CHANGE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

8260.3B
CHG 20

National Policy

Effective Date:
12/07/07

SUBJ: United States Standard for Terminal Instrument Procedures (TERPS)

1. **Purpose.** Order 8260.3B, United States Standard for Terminal Instrument Procedures (TERPS), contains criteria that must be used to formulate, review, approve, and publish procedures for instrument approach and departure of aircraft to and from civil and military airports. These criteria are for application at any location over which the Federal Aviation Administration (FAA) or Department of Defense (DoD) exercises jurisdiction. *This change replaces criteria in Volume 1, chapter 3 with internationally harmonized minimums standards.*

2. **Distribution.** This change is distributed in Washington Headquarters to the branch level in the Offices of Aviation Research and Airport Safety and Standards, the Air Traffic Organization (Safety, En Route and Oceanic Services, Terminal Services, and Technical Operation Services), and Flight Standards Service; to the National Flight Procedures Office and the Regulatory Standards Division at the Mike Monroney Aeronautical Center; to the branch level in the regional Flight Standards and Airports Divisions; to the Technical Operations Service Areas and Air Traffic Service Areas; special mailing list ZVS-827, and to special military and public addressees.

3. **Effective Date.** December 21, 2007

4. **Explanation of Changes.** Significant areas of new direction, guidance, policy, and criteria as follows:

a. **VOLUME 1, General Criteria.** Chapter 3, Takeoff and Landing Minimums. The entire chapter has been revised to reflect the new standard for determining landing minima, the result of extensive coordination with European aviation authorities aimed at harmonizing landing minima affecting United States and European operators. The chapter has also been reformatted to improve clarity and ease of understanding. Highlights of the major changes in each section of the chapter are as follows:

(1) **Section One, General Information.**

(a) **Added new groupings for approach lighting systems**, aligned with international specifications;

(b) **Replaced the term Height Above Touchdown (HAT)** with Height Above Threshold (HATh).

Distribution: A-W(AR/AS/ND/FS/AT/AF)-3; AJW-32 (200 Cys); AMA-200 (12 Cys); A-X(FS/AF/AT/AS)-3; ZVS-827; Special Military and Public Addressees

Initiated By: AFS-420

(c) Added a table establishing threshold crossing height (TCH) limits for allowing visibility credit for authorized lighting systems.

Note: Addition of this table rescinds table 2-6 of Order 8260.54A and table 2-2c of Order 8260.3. Volume 3.

(2) Section Two, Establishing Minimum Altitudes/Heights.

(a) Revised paragraphs on establishing Decision Altitudes/Heights and Minimum Descent Altitudes;

(b) Added a table prescribing the minimum height above threshold, based on glide-path angle.

(3) Section Three, Visibility Minimums.

(a) Developed completely new tables and methodology for establishing straight-in approach visibility minimums;

(b) Authorized minimums to 1800 runway visual range (RVR) to runways without touchdown zone or centerline lights; authorization is contingent upon the pilot's use of a flight director, coupled autopilot, or head-up display (HUD) system during the instrument approach;

(c) Revised requirements for authorizing "fly visual to airport" on approach charts;

(d) Expanded the HATh range within which minimums of 1800 RVR are authorized with operable touchdown zone and centerline lights;

(e) Expanded the methodology for establishing circling visibility minimums.

(4) Section Four, Alternate Minimums.

(a) Provided an expanded description of the process for establishing other-than-standard alternate minimums;

(b) Modified the alternate minimums table and added an example computation.

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James J. Ballough
Director, Flight Standards Service

Chapter 3. Takeoff and Landing Minimums.
Section One. General Information.

3.0 Application.

The minimums specified in this chapter are the lowest that can be approved through TERPS application at any location for the type of navigation facility concerned. Category (CAT) II/III visibility minima calculation methods and elements are located in *Volume 3, appendix 1.*

3.1 Establishment.

Establish the lowest minimums permitted by the criteria contained in this order. Specify minimums for each condition indicated in the procedure; i.e., straight-in, circling, alternate, and takeoff, as required. List the following minima elements: decision altitude (DA), decision height (DH), minimum descent altitude (MDA), height above threshold (HATh), height above airport (HAA), height above landing (HAL), or height above surface (HAS) as appropriate, and runway visual range (RVR) or visibility. Alternate minimums, when specified, shall be stated as ceiling and visibility. Specify takeoff minimums when required, as visibility only, except where the need to see and avoid an obstacle requires the establishment of a ceiling value. DoD may specify alternate and takeoff minimums in separate directives.

Note: Ceiling = (DA/MDA - Airport Elevation) rounded to next higher 100 ft increment. For example, DA 1242 – Airport Elevation 214 = 1028 = Ceiling 1,100 ft.

3.1.1 Publication.

3.1.1 a. Publish minimums for each approach category accommodated at the airport. Approach category E minimums should be published at civil/joint-use airports only where a valid DoD requirement exists. Minimums for DoD procedures are published as prescribed by the appropriate DoD service.

Note: Do not base the decision to restrict straight-in minima to specific approach categories solely on the Airport Reference Code (ARC) designation of the runway. The ARC system described in Advisory Circular (AC) 150/5300-13, Airport Design, is primarily intended to establish runway infrastructure requirements. The ARC designation is not meant to determine the set of approach categories to publish in a procedure landing minima. This decision is made on a case-by-case basis through Regional Airspace and Procedures Team (RAPT) coordination or by appropriate DoD authority, and must accommodate the approach speed of all aircraft expected to utilize the procedure. ARC code/supporting infrastructure should be considered when determining authorized approach categories when the RAPT determines it is appropriate for safe operations.

3.1.1 b. Annotate the chart appropriately when one or more approach categories are not authorized. Publish minima for each approach category except those not authorized (e.g., publish only category A and B straight-in minimums when categories C and D are not authorized).

3.1.2 Runway Visual Range (RVR).

RVR is a system of measuring the visibility along the runway. An instrumentally derived value, it represents the horizontal distance a pilot will see down the runway from the approach end. RVR is based on the sighting of either high intensity runway lights or the visual contrast of other targets, whichever yields the greater visual range.

3.1.2 a. Runway Requirements for RVR Approval.

RVR may be published with straight-in landing minima when:

3.1.2 a. (1) RVR equipment is installed to the runway in accordance with the applicable standard (e.g., FAA Standard 008 or appropriate DoD directive).

