures must be directed by the operational authority.

7.1.1. General.

ARA procedures are designed to be flown with the use of airborne radar ONLY. A flyability check shall be conducted for each type aircraft or type radar that shall use the procedure.

7.1.2. ARA reflectors.

When radar reflectors are used, there shall be at least three pair of ground reflectors on opposite sides of the runway. One pair must be at each end within the touchdown zone (the first 3000 ft) and one pair near the midpoint. If an approach to either end of the runway is designed, the reflectors should be bidirectional. These reflectors may be placed no less than 325 ft from the runway edge and not less than 400 ft, nor more than 750 ft from the runway centre line to the edge of the equipment in a pattern parallel to the runway.

7.1.3. Initial approach segment.

This segment begins at a fix established by the airborne radar equipment and ends at the airborne radar fix, where it intersects the intermediate course. An approved terminal fix may be used in conjunction with, but not as a substitute for, the airborne radar initial approach fix.

1. **Alignment**. The initial approach course(s) shall coincide with aircraft manoeuvring capability and satisfy air traffic flow requirements. The initial approach course joins the intermediate course at an angle of not more than 90º.

2. **Area.** Although the initial segment has no standard length, it shall be long enough to permit the altitude change required by the procedure. It should not exceed 50 NM . It shall be 12 NM wide (that is, 6 NM on each side of the initial approach course) and be divided into two areas: a primary area, which extends 4 NM on each side of the course and a secondary area, which extends 2 NM beyond the primary area.

3. **Obstacle Clearance.** The obstacle clearance in the initial approach primary area shall be a minimum of 300 m (984 ft). In the secondary area 150 m (492 ft) of

obstacle clearance shall be provided at the inner edge, tapering uniformly to zero ft at the outer edge. The minimum obstacle clearance required at any given point in the secondary area is found using the following formula:

$$MOC_S = \frac{2-d}{2} x492$$

***d** = Distance from inner edge of secondary area.*

Allowance for precipitous terrain should be made as specified in paragraph 3.3.2.1.a.(1)The altitudes selected by application of the obstacle clearance specified may be rounded to the nearest 100 ft. (Also see *PANS-OPS Volume II, Part I, Section 4, Chapter 3, paragraph 3.2.)*

4. Descent Gradients.

a. **Low Altitude.** The optimum descent gradient in the initial approach is 4.1% (250 ft/NM). Where a higher descent gradient is necessary, the maximum permissible gradient is 8.2% (500 ft/NM).

b. **High Altitude Penetrations**. The optimum descent gradient for high altitude penetrations is 13.1% (800 ft/NM). Where a higher descent gradient is necessary, the maximum permissible gradient is 16.4% (1000 ft/NM).

7.1.4. **Intermediate approach segment.**

This segment, which blends the initial approach segment into the final approach segment, begins at the airborne radar fix where the initial approach course intersects the intermediate course and ends at the final approach fix (FAF). In this segment, aircraft configuration and position are adjusted for entry into the final approach segment.

1. **Alignment.** The intermediate segment is an extension of the final approach course. If these courses cannot be identical, the intermediate course must not differ from the final approach course by more than 30º.

2. **Area.** The intermediate segment is not less than 5 NM and not more than 15 NM long. The optimum length is 10 NM. The width is determined by using straight lines to join the outer edges of the initial approach and the final approach segments. The segment is divided into two areas for obstacle clearance purposes:

a. The primary area is determined by using straight lines to join the primary initial and the primary final approach areas;

b. The secondary area is determined by using straight lines to join the initial and final approach secondary areas.

3. Obstacle Clearance. A MINIMUM of 150 m (492 ft) of obstacle clearance shall be provided in the primary area of the intermediate approach segment. In the secondary area, 150 m (492 ft) of obstacle clearance shall be provided at the inner edge, tapering to zero ft at the outer edge. The minimum obstacle clearance required at any given point in the secondary area is found using the following formula:

$$MOC_S = \frac{W_S - d}{W_S} x492$$

W_S *= Width of the secondary area at the obstacle.*

d *= Distance from inner edge of secondary area.*

Allowance for precipitous terrain should be considered as specified in paragraph 3.3.2.1.a.(1) The altitudes selected by application of the obstacle clearance specified in this paragraph may be rounded to the nearest 50 m or 100 ft as appropriate.

4. **Descent Gradient.** Because the intermediate segment is used to prepare the aircraft speed and configuration for entry into the final approach segment, the gradient should be as flat as possible. The optimum descent gradient should not exceed 2.4% (150 ft/NM). The maximum permissible gradient is 4.9% (300 ft/NM).

NOTE: When the descent gradient exceeds 4.9%, the procedure specialist should assure a segment is provided prior to the intermediate segment to prepare the aircraft speed and configuration for entry into the final segment. This segment should have a minimum length of 5 NM and its descent gradient should not exceed 4.9%.

7.1.5. Final approach segment.

This segment begins at the airborne radar fix where the final approach descent begins. It terminates at the missed approach point.

1. **Alignment.** The final approach course must be aligned on the extended runway centre line.

2. **Final Approach Area.** The area considered for obstacle clearance begins at the final approach fix and ends at the runway threshold or missed approach point, whichever is encountered last and is centered on the final approach course. It is not less than 6 NM, nor more than 10 NM long.

a. The primary area is 1.7 NM on each side of the center line of the runway at the approach end. It increases uniformly on each side of the extended center line to 4 NM laterally, at a point 10 NM from the approach end of the runway.

b. The secondary area, which is on each side of the primary area, is zero NM wide at the approach end. It expands uniformly to 1 NM on each side of the primary area, at a point 10 NM from the approach end of the runway.

3. Obstacle Clearance:

a. The minimum clearance in the primary area is 75m (246 ft).

b. In the secondary area, 75m (246 ft) of obstacle clearance must be provided at the inner edge, tapering uniformly to zero at the outer edge.

4. **Descent Gradient.** The optimum descent gradient in the final approach segment is 5.2% (300 ft/NM). (If a higher descent gradient is necessary, the MAXIMUM permissible is 6.5% (400 ft/NM.)) If a step down fix is used, the descent gradient applies between the final approach fix (FAF) and the step down fix and between the step down fix and the approach threshold.

7.1.6. **Circling approach.**

The criteria in *PANS-OPS, Volume II, Part I, Section 4, Chapter 7, VISUAL MANOEUVRING (CIRCLING) AREA* applies.

For HPMA, criteria of chapter 5 should be applied.

7.1.7. **Missed approach.**

The criteria for this segment are given in *PANS-OPS, Volume II, Part I, Section 4, Chapter 6*. It must be possible to fly the entire missed approach procedure with airborne radar equipment only. The missed approach point is on the final approach course at the point where the aircraft has reached a specified radar distance from the end of the runway. It must not be further from the FAF than the first usable landing surface.

7.1.8. **Landing minima.**

Landing minima are established as directed in chapter 3.

CHAPTER 8 - ADDITIONAL MILITARY CRITERIA – HELICOPTERS

8.1. GENERAL.

The helicopter criteria contained in this chapter are provided in addition to the criteria specified in PANS-OPS and this supplement.

8.1.1. Terminology.

The following terms are peculiar to helicopter procedures and are defined as follows

1. **HAL.** The Height above a designated helicopter landing area used for helicopter instrument approach procédure.

2. **Landing Area.** Refers to the portion of the heliport or airport runway used or intended to be used for helicopter landing and take-off.

3. **Touchdown Zone.** That portion of the helicopter landing area or runway used for landing.

8.2. GENERAL CRITERIA

8.2.1. Application.

These criteria are based on the unique manoeuvring capability of the helicopter at airspeeds not exceeding 90 kt on final approach and missed approach.

8.2.2. Point in space approach.

Where the center of the landing area is not within 800 m (2600 ft) of the MAPt, an approach procedure to a point in space may be developed. In such procedures, the point in space and the missed approach point are identical and, upon arrival at this point, helicopters must proceed under visual flight rules to a landing area or conduct the specified missed approach procedure. The published procedure shall be noted to this effect and also should identify available landing areas in the vicinity by noting the course and distance from the MAPt to each selected landing area. The final approach course should be aligned to provide for the most effective operational use of the procedure consistent with safety. Point in space approach procedures shall not contain alternate minima.

8.2.3. Procedure construction.

Helicopter only procedures contain all applicable segments except for circling.

8.3. TAKE-OFF AND LANDING MINIMA

8.3.1. **Application.**

The minima specified in this section apply to helicopter only procedures.

In the minima section of the procedure plate, identify the category as “H”, depict the abbreviated NAVAID and the three-digit final approach course heading, e.g. H-PAR 085. If the procedure is designed to a runway include the runway number, e.g. H-PAR RWY 30.

8.3.2. **Altitudes.**

Minimum DH for PAR. With approach lights, the DH for PAR as low as 100 ft may be approved. Without approach lights, a DH of 200 ft may be approved. Table 2 in paragraph 8.4.1.5 governs the establishment of the DH.

8.3.3. **Visibility.**

1. Paragraph 3.3.3 do not apply.

2. Straight-in Minima.

   a. **Non-precision Approaches** (landing area within 800 m (2600 ft) of MAPt). The minimum visibility required prior to applying credit for lights may not be less than the visibility associated with the HAL as specified in Table 1.

Table 1. Effect of HAL on Visibility Minima.

HAL	**250-600 ft.**	**601-800 ft.**	**More than 800 ft.**
Visibility Minimum (km)	0.8 km	1.2 km	1.6 km

   b. **Precision Approaches**. The minimum visibility authorized prior to applying credit for lights is 0.8 km (RVR 800 m/2600 ft).

3. **Point in Space Approaches**. The minimum visibility required shall be 0.8 km. No credit for lights shall be authorized unless an approved visual system is provided. Alternate minima are not authorized. Table 1 does not apply.