3.1.2 a. (2) High Intensity Runway Lights are installed to the runway in accordance with appropriate FAA or DoD standards.

3.1.2 a. (3) Runway marking and lighting is appropriate for the intended use. Precision approaches, approaches with vertical guidance (APV), and most nonprecision approach (NPA) procedures require instrument runway markings or touchdown zone and center-line lighting (TDZ/CL). When required runway markings are not available but TDZ/CL is available, RVR equal to the visibility minimum appropriate for the approach light configuration is authorized. See AC 150/5300-13 and AC 150/5340-1, *Standards for Airport Markings*, for further information.

3.1.3 Approach Lighting Systems.

Approach lighting systems extend visual cues to the approaching pilot and make the runway environment apparent with less visibility than when such lighting is not available. For this reason, lower straight-in (not applicable to circling) visibility minimums may be established when standard or equivalent approach lighting systems are present.

3.1.3 a. Standard Lighting Systems.

Table 3-1 provides the types of standard approach and runway lighting systems, as well as the operational coverage for each type. *Table 3-2* provides United States and international lighting system classifications.

Table 3-1. *Standard Lighting Systems.*

	APPROACH LIGHTING SYSTEMS	Operational Coverage (°)	
		Lateral (±)	Vertical (above horizon)
ALSF-1	Standard Approach Lighting System with Sequenced Flashers	21.0* 12.5#	12.0* 12.5#
ALSF-2	Standard Approach Lighting System with Sequenced Flashers & CAT II Modification	21.0* 12.5#	12.0* 12.5#
SALS	Short Approach Lighting System	21.0* --	12.0* --
SALSF	Short Approach Lighting System with Sequenced Flashers	21.0* 12.5#	12.0* 12.5#
SSALS	Simplified Short Approach Lighting System	21.0* --	12.0* --
SSALF	Simplified Short Approach Lighting System with Sequenced Flashers	21.0* 12.5#	12.0* 12.5#
SSALR	Simplified Short Approach Lighting System with Runway Alignment Indicator Lights	21.0* 12.5#	12.0* 12.5#
MALS	Medium Intensity Approach Lighting System	10.0* --	10.0* --
MALSF	Medium Intensity Approach Lighting System with Sequenced Flashers	10.0* 12.5#	10.0* 12.5#
MALSR	Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights	10.0* 12.5#	10.0* 12.5#
ODALS	Omni-Directional Approach Lighting System	360#	2.0-10.0#

** Steady-burning # Sequenced flashers*

RUNWAY LIGHTING SYSTEMS	
HIRL	High Intensity Runway Lights
MIRL	Medium Intensity Runway Lights
LIRL	Low Intensity Runway Lights
TDZ/CL	Touchdown Zone and Centerline Lights

Note: See Order 8260.3B, Volume 3, appendix 5 for lighting system descriptions.

Table 3-2. *United States and International Approach Lighting Classifications.*

Facility Class	Approach Lighting Systems (ALS)	ALS Length (ft)
Full (FALS)	**ALS length ≥720 m** **U.S.: ALSF-1, ALSF-2, SSALR, MALSR** High or medium intensity and/or flashing lights **ICAO:** Calvert or Barette Centre Line Lights, high intensity lights	≥2400
Intermediate (IALS)	**ALS length 420 - 719 m** **U.S.: MALSF, MALS, SSALF, SSALS, SALS/SALSF** High or medium intensity and/or flashing lights **ICAO:** Simplified Approach Light System, high intensity lights	≥1400 – 2399
Basic (BALS)	**ALS length 210 - 419 m** **U.S.: ODALS** High or medium intensity lights and/or flashing lights **JAA:** High, medium or low intensity lights, including one crossbar	≥700 – 1399
Nil (NALS)	**ALS length < 210 m**, or No approach lights	None or < 700

3.1.3 b. Operational Conditions.

In order to apply approach light credit (e.g., publish visibility from the FALS, IALS, or BALS column from *table 3-5a, 3-6, or 3-7*), the following conditions must exist:

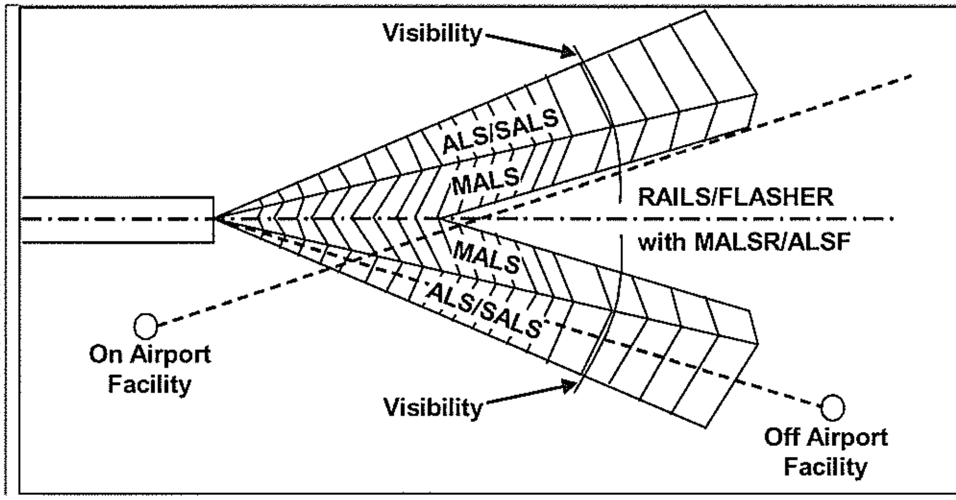
3.1.3 b. (1) The runway must have nonprecision instrument or precision instrument (all-weather) markings or TDZ/CLs as specified in directives of the appropriate approving authority. Unless otherwise authorized by Flight Standards, precision instrument runway markings are required in order to publish visibility less than 3/4 statute miles (SM). Runway marking effectiveness may be degraded when obscured by surface water, snow, ice, or tire marks. All procedures to the affected runway must revert to no-light minimums when required markings are removed, or when it is determined the markings are inadequate for reduced visibility credit. Operational TDZ/CL lights may be substituted for removed, deteriorated, or obscured runway markings to authorize a visibility minimum appropriate for the applicable approach light configuration.

3.1.3 b. (2) The final approach course (FAC) must place the aircraft within the lateral and vertical coverage of the approach lighting system at a distance from the landing threshold equal to the standard visibility required <u>without</u> lights (NALS column) **AND** the distance from MAP/DA to threshold must be less than or equal to 3 SM.