8.3.4. **Visibility credit.**

Where visibility credit for lighting facilities is allowed for fixed-wing operations, the same type credit should be considered for helicopter operations. The approving authority shall grant credit on an individual case basis until such time as a standard helicopter approach lighting system is established. The concept stated in paragraph 3.3.3 apply, except heliport markings may be substituted for the runway marking requirements specified therein. The minimum visibility authorized prior to applying credit for lights may be reduced by 0.4 km for both precision and nonprecision procedures where approved approach light systems are operative. In addition, in precision approach procedures where RVR is approved and minima have been reduced to 0.4 km, RVR 400 m/1300 ft may also be authorized.

8.3.5. **Take-off minima.**

Helicopter take-off minima shall be in accordance with the appropriate national regulations.

8.4. **PRECISION APPROACH RADAR (PAR)**

8.4.1. **PAR.**

1. **Feeder Routes and Initial Approach Segment.** Navigational guidance for feeder routes and initial segments may be provided by radar, other navigation facilities or a combination thereof. The criteria specified in PANS-OPS shall apply as appropriate.

2. **Intermediate Approach Segment**. Navigational guidance in the intermediate segment may be provided by radar, other navigational facilities or a combination thereof. Except as stated in this paragraph, the criteria for the intermediate segment are contained in PANS-OPS. The intermediate segment begins at the point where the initial approach course intercepts an extension of the final approach course. This extension is the intermediate course. It extends along the inbound final approach course to the point of interception of the glide path. The minimum length of the intermediate segment depends on the angle at which the initial approach course intercepts the intermediate and is specified in Table 1 in paragraph 2.1.5. The MAXIMUM angle of interception shall be 90°.

   a. **Descent Gradient.** Even though the minimum length of the intermediate segment may be less than that specified in PANS-OPS, intermediate descent criteria shall be applied to at least 5 NM of flight track, immediately prior to the glide slope intercept point.

   b. **Altitude Selection.** Altitudes selected for the initial approach and intermediate approach segments shall be established and provide required obstacle clearance as specified in PANS-OPS. In addition, the selected altitudes shall NOT be less than the glide slope interception altitude. Where PAR and ILS serve the same runway, the glide slope interception altitude should be the same for both and the point of interception should be the outer marker or DME fix wherever possible.

3. **Final Approach Segment.** The final approach segment begins at the Final Approach Point (FAP). The FAP in PAR procedures is the point where interception of the glide path occurs. The point of glide path interception shall NOT be less than 2 NM

from the landing area. When the glide slope is inoperative, the FAF is a point on the final approach course within 5 NM of the landing threshold but not less than the distance required by descent gradient criteria. The FAF for procedures without a glide slope should coincide with the FAP for PAR.

Note: Where the PAR serves a landing area or runway that is also served by a VASI/PAPI, the PAR and VASI/PAPI glide slope angles should coincide.

a. **Height Loss:** The height loss to be applied for the calculation of the final OCH equals to 30m (98ft)

b. **Descent gradient:** The optimum descent gradient in the final segment is 3°. A descent gradient up to maximum 3.5° is acceptable. Higher descent gradients depend on national regulations and needs to be approved by the national authority.

4. **Missed Approach Segment.** Length of Initial Missed Approach Segment: The initial missed approach segment ends at a point 700m beyond THR.

5. **Adjustment of DH**. An adjustment is required whenever the angle to be used exceeds 3.8°. (See Table 2.) This adjustment is necessary to provide ample deceleration distance between the DH point and the landing area.

Table 2. Minimum DH - GS Angle Relationship.

GS Angle (°)	≤ 3.80	3.81 / 5.70	5.71 / 6
Minimum DH (ft)	100	150	200

8.4.2. RNAV/Point-in-space approaches.

The minimum visibility required shall be 0.8 km. No credit for lights shall be authorized unless an approved visual system is provided.

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CHAPTER 9 - ADDITIONAL MILITARY CRITERIA – DEPARTURES

9.1. GENERAL.

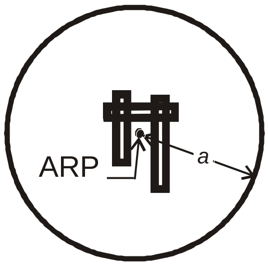
The departure criteria contained in this chapter are provided in addition to the criteria specified in PANS-OPS and this supplement.

NOTE: These alternative departure options are specifically restricted to military/NATO aircraft. A note on the promulgated procedure shall be added indicating that aircrews shall have national approval to fly such procedures.

9.1.1. Visual Climb Over Airport (VCOA)

1. **GENERAL**. VCOA is a part of an IFR departure option for an aircraft to visually conduct climbing turns over the airport to the published "climb to" altitude from which to proceed with the instrument portion of the departure. VCOA procedures are developed to avoid obstacles more than 4.8 km from the departure end of the runway as an alternative to complying with climb gradients greater than 3.3% (200 ft/NM).

2. **BASIC AREA.** Construct a visual climb area over the airport using the Airport Reference Point (ARP) or on-airport navaid as the center of a circle (See Figure 1). Use R1 in table 1 plus the distance from the ARP to the most distant runway end as the radius for the circle.

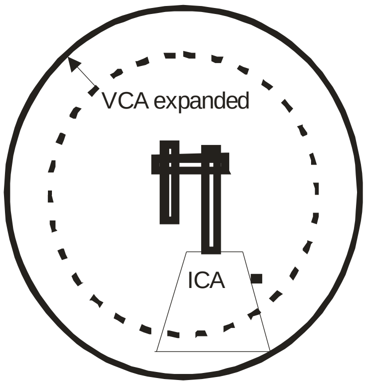


a = R1 plus the Distance from ARP to most distant DER

Figure 1. VCA.

Select 465 km/h (250 Kt) Indicated Air Speed (KIAS) as the standard airspeed and apply the appropriate MSL altitude to determine the R1 value. If other airspeeds are used, use table 1 to find the appropriate radius for the selected airspeed. This speed has to be specified on the procedure. Altitude must equal or exceed field elevation. The Visual Climb Area (VCA) must encompass the area of the Initial Climb Area (ICA) from the departure runway(s). Expand the VCA radius if necessary to include the ICA.. (See Figure 2.)

ICA is equivalent to area 1 and 2 described in *PANS-OPS Volume II, Part I, Section 3, Chapter 4, paragraph 4.2.*



The VCA must completely encompass the ICA.

Figure 2. VCA Expanded.

Table 1. Radius Values (R-1).

Speed IAS		**Altitudes MSL in ft**					
kt	**km/h**	**2000**		**5000**		**10000**	
		NM	km	NM	km	NM	km
90	165	2	3.7	2	3.7	2	3.7
120	220	2	3.7	2	3.7	2	3.7
180	335	2	3.7	2	3.7	2.5	4.7
210	390	2.1	3.9	2.5	4.7	3.2	6
250	467	2.8	5.2	3.4	6.3	4.2	7.8
310	579	4.2	7.8	4.9	9.1	6.0	11.2
350	654	5.2	9.7	6.0	11.2	7.3	13.6

NOTE: Table 9-1 speeds include 30 kt tail winds up to 2000 ft MSL, 45 kt tail winds up to 5000 ft MSL and 60 kt tail winds at 10000 ft MSL; bank angle: 23°.

3. VCOA EVALUATION.

a. **Omnidirectional VCOA**. Identify the highest obstruction in the VCA. This is the preliminary height of the VCA level surface. Evaluate a 2.5% surface from the edge of the level surface. If the 2.5% surface is penetrated, raise the VCA level surface height by the amount of the greatest penetration (See Figure 3). Determine the VCOA "climb-to" altitude using the following formula:

Climb to altitude = level surface MSL height + 250 ft MOC + adjustments

Example: 5124 + 250 + 0 = 5374 rounds to 5400'

Where OCS height = 5124

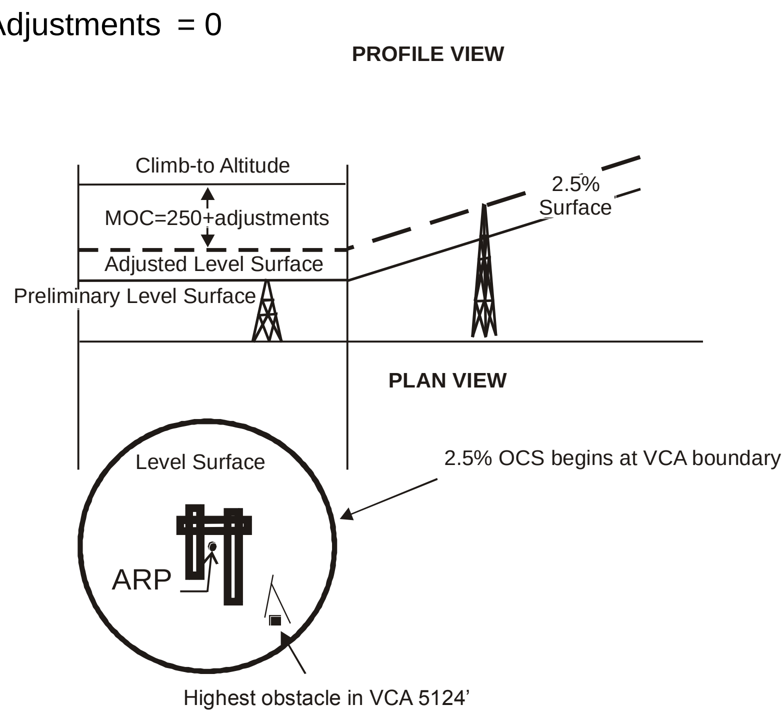


Figure 3. Diverse VCOA Evaluation.

b. **Departure Routes.** Where VCOA Omnidirectional Departure is not feasible, construct a VCOA departure route.

(1) Construct the VCA according paragraph 9.1.1.

(2) Determine the preliminary level surface height (See Figure 3).

(3) Locate, within the VCA, the beginning point of the route.

(4) Construct the departure route using criteria for the navigation system desired. The 2.5% surface rise begins along a line perpendicular to the route course and tangent to the VCA boundary (See Figure 4).