<u>Note</u>: The straight-in (SI) FAC to an "on-airport" facility typically transits all approach light operational areas within the visibility arc limits, but the FAC from

an "off-airport" facility may be restricted to a standard approach light system (ALSF) or short approach lighting system (SALS) for visibility credit. See figure 3-1.

Figure 3-1. *Application of Lateral Coverage Angles of Table 3-2.*



3.1.3 b. (3) For PA and APV procedures, the TCH must not exceed the upper limit value specified by *table 3-3.*

3.1.3 c. Other Lighting Systems.

Standard system variations, and other systems not included in this chapter, must meet the specified operational conditions in *paragraph 3.1.3.b* to receive visibility reduction credit. The provisions of *TERPS Volume 1, paragraph 141*, govern civil airport lighting systems which do not meet known standards, or for which criteria does not exist. DoD lighting systems may be equated to standard systems for visibility reduction, as illustrated in *appendix 5.* Where existing systems vary from *appendix 5* configurations and cannot be equated to a standard system, consult the appropriate approving authority for special consideration.

Table 3-3. *PA/APV Threshold Crossing Height Upper Limits for Allowing Visibility Credit for Authorized Lighting Systems.*

HATh (Feet)	GLIDEPATH ANGLE (Degrees)	TCH UPPER LIMIT (Feet)
* 200 to 249	# 2.50 - 3.20	75
	3.21 - 3.30	70
	3.31 - 3.40	66
	3.41 - 3.50	63
	3.51 - 3.60	59
	3.61 - 3.70	55
	3.71 - 3.80	50
	3.81 - 3.90	47
	3.91 - 4.00	43
	4.01 - 4.10	39
	4.11 - 4.20	35
250 to 269	# 2.50 - 4.10	75
	4.11 - 4.20	71
	4.21 - 4.30	67
	4.31 - 4.40	62
	4.41 - 4.50	58
	4.51 - 4.60	54
	4.61 - 4.70	50
	4.71 - 4.80	45
	4.81 - 4.90	41
	4.91 - 5.00	37
270 to 299	# 2.50 - 4.40	75
	4.41 - 4.50	73
	4.51 - 4.60	68
	4.61 - 4.70	64
	4.71 - 4.80	59
	4.81 - 4.90	55
	4.91 - 5.00	51

HATh (Feet)	GLIDEPATH ANGLE (Degrees)	TCH UPPER LIMIT (Feet)
300 to 349	# 2.50 - 4.90	75
	4.91 - 5.00	71
	5.01 - 5.10	66
	5.11 - 5.20	61
	5.21 - 5.30	56
	5.31 - 5.40	52
	5.41 - 5.50	48
	5.51 - 5.60	43
	5.61 - 5.70	39
350 and above	# 2.50 - 5.60	75
	5.61 - 5.70	70
	5.71 - 5.80	65
	5.81 - 5.90	60
	5.91 - 6.00	55
	6.01 - 6.10	50
	6.11 - 6.20	45
	6.21 - 6.30	40
	6.31 - 6.40	35

* *100 ft – 199 ft HATh for DoD PAR only*

\# *GPA < 3.0 DoD only*

Chapter 3. Takeoff and Landing Minimums.
Section Two. Establishing Minimum Altitudes/Heights.

3.2 Decision Altitude (DA) or Decision Height (DH).

A specified altitude or height in the precision or APV instrument approach, at which a missed approach must be initiated if the required visual reference to continue the approach has not been established. Determine DA *using Volume 3 criteria* and round the published value to the next higher 1-ft increment (234.10 rounds to 235).

Note 1: Reference decision altitude to mean sea level (MSL) and DH to the threshold elevation.

Note 2: For convenience where both expressions are used, they may be written in the form "decision altitude/height" and abbreviated "DA/H."

Note 3: For CAT II and III operations, a DA generally does not apply. CAT II operations use a DH. Base the DH on a radio altimeter (RA) or, where the RA is NA, the inner marker.

3.2.1 Minimum Descent Altitude (MDA).

MDA represents the final approach minimum altitude for nonprecision instrument approach procedures. The published MDA shall be expressed in feet above MSL and is rounded to the next highest 20-ft increment. Apply criteria as specified by the applicable chapter/criteria to determine the MDA.

3.2.1 a. **The straight-in (SI) approach MDA** must provide at least the minimum final approach segment (FAS) and missed approach segment (MAS) required obstacle clearance (ROC) as specified by the applicable chapter/criteria.

3.2.1 b. **The circling MDA (CMDA)** HAA must be no lower than that specified in *paragraph 3.3.3* and *table 3-9*. The CMDA must provide the minimum ROC in the circling maneuvering area and meet the missed approach requirements specified in *paragraph 3.2.1a*. The published CMDA must provide the minimum required final obstacle clearance in the final approach segment and the minimum required circling obstacle clearance in the circling approach area. The CMDA must not be above the FAF altitude or below the straight-in MDA of the highest nonprecision approach (NPA) line of minima published on the same chart. When precision approach (PA) or APV procedures are published standalone, i.e., without an accompanying nonprecision line of minima, the CMDA must not be above the intermediate segment altitude or below the straight-in DA of the highest PA or APV line of minima published on the same chart.

Note: When dual minimums are authorized, the CMDA is compared against the SI MDA associated with the corresponding minima set (i.e., circling with stepdown minimums checked against SI with stepdown minimums).

3.2.2 Adjustments to Minimum Altitudes/Heights.

The MDA or DA/H may require an increase under the conditions described below.

Note: *Where the intermediate and/or final segment primary ROC is increased, the secondary area ROC is total primary area ROC value (including the adjustment) at the primary area boundary, and tapers to zero at the outer edge.*

3.2.2 a. **Determine the eligible aircraft category** and the minimum HATh *using table 3-4* below.