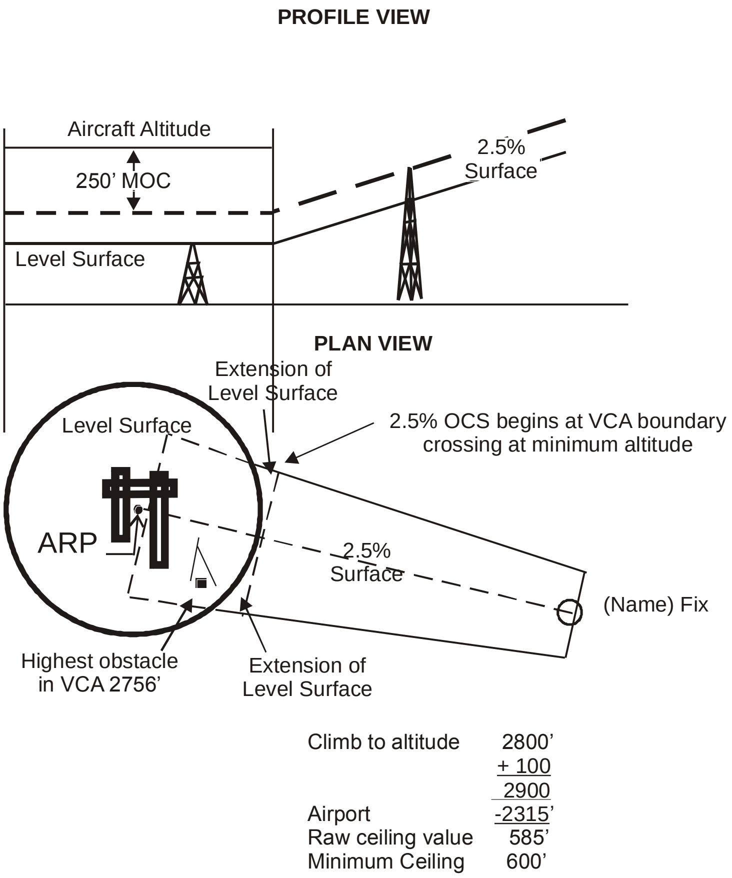


Figure 4. Route out of VCA.

(5) OCS Evaluation. Where obstacles penetrate the route 2.5% OCS:

(a) Raise the VCA level surface to the amount of penetration. Determine the climb-to altitude using the formula below or

Climb to altitude = level surface MSL height + 250' MOC + adjustments

Example: 5124 + 250 + 0 = 5374 rounds to 5400'

Where OCS height = 5124

Adjustments = 0

(b) Determine a climb gradient that shall clear the obstacle using the formula:

$$CG = \frac{a - b}{0.76 \times d}$$

Where:
a = obstacle MSL altitude
b = VCA climb – to altitude
d = distance (NM) from 2.5% origin to obstacle

Example:

$$CG = \frac{3379 - 2100}{0.76 \times 5.34} = 315.15\, ft / NM$$

(c) Calculate altitude (alt) that the CG may be discontinued:

$$alt = b + (d \times CG)$$

Example:

$alt = 2100 + (5.34 \times 316) = 3787.44$ round up to 3800'

4. **Published Annotations.** The procedure must include instructions specifying an altitude to cross a fix/location over the airport, followed by routing and altitude instructions to the en route system. Example: "Climb in visual conditions to cross Wiley Post airport westbound at or above 6000 ft, then climb to FL180 via AMA R-098 to AMA VORTAC", "Climb in visual conditions to cross DXTER eastbound at 5000 ft, then via LEX R-281 to LEX.". (See Figure 5.)

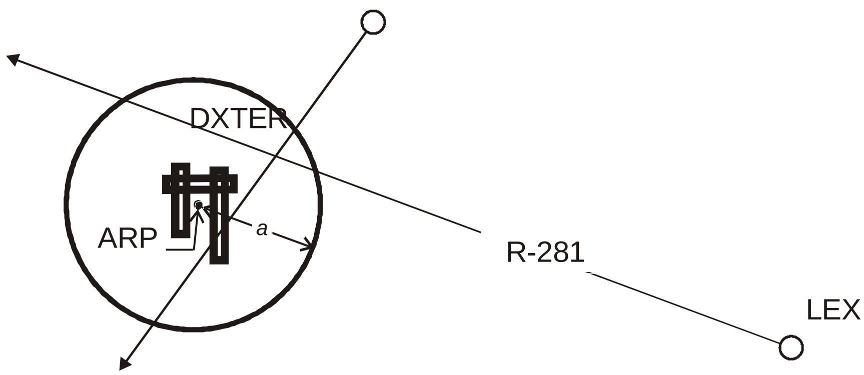


Figure 5 VCOA Departure Route.

5. **CEILING AND VISIBILITY**. Publish a ceiling that is the 100 ft increment above the "climb-to" altitude over the VCA. Obstacles inside the VCA are subject to see and avoid manoeuvres. Obstacles outside the VCA may be avoided by publishing a ceiling above an altitude that must be attained inside the VCA over a specified fix or identifiable point. From this altitude, a 2.5% OCS from the VCA boundary clears all

obstacles outside the VCA omni-directionally or along a route of flight. Determine the published visibility in metres from Table 2.

Table 2. Visibility.

Speed IAS		Altitudes (MSL in ft) and Visibility (Metres)		
kt	km/h	2000	5000	10000
90	165	1600	1600	1600
120	220	1600	1600	2000
180	335	2400	3200	4000
210	390	3200	4000	4400
250	467	4000	4800	4800
310	579	4800	4800	4800
350	654	4800	4800	4800

9.1.1. Reduced takeoff runway length procedure

Limiting the available length of the departure runway during take-off is an option that can be used to reduce departure climb gradients. Use of this option requires approval of the appropriate military authority. Use the following formula to determine the TORA for a given desired climb gradient (DCG):

NOTE: Climb gradients are expressed in feet per nautical mile (ft/NM).

$$\text{TORA} = L - \left(\frac{A}{DCG} - \frac{A}{CG}\right)6076.11548$$

Where A = Altitude above DER elevation where CG ends
CG = Required climb gradient before adjustments
DCG = Desired climb gradient
L = Full length of runway available for departure before adjustments

Example: $10000 - \left(\frac{1000}{250} - \frac{1000}{300}\right)6076.11548 = 5949.26'$

CHAPTER 10 - ADDITIONAL MILITARY CRITERIA – PERFORMANCE BASED NAVIGATION (PBN)

(To be developed)

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ANNEX A SAFETY CONSIDERATIONS

Introduction:
This Annex is intended for NATO Led Service Providers in implementing this STANAG at existing or planned airfields as well as during deployed operations.

It includes general considerations such as the suitability of the STANAG/AATMP for the required operations, currency with regard to edition number and amendments, applicability of related documents, nations ratifying and reservations.

Specific safety considerations are identified by the custodian of the STANAG/AATMP and national SMEs along with consequences and possible mitigations.

Custodian POC. For users to provide any comments and lessons learned: **Thierry Marchand (France) thierry.marchand@intradef.gouv.fr**
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General:
In the implementation of any STANAG/AATMP, the NATO Led Service Provider should verify the items listed below using the NATO Standardization Organization (NSO) pass word protected Website https://nso.nato.int/nso/

A. Suitability	Review STANAG 7210 (AEP-68) *Guidance in the Selection of STANAGs for Deployed Operations, to determin*e if the STANAG/AATMP is suitable for the type of operation required.
B. Currency	Ensure that STANAG/AATMP Edition and any Amendments are the most current as shown on the NSA website.
C. Related Documents	Obtain related documents cited in the STANAG/AATMP and, in particular, review those documents where criteria as been adopted. STANAGs are available on the NSA Website whereas civilian documents, such as ICAO, may be available from your Aviation or Engineering Commands.
D. Implementation Status	Review the ratification status along with any reservations to the STANAG/AATMP on the NSA Website and, in particularly, the status for those for nations taking part in the operation.
E. Compliance	For existing airfield facilities and procedures, determine if they are in compliance with the criteria and standards specified in the STANAG/AAMTP.

Specific:
The safety considerations, consequences and possible mitigations listed below by the STANAG/AATMP Custodian assisted by Subject Matter Experts are by no means exhaustive or fully applicable to all environments or situations.

Full safety surveys in accordance with STANAG 4720 *NATO Standard for Air Traffic Management (ATM) Safety Management System (SMS)*, shall still be carried out.

Safety Considerations	Consequences	Possible Mitigations
Non standard procedures may be required due to technical or operational considerations.	Flight incident/accident.	Special study shall demonstrate that no derogation of safety is involved. A cautionary note on charts or AIS.
New procedures /changes to existing procedures.	Any changes may have consequences on ATM system.	Changes impacts on procedure shall be evaluated in order to check the actual ATM SYSTEM is not affected. If it is, a complete reprocessing is necessary.
Procedure design process: large and complex datas to take account.	The mixed use of complex software and manual calculations may lead to mistakes.	Every step of procedures design (construction, checking and validation) shall be done by different contributors. Moreover the version of software, origin and date of datas used shall be indicated in file archived.
Instrument approach charts content.	Wrong reading or interpretation of charts may have an impact on ATM, safety.	In spite of impossibility to harmonize charts, minimum requirements described in stanag 3970 shall be implemented.