Table 3-4. *Minimum HATh for Precision and APV Approach Procedures.*

	Aircraft Category			
Glide Path Angle	A	B	C	D & E
2.50° - 2.99° (DoD only)	200[1,2]			
3.00° - 3.10°	200[1,2]			
3.11° - 3.30°	200[2]		250	NA[4]
3.31° - 3.60°	200[2,3]		270[4]	NA[4]
3.61° - 3.80°	200[2,3]		NA	
3.81° - 4.20°	200[3]	250	NA	
4.21° - 5.00°	250	NA		
5.01° - 5.70°	300	NA		
5.71° - 6.40° Airspeed NTE 80 knots	350	NA		

1. PAR minimum HATh = 100 (DoD only)
2. LNAV/VNAV and RNP SAAAR minimum HATh = 250
3. LPV w/GPA > 3.5° = 250
4. USN = 250

NA = Not Authorized

3.2.2 b. **Precipitous terrain adjustments.** In areas characterized by precipitous terrain, in or outside of designated mountainous areas, consideration must be given to induced altimeter errors and pilot control problems. Evaluate and identify terrain as precipitous or non-precipitous using software implementing the FAA-approved algorithms developed for this purpose.

3.2.2 b. (1) **Precipitous terrain identified in the final segment.** For conventional NPA procedures, increase primary area ROC values by the amount specified by the software/

algorithms. For PA/non-Baro APV procedures that permit precipitous terrain in the final segment increase the HATh by 10 percent of the value determined by evaluation of the final and missed segments, e.g., 200 ft increases to 220 ft, 350 ft increases to 385 ft, and recalculate the DA; do not include adjustment for RASS before determining the precipitous terrain adjustment.

3.2.2 **b. (2) Precipitous terrain identified in other procedure segments** will not directly affect the MDA/DA, but may require increased ROC.

3.2.2 **b. (2)(a) Precipitous terrain identified in feeder segments/radar MVA sectors in a designated mountainous area.** No increase is required, but ROC may not be reduced from 2,000 ft (*see Volume 1, chapter 17, paragraph 1720*).

3.2.2 **b. (2)(b) Precipitous terrain identified in specified level surface segments.** When precipitous terrain adjustment is required, increase ROC values by the amount specified by the software/algorithms. Do not apply to segments associated with visual maneuvers or emergency use (i.e., circling maneuvering area or MSA/ESA.).

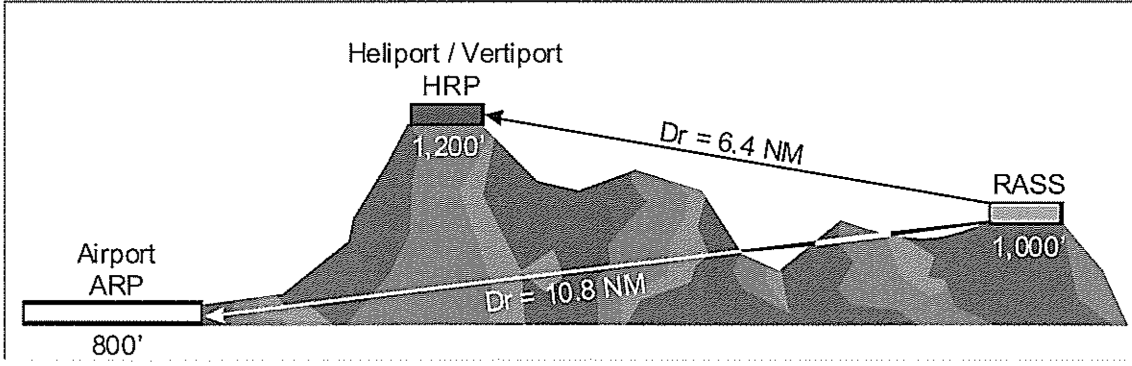
3.2.2 **c. Remote Altimeter Setting Source (RASS) ROC Adjustment.** When the altimeter setting is obtained from a source more than 5 nautical miles (NM) from the Airport Reference Point (ARP) for an airport, or the Heliport Reference Point (HRP) for a heliport or vertiport, increase the primary area ROC by the amount of RASS adjustment for the final (except precision final), step-down, and circling segments. For PA/APV finals, increase the DA/H (prior to rounding) by the amount of RASS adjustment. Increase intermediate segment primary area ROC as specified by *paragraph 3.2.2c(3)*. When two altimeter sources are used, apply RASS to the missed approach climb-to-altitude. Do not apply RASS adjustment to minimum safe/sector altitude (MSAs), initials, en route, feeder routes, or segment/areas based on en route criteria. A remote altimeter-setting source is not authorized for a remote distance greater than 75 NM or for an elevation differential between the RASS and the landing area that is greater than 6,000 ft. To determine which adjustment must apply, evaluate the terrain between the RASS and the airport/heliport/vertiport for adverse atmospheric pressure pattern effect. Solicit the best available climatological information from the National Weather Service (NWS), the National Aviation Weather Advisory Unit (NAWAU), the Center Weather Service Unit (CWSU), and the local Flight Service Station (FSS).

Note: When a secondary altimeter source must be specified AND either the primary or secondary altimeter source (or both) is considered remote, establish separate landing minima. If establishing separate minima is impractical, publish a chart note specifying the difference between the MDA/DA for primary and secondary sources.

3.2.2 **c. (1) Where intervening terrain** does not adversely influence atmospheric pressure patterns, *use formula 3-1a* (RASS Adjustment) to compute the basic adjustment in feet. *See figure 3-1a.*

Formula 3-1a. *RASS Adjustment.*
Adjustment = $2.30D_r + 0.14e$ Where "D_r" = horizontal distance (NM), altimeter source to ARP/HRP; and "e" = the elevation differential (ft) between RASS elevation and airport/heliport/vertiport elevation
$2.30*D_r + 0.14*e$
Examples
Airport D_r = 10.8 NM e = 1000 - 800 = 200 ft (2.30 * 10.8) + (0.14 * 200) = 52.84 ft basic RASS adjustment In intermediate segment : 52.84 * 0.6 < 200 (no ROC increase) In PA/APV final segment: DH = 200 + 52.84 = increase DH to 253 In NPA final segment: 1225 (Controlling obs) + 250 ROC + 52.84 = 1540 MDA Heliport D_r = 6.4 NM e = 1200 - 1000 = 200 ft (2.30 * 6.4) + (0.14 * 200) = 42.72 ft basic RASS adjustment In intermediate segment 42.72 * 0.6 < 200 (no ROC increase) In PA/APV final segment: DH = 200 + 42.72 = increase DH to 243 In NPA final segment: 1225 (Controlling obs) + 250 ROC + 42.72 = 1540 MDA