ANNEX B RELATED STANAGS AND DOCUMENTS

B.1. RELATED STANAGS (Number and Title)

3052 Aeronautical Briefing Facilities
3158 Day Marking of Airfield Runways and Taxiways
3297 NATO Standard Aerodrome and Heliport ATS procedures
3316 Airfield Lighting
3346 Marking and Lighting of Airfield Obstructions
3374 Flight Inspection of NATO Radio/Radar Navigation and Approach Aids – AEtP-1
3530 Radio and/or Navigational Aid Failure Procedures for Operational Air Traffic (OAT) Flights
3534 Airfield Lighting, Marking and Tone Down Systems for Non-permanent/Deployed Operations
3619 Helipad Marking and Lighting
3634 Runway Friction and Braking Conditions
3697 Airfield Aircraft Arresting Systems
3711 Airfield Marking and Lighting Colour Standards
3758 Signals Used by Air Traffic Service Units for Control of Pedestrian and Vehicular Traffic in the Manoeuvring Area of Airfields
3817 NATO Radiotelephony Phraseology (RTF) (AATCP-2)
3970 Content and Format of Flight Information Publication (FLIP) Terminal High/Low Instrument Approach Procedures, Instrument Departure Procedures and Aerodrome Diagrams/Layouts
7005 Exchange of Flight Information Publication (FLIP) Data
7008 Military Aviation Radio-Telephony (R/T) Callsigns
7012 Minimum Radio-Telephony (R/T) Aerodrome Departure Procedures
7025 Air Traffic Management and Control of Minimum Operating Strips (MOS) Operations
7104 Airfield Aircraft Arresting System Operating Procedures
7114 Helicopter Clearance Plane Requirements
7131 Aircraft Classification Number (ACN)/ Pavement Classification Number (PCN) (AEP-46)
7174 Airfield Clearance Planes
7199 NATO Supplement to ICAO Doc 8168-OPS/611, Volume I, Flight Procedures

B.2. RELATED DOCUMENTS (Number and Title)

ICAO International Standards and Recommended Practices (SARPS):

Annex 4 Aeronautical Charts,

Annex 5 Units of Measurements

Annex 10 Aeronautical Telecommunications, Vol I

Annex 11 Air Traffic Services,

Annex 14 Aerodromes, Vol I Aerodrome Design and Operations and Vol. II Heliports,

Annex 15 Aeronautical Information Services.

ICAO Procedures for Air Navigation Services (PANS) and related documents:

Doc 4444-, PANS-ATM/501, Air Traffic Management,

Doc 8126-AN/872, Aeronautical Information Services Manual,

Doc 8168-OPS/611 Vol I, Aircraft Operations,

Doc 8168-OPS/611 Vol II, Construction of Visual and Instrument Flight Procedures

Doc 8400, ICAO Abbreviations and Codes,

Doc 8697-AN/889, Aeronautical Chart Manual,

Doc 9137-AN/898 , Part VI, Control of Obstacles

Doc 9274-AN/904, Manual on the use of the Collision Risk Model (CRM) for ILS Operations,

Doc 9365-AN/910, Manual of All-Weather Operations,

Doc 9368-AN/911, Instrument Flight Procedure Construction Manual,

Doc 9426-AN/924, Air Traffic Services Planning Manual,

Doc 9613-AN/937, Performance-based Navigation (PBN) Manual,

Doc 9643-AN/941, Manual on Simultaneous Operations on Parallel or Near-Parallel Instrument Runways (SOIR)

Doc 9674-AN/946, World Geodetic System-1984 (WGS-84) Manual,EUR Doc 015, European Guidance Material on Managing Building Restricted Areas.

Doc 9906-AN/472, Quality Assurance Manual For Flight Procedure Design, Vol 1-6

Doc 9931-AN/476, Continous Descent Operations (CDO) Manual,

Doc 9993-AN/495, Continous Climb Operations (CCO) Manual.

European Aviation Safety Agency (EASA)/European Union: EU-OPS

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ANNEX C LEXICON

C.1. TERMS AND DEFINITIONS

1. controlling obstacle
The highest obstacle relative to a prescribed plane within a specific area for non-precision and circling approaches. The obstacle that results in the highest glide slope or Decision Altitude in precision approaches. The obstacle that results in the highest climb gradient for departures.
[ICAO Annex 14: 2004]
Not NATO Agreed

2. Flight check
A flight assessment of an instrument procedure, for the purpose of evaluating and verifying that the procedure is operationally acceptable for safety, design accuracy and whether it is flyable.
[MIPST:2011]
Not NATO Agreed

3. gradient
A slope expressed in ft/NM or % or as a ratio of the horizontal to the vertical distance. For example, 152ft/Nm = 2,5% = 40:1 (means 40 ft horizontally to 1 ft vertically).[MIPST: 2007]
Not NATO Agreed

4. ground point of intercept
A point in the vertical plane on the runway centre line at which it is assumed that the straight line extension of the glide slope intercepts the runway approach surface baseline.
[MIPST: 2007]
Not NATO Agreed

5. minimum obstacle clearance
The vertical distance between the lowest authorized flight altitude and a prescribed surface within a specified area.
[MIPST: 2007]
Not NATO Agreed

6. precipitous terrain
Terrain characterized by steep or abrupt slopes.
[ICAO Annex 14: 2004]
Not NATO Agreed

7. runway point of intercept
The point where the straight line extension of the glide slope intercepts the runway centre line on the runway surface.
[MIPST: 2007]
Not NATO Agreed

8. touchdown zone elevation
The highest runway centre line elevation in the touchdown zone (first 3000 ft of the runway from THR).
[MIPST: 2007]
Not NATO Agreed