Figure 3-1a. *RASS adjustment.*



3.2.2 **c.** **(2)** **Where intervening terrain** adversely influences atmospheric pressure patterns, an Elevation Differential Area (EDA) must be evaluated. The EDA is defined as an area 5 NM each side of a line connecting the ARP/HRP and the RASS, and includes a circular area enclosed by a 5 NM radius at each end of this line. Use *formula 3-1b* (RASS Adjustment Adverse Terrain) to compute the basic adjustment in feet. *See figure 3-1b.*

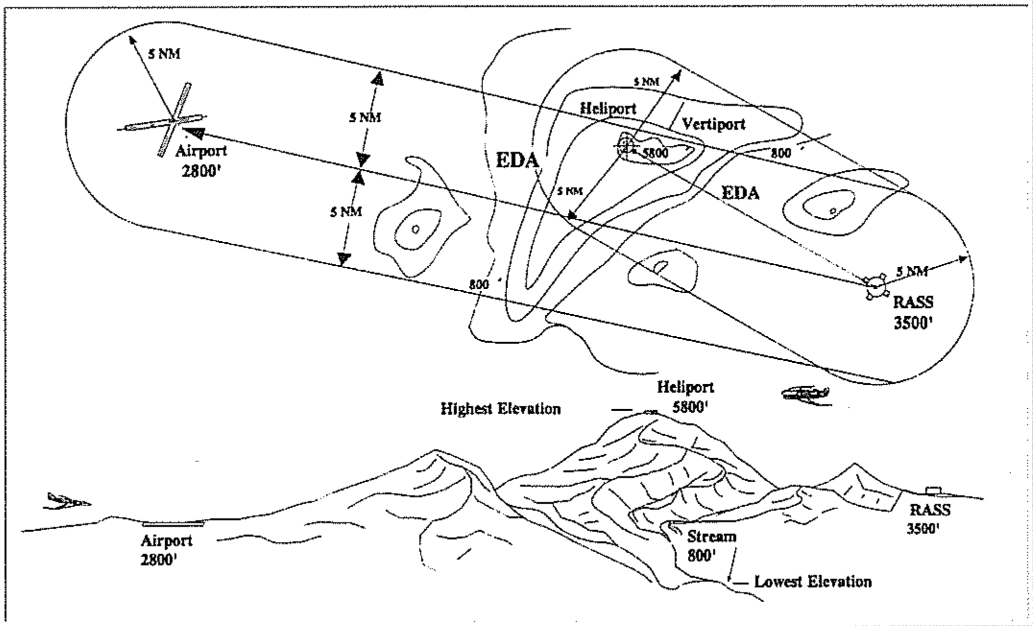
Formula 3-1b. *RASS Adjustment Adverse Terrain.*
Adjustment = $2.30D_r + 0.14E$ Where "D_r" = horizontal distance (NM), altimeter source to ARP/HRP; and "E" = the elevation differential (ft) between lowest and highest elevation points within the EDA
$2.30*D_r + 0.14*E$
Examples
Airport D_r = 25 NM E = 5800 - 800 = 5000 ft (2.30 * 25) + (0.14 * 5000) = 757.5 ft basic RASS adjustment In intermediate segment 757.5 * 0.6 = 454.5 > 200 (254.5 ft ROC increase) In PA/APV final segment: DH = 350 + 757.5 = increase DH to 1108 In NPA final segment: 3052.2 (Controlling obs) + 250 ROC + 757.7 = 4060 MDA Heliport D_r =15 NM E = 5800 - 800 = 5000 ft (2.30 * 15) + (0.14 * 5000) = 734.5 ft basic RASS adjustment In intermediate segment 734.5 * 0.6 = 440.7 > 200 (240.7 ft ROC increase) In PA/APV final segment: DH = 294 + 734.5 = increase DH to 1029 In NPA final segment: 6000 (Controlling obs) + 250 ROC + 734.5 = 7000 MDA

3.2.2 c. (3) **For the intermediate segment,** use 60 percent of the basic adjustment from *paragraphs 3.2.2.c(1) or (2)*, and increase the intermediate segment primary area ROC by the amount this value exceeds 200 ft.

3.2.2 c. (4) **When the missed approach design utilizes a turn at altitude prior to the clearance limit** and a part-time altimeter source is specified, apply RASS adjustment as follows:

3.2.2 c. (4)(a) **Decrease the turning section Obstacle Clearance Surface (OCS) starting height** by the difference between RASS adjustments for the two remote altimeter sources. (Where one altimeter source is local, subtract the full RASS adjustment.) Do not decrease these surface starting heights to less than the OCS at the missed approach point (MAP).

Figure 3-1b. *Elevation Differential Area (EDA) Intervening Terrain Influences Atmospheric Pressure Patterns.*



3.2.2 c. (4)(b) If application of paragraph 3.2.2.c (4) (a) [above] results in an OCS penetration that cannot be resolved by other methods, provide a second climb-to-altitude determined by adding the difference between the RASS adjustments to the climb-to-altitude and rounding to the next higher appropriate increment. This application must not produce a turn altitude above the missed approach clearance-limit altitude.

Example: MISSED APPROACH: Climb to 6000 (6,100 when using Denver Intl altimeter setting) then…

Note: Combination straight-portion length extension is not required to accommodate the worst-case altimeter source.

3.2.2 c. (5) Point in Space (PinS) Approach. When the MAP is more than 5 NM from the PinS approach altimeter-setting source, RASS adjustment must be applied. For application of the RASS formula, define "D_r" as the distance from the altimeter-setting source to the MAP, and define "e", or "E", as in *paragraphs 3.2.2c(1) or (2).*

3.2.2 c. (6) Minimum Reception Altitude (MRA). Where a minimum altitude is MRA based, increase the MRA using the RASS adjustment factor value.

3.2.2 c. (7) Where the altimeter is based on a remote source(s), annotate the procedure and/or publish the appropriate minima lines in accordance with Order 8260.19, *Flight Procedures and Airspace.*

3.2.2 **d. Excessive Length, Nonprecision Final Approach.** When a procedure incorporates a final approach fix (FAF), and the final approach segment (FAS) length FAF-to-MAP exceeds 6 NM (plotted positions), increase FAS primary area ROC 5 ft for each one-tenth NM over 6 NM.

EXCEPTION: If a stepdown fix exists and the remaining segment length is less than 6 NM, the basic FAS ROC may be applied between the stepdown fix and the MAP. *See formula 3-2* (Excessive Length Adjustment).

Formula 3-2. *Excessive Length Adjustment.*
Adjustment = $50(Length_{final} - 6)$ Where $Length_{final}$ = horizontal distance in NM from plotted position of FAF to MAP
$50*(Length_{final}-6)$
Example
Distance FAF to MAP = 6.47 Adjustment = 50(6.47- 6) = 23.5 250 ROC + 23.5 = 273.5 adjusted ROC

Chapter 3. Takeoff and Landing Minimums.
Section Three. Visibility Minimums.

3.3 Visibility Minimums.

3.3.1 Authorization.

3.3.1 a. Straight-in visibility minimums are authorized when:

3.3.1 a. (1) **Applicable straight-in alignment criteria** is met, and

3.3.1 a. (2) **The descent gradient** meets final approach segment descent gradient tolerances.

3.3.1 b. Establish circling visibility minimums when:

3.3.1 b. (1) **Straight-in alignment cannot be met** (e.g., for "Circling-only" procedures not meeting straight-in alignment requirements, *see paragraph 162*).

3.3.1 b. (2) **Straight-in alignment requirements are met,** but descent gradients/angles preclude publication of straight-in minimums (*see paragraph 252*).

3.3.1 b. (3) Published in conjunction with Straight-in minimums.

3.3.2 Establishing Straight-in Visibility Minimums.

3.3.2 a. **STEP 1. Determine MAP/DA to threshold distance** (*see figure 3-3a*):

3.3.2 a. **(1) When the HATh is less than 1,000 ft or the NPA MAP is located at or after the runway threshold,** proceed to *STEP 3*.

3.3.2 a. **(2) For all PA/APV DAs**, determine the shortest distance from the calculated location of the DA to the landing threshold in SM and proceed to *STEP 2*.

3.3.2 a. **(3) When the NPA MAP is located prior to runway threshold**, determine the shortest distance from the plotted position of the MAP and proceed to *STEP 2*.

3.3.2 b. **STEP 2. Publishing "Fly Visual to Airport" (Flight Standards approval required).** When the MAP to threshold or DA to threshold distance is greater than or equal to 3 SM **AND** the HATh is greater than or equal to 1,000 ft, specify visibility as 3 SM and annotate the procedure "Fly visual to airport." *See Order 8260.19, paragraph 855k for charting requirements.*

Note: The FAA, in the preamble to a Title 14 Code of Federal Regulations (14 CFR) Part 91 change, has declared that the Administrator must retain the authority to approve instrument approach procedures where the pilot may not necessarily have one of the visual references specified in Part 91.175, and related rules such as

121.651, 135.225, and 125.381 which refer to and incorporate 91.175. There are other cases where the Administrator's authority to issue special provisions must also be available to approve visual approaches, contact approaches, helicopter procedures, or other items such as waivers for all-weather takeoff and landing research and development. It is NOT a function of procedure design to ensure compliance with Part 91.175. The annotation "Fly Visual to Airport" provides relief from Part 91.175 which should not be granted routinely.

3.3.2 c. **STEP 3. Determine straight-in visibility/RVR from the appropriate table(s).** Find the highest value derived from *tables 3-5a, 3-5b, 3-6, 3-7, and 3-8,* as applicable, and as appropriate to the approach lighting system.

3.3.2 c. **(1) *Table 3-5a* specifies standard civil and military** straight-in minimums. This table applies to all instrument procedures, except aircraft category A and B nonprecision instrument approaches, Category II/III instrument approaches, and helicopters. Lower minimums, based on special equipment or aircrew qualifications, may only be authorized by AFS-400 or DoD approving authorities.

Note: RVR less than 2400 may be authorized at locations without TDZ/CLs or when such system is inoperative, if the approach is flown using a flight director, head-up display (HUD), or coupled to an autopilot. See note 2 on table 3-5a. Authorization must be stated on the procedure.

3.3.2 c. **(2) Use *table 3-6* exclusively for category A straight-in** nonprecision approaches. Use *table 3-7* exclusively for category B straight-in nonprecision approaches.

3.3.2 c. **(3) Use *table 3-8* for category C/D/E straight-in** nonprecision approaches after determining the visibility minimums prescribed by *table 3-5a*. Use the highest value derived from *tables 3-5 and 3-8.*

Note: The lower minimums in table 3-8, i.e., RVR 2400 or ½-mile visibility, are only for procedures meeting the following criteria:

- *The final approach track is offset by no more than 5 degrees for category C/D/E aircraft.*
- *The procedure final approach segment is at least 3 NM in length.*
- *The procedure includes a FAF.*
- *The distance from the FAF to the runway threshold is less than or equal to 8 NM, if the missed approach point is determined by timing.*

3.3.2 d. **STEP 4. Determine visibility based on evaluation of the visual portion of the final approach segment**. Evaluate the visual area associated with each usable runway at an airport. Apply the STANDARD visual area described in *paragraph 3.3.2d(1)(a)* to runways to which an aircraft is authorized to circle (either in association with a SI procedure, or a Circling only). Apply the STRAIGHT-IN area described in *paragraph 3.3.2d(1)(b)* to runways with approach procedures aligned with the runway centerline (less than or equal to ± 0.03°). Apply the OFFSET visual area described in *paragraph 3.3.2d(1)(c)* to evaluate the visual portion of a straight-in approach that is not aligned with the runway centerline (more than ± 0.03°). These evaluations determine if night operations must be prohibited because of close-in unlighted obstacles or if visibility minimums must be restricted.

Note 1: The type of visual area assessment conducted and the subsequent results depend on how the runway is used in relation to the procedure being developed. For example, a runway is served by an approach procedure not aligned with the runway centerline, and is authorized for landing from a circling maneuver on another approach procedure to a different runway receives both standard and offset evaluations. However, it is not necessary to publish the results of a STANDARD area assessment to the runway to which the approach is being developed.

Note 2: Assess the appropriate visual area separately for each conventional/RNAV procedure published as a line of minima on the same approach plate.

3.3.2 d. (1) Area.

3.3.2 d. (1)(a) Standard.