9. visual descent point
The visual descent point on the final approach course of a non-precision straight-in approach procedure from which normal descent from the OCH to the runway touchdown point may be commenced provided visual reference is established.
[MIPST: 2007]
Not NATO Agreed

C.2. ABBREVIATIONS

AATCP
Allied Air Traffic Control Publication (formerly APATC)

AFPP
Allied Flight Procedures Publication

ATC
Air Traffic Control

ATD
Along Track Distance

ALS
Approach Lighting System

AMSL
Above Mean Sea Level

APP
Allied Procedural Publication

APV
Approach Procedure with Vertical guidance

ARA
Airborne Radar Approach

ARP
Aerodrome Reference Point (see also HRP)

ARSR
Air Route Surveillance Radar

ASR
Airport Surveillance Radar

ASB
Approach Surface Baseline

ATD
Along Track Distance

CG
Centre of Gravity

CL
Centre Line

CRM
Collision Risk Model

DA
Decision Altitude

DCG
Direct Climb Gradient

DER
Departure End of Runway

DF
Direction Finding

DH
Decision Height

DME
Distance Measuring Equipment

DR
Dead Reckoning

EU-OPS
European Union - Operations

FAF
Final Approach Fix

FAOCS
Final Approach Obstacle Clearance Surface

FAP
Final Approach Point

FTT
Flight Technical Tolerance

GNSS
Global Navigation Satellite System

GPI
Ground Point of Intercept

GS
Glide Slope

HAA
Height Above Airport Elevation

HAL
Height Above Landing Elevation

HIRL
High Intensity Runway Lights

HPMA
High Performance Military Aircraft

HRP
Heliport Reference Point

IAF
Initial Approach Fix

IAS
Indicated Air Speed

ICA
Initial Climb Area

ICAO
International Civil Aviation Organization

IF
Instrument Flight

IFR
Instrument Flight Rules

ILS
Instrument Landing System

IMC
Instrument Meteorological Conditions

ISA
Intermediate Segment Angle

KIAS
Knots Indicated Air Speed

km
Kilometre

km/h
Kilometres per hour

Kt
Knot

LDIN
Lead-in lighting system

LOC
Localizer

m
Metre

MALS
Medium Intensity Approach Light System

MALSF
Medium Intensity Approach Light System with Sequenced Flashers

MALSR
Medium Intensity Approach Light System with Runway alignment indicator lights

MAPt
Missed Approach Point

MDA
Minimum Descent Altitude

MDH
Minimum Descent Height

MIRL
Medium Intensity Runway Edge Lights

MLS
Microwave Landing System

MOC
Minimum Obstacle Clearance

MRA
Minimum Reception Altitude

MSA
Minimum Safe Altitude

MSL
Mean Sea Level

NA
Not Authorized

N/A
Not Applicable

NATO
North Atlantic Treaty Organization

NAVAID
Navigational Aid

NDB
Non-Directional Beacon

NPA
Non-Precision Approaches

NM
Nautical Miles

NOTAM
Notice to Airmen

OAS
Obstacle Assessment Surface

OCA
Obstacle Clearance Altitude

OCA/OCH
Obstacle Clearance Altitude/Height

OCH
Obstacle Clearance Height

ODALS
Omnidirectional Approach Lighting System

OIS
Obstacle Identification Surface

PANS-OPS
Procedures for Air Navigation Services - Aircraft Operations

PAPI
Precision Approach Path Indicator

PAR
Precision Approach Radar

PBN
Performance Based Navigation

PDG
Procedure Design Gradient

PINSA
Point-In-Space Approach

r
Radius

RAIL
Runway Alignment Indicator Lights

RASS
Remote Altimeter Setting Source

RDH
Reference Datum Height

REIL
Runway End Identifier Lights

RNAV
Area Navigation

ROC
Required Obstacle Clearance

RPI
Runway Point of Intercept

RRP
Runway Reference Point

RTRL
Reduced Takeoff Runway Length

RVR
Runway Visual Range

RWY
Runway

SALS
Short Approach Light System

SI
International system of units

SIAPs
Standard Instrument Approach Procedures

SARPS
Standards and Recommended Practices

SRA
Surveillance Radar Approach

SSALF
Simplified Short Approach Light system with sequenced Flashers

SSALR
Simplified Short Approach Light system with Runway alignment indicator lights

SSALS
Simplified Short Approach Light System

STANAG
Standardization Agreement

TACAN
Tactical Air Navigation

TAS
True Air Speed

TCH
Threshold Crossing Height

TDZ
Touchdown Zone

TDZE
Touchdown Zone Elevation

THR
Threshold

TORA
Take-Off Run Available

VASI
Visual Approach Slope Indicator

VCA
Visual Climb Area

VCOA
Visual Climb Over Airport

VDP
Visual Descent Point

VGSI
Visual Glide Slope Indicator

VOR
Very high frequency Omnidirectional Radio range

VORTAC
Very high frequency Omni-directional Radio range Tactical AIR navigation aid

VSS
Visual Segment Surface

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AATCP-1(E)(1)