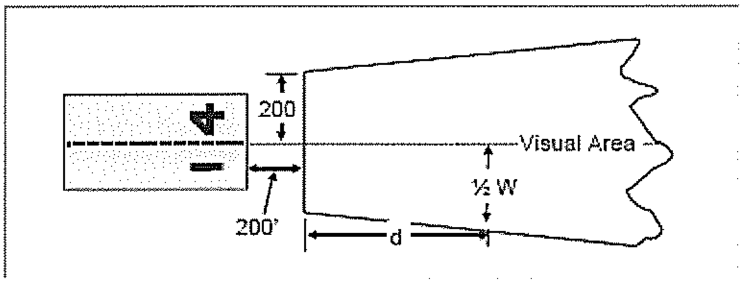
3.3.2 d. (1)(a) 1. Alignment. Align the visual area with the runway centerline extended.

3.3.2 d. (1)(a) 2. Length. The visual area begins 200 ft from the threshold at threshold elevation and extends 10,000 ft out the runway centerline (*see figure 3-2a*).

3.3.2 d. (1)(a) 3. Width. The beginning width of the visual area is 400 ft (200 ft either side of runway centerline) (*see figure 3-2a*). The sides splay outward relative to runway centerline. Calculate the half-width of the area at any distance "d" from its origin using the following formula:

Formula 3-3a. *Standard Visual Area 1/2 width.*
$\frac{1}{2}W = (0.15 \cdot d) + 200'$ Where 1/2W = perpendicular distance from RCL (extended) to edge of area "d" = distance (ft) measure along RCL from area origin
0.15*d + 200

Figure 3-2a. *Standard Visual Area.*



3.3.2 d. (1)(b) Straight-in. (Need not meet straight-in descent criteria)

3.3.2 d. (1)(b) 1. Alignment. Align the visual area with the runway centerline extended.

3.3.2 d. (1)(b) 2. Length. The visual area begins 200 ft from the threshold at threshold elevation and extends to the calculated DA point for each PA or APV procedure and to the VDP location (even if one is not published for NPA procedures). *See Volume. 1, paragraph 253.*

Note: When dual minimums are published, use the lowest MDA to determine VDP location and to determine the length of the visual area for NPA procedure. For PA/APV procedures use each DA based on primary altimeter source to determine the length of the standard area.

3.3.2 d. (1)(b) 3. Width. The beginning width (relative to the runway centerline (RCL) extended) of the visual area at its origin point 200 ft from RWY is ± 200 ft for runways serving only Category A/B aircraft and ± 400 ft for runways serving Category C/D/E aircraft. The sides splay outward relative to RCL (*see figure 3-2b*). Calculate the half-width of the area at any distance "d" from its origin using the following formula:

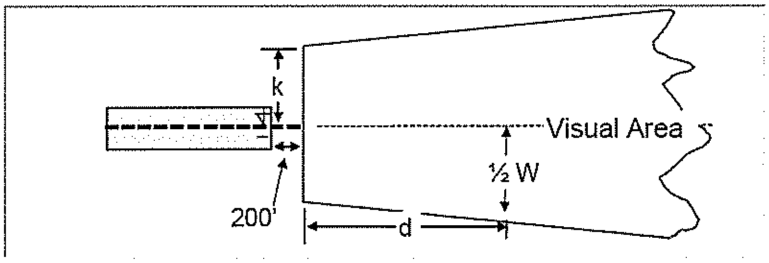
Formula 3-3b. *Straight-in Visual Area 1/2 width.*

$$\frac{1}{2}W=(0.138 \cdot d)+k$$

Where 1/2W = perpendicular distance from RCL (extended) to edge of area
"d" = distance (ft) measure along RCL from area origin
"k" = 200 for Cat A/B, 400 for Cat C/D/E

0.138*d + k

Figure 3-2b. *Straight-in Visual Area.*



3.3.2 d. (1)(c) Offset. When the final course does not coincide with the runway centerline extended (± 0.03°), modify the STANDARD visual area as follows: (*See figure 3-2c*).

STEP A. Draw the area aligned with the RCL as described in *paragraph 3.3.2d(1)*.

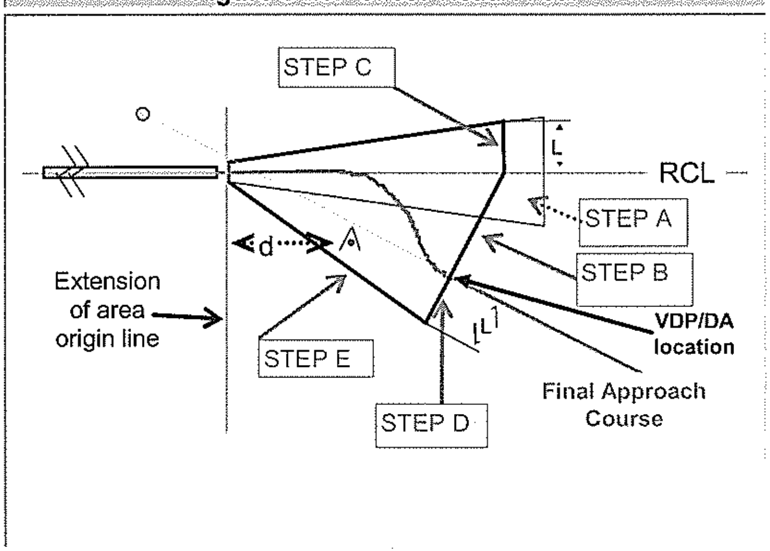
STEP B. Extend a line perpendicular to the final approach course (FAC) from the DA point or visual descent point (VDP) (even if one is not published) to the point it crosses the runway centerline (RCL) extended.

STEP C. Extend a line from this point perpendicular to the RCL to the outer edge of the visual area, noting the length (L) of this extension.

STEP D. Extend a line in the opposite direction of the line in *STEP B* from the DA/VDP perpendicular to the FAC for the distance (L).

STEP E. Connect the end of the line constructed in *STEP D* to the end of the inner edge of the area origin line 200 ft from runway threshold.

Figure 3-2c. *Offset Visual Area.*



3.3.2 **d. (2) Obstacle Clearance.** Two obstacle identification surfaces (OIS) overlie the visual area with slopes of 20:1 and 34:1 respectively. When evaluating a runway for a circling (STANDARD visual area) apply the 20:1 surface only. When evaluating a runway for an approach procedure meeting straight-in FAS alignment criteria (either STRAIGHT-IN or OFFSET visual area) apply both the 20:1 and 34:1 surfaces. Calculate the surface height above threshold at any distance "d" from an extension of the area origin line using the following formulae:

Formula 3-3c. *Visual Area OIS height.*

$$20:1 \text{ Surface Height} = \frac{d}{20}$$

$$34:1 \text{ Surface Height} = \frac{d}{34}$$

Where "d" = distance (ft) measure along RCL from area origin extended

d/20 or d/34

3.3.2 **d. (2)(a) If the 34:1 surface is penetrated**, take **ONE** of the following actions:

3.3.2 d. (2)(a) 1. Adjust the obstacle height below the surface or remove the penetrating obstacles.

3.3.2 d. (2)(a) 2. Limit minimum visibility to ¾ mile/ 4000 RVR.

3.3.2 **d. (2)(b). If the straight-in runway's 20:1 surface is penetrated** (in addition to the 34:1 evaluation), take **ONE** of the following actions:

3.3.2 d. (2)(b) 1. Adjust the obstacle height below the surface or remove the penetrating obstacles.

3.3.2 d. (2)(b) 2. Do not publish a VDP, limit minimum visibility to 1 mile/5000 RVR, and take action to have the penetrating obstacles marked and lighted.

3.3.2 d. (2)(b) 3. Do not publish a VDP, limit minimum visibility to 1 mile/5000 RVR, and publish a note denying the approach (both straight-in and circling) to the affected runway at night [*also see paragraph 3.3.2d(2)(d)*].

3.3.2 **d. (2)(c) 20:1 Surface Penetrations (circling runways).** Mark and light the penetrating obstacles or publish a note denying night circling to the affected runway (except as noted below).

3.3.2 **d. (2)(d) 20:1 Surface Penetrations** are sometimes impossible to mark and light. In these cases **ONLY**, nighttime operations may continue where an operating VGSI set at an angle ≥3 degrees serves the runway and its associated OCS is verified to be clear. The approach chart must be annotated to indicate the straight-in approach procedure or circling operation (as appropriate) is not authorized at night when the VGSI is inoperative.

3.3.2 e. STEP 5. Establish SI visibility/RVR as the highest value determined from *STEPS 2 - 4.*

3.3.2 e. (1) When published visibility/RVR minima takes approach lighting system credit, determine the applicable "no light" (NALS) values from the applicable table, then compare against the sum of the "'with lights" value from the preceding steps plus the increase specified by the "Inoperative Components and Visual Aids" table. When the inoperative components table is not applicable (i.e., light credit not taken) **OR** when the sum is not equal to or greater than the applicable NALs visibility/RVR, annotate the procedure according to *Order 8260.19 paragraph 854m(3).*

3.3.2 e. (2) The SI visibility for any standard NPA procedure may not be less than RVR 2400 or ½ mile.

3.3.2 e. (3) The maximum published RVR value is 6,000 ft.

Table 3-5a. *Minimum Visibility Values, All Procedures/Aircraft Categories (except category A and B nonprecision approaches, CAT II/III, and helicopters).*

	FALS			IALS			BALS			NALS		
HATh Range	RVR	SM	M	RVR	SM	M	RVR	SM	M	RVR	SM	M
200	1800[1,2]	3/8	550	2600	1/2	750	3000	5/8	1000	4000	3/4	1200
201 - 210	1800[1,2]	3/8	550	2600	1/2	750	3000	5/8	1000	4000	3/4	1200
211 - 220	1800[1,2]	3/8	550	2600	1/2	800	3500	5/8	1000	4000	3/4	1200
221 - 230	1800[1,2]	3/8	550	2600	1/2	800	3500	5/8	1000	4000	3/4	1200
231 - 240	1800[1,2]	3/8	550	2800	1/2	800	3500	5/8	1000	4000	3/4	1200
241 - 250	1800[1,2]	3/8	550	2800	1/2	800	3500	5/8	1000	4000	3/4	1300
251 - 260	1800[1,2]	3/8	600	2800	1/2	800	3500	5/8	1100	4000	3/4	1300
261 - 280	2000[2]	3/8	600	3000	5/8	900	3500	5/8	1100	4500	7/8	1300
281 - 300	2200[2]	3/8	650	3000	5/8	900	4000	3/4	1200	4500	7/8	1400
301 - 320	2400	1/2	700	3500	5/8	1000	4000	3/4	1200	4500	7/8	1400
321 - 340	2600	1/2	800	3500	5/8	1100	4500	7/8	1300	5000	1	1500
341 - 360	3000	5/8	900	4000	3/4	1200	4500	7/8	1400	5500	1	1600
361 - 380	3500	5/8	1000	4000	3/4	1300	5000	1	1500	5500	1	1700
381 - 400	3500	5/8	1100	4500	7/8	1400	5000	1	1600	6000	1 1/8	1800
401 - 420	4000	3/4	1200	5000	1	1500	5500	1	1700	6000	1 1/8	1900
421 - 440	4000	3/4	1300	5000	1	1600	6000	1 1/8	1800		1 1/4	2000
441 - 460	4500	7/8	1400	5500	1	1700	6000	1 1/8	1900		1 3/8	2100
461 - 480	5000	1	1500	6000	1 1/8	1800		1 1/4	2000		1 3/8	2200
481 - 500	5000	1	1500	6000	1 1/8	1800		1 1/4	2100		1 3/8	2300
501 - 520	5500	1	1600		1 1/4	1900		1 3/8	2100		1 3/8	2400
521 - 540	5500	1	1700		1 1/4	2000		1 3/8	2200		1 1/2	2400
541 - 560	6000	1 1/8	1800		1 3/8	2100		1 3/8	2300		1 5/8	2500
561 - 580		1 1/4	1900		1 3/8	2200		1 1/2	2400		1 5/8	2600
581 - 600		1 1/4	2000		1 3/8	2300		1 5/8	2500		1 3/4	2700
601 - 620		1 3/8	2100		1 1/2	2400		1 5/8	2600		1 3/4	2800
621 - 640		1 3/8	2200		1 1/2	2500		1 3/4	2700		1 3/4	2900
641 - 660		1 3/8	2300		1 5/8	2600		1 3/4	2800		1 7/8	3000
661 - 680		1 1/2	2400		1 3/4	2700		1 3/4	2900		1 7/8	3100
681 - 700		1 1/2	2500		1 3/4	2800		1 7/8	3000		2	3200
701 - 720		1 5/8	2600		1 3/4	2900		1 7/8	3100		2	3300
721 - 740		1 5/8	2700		1 3/4	3000		2	3200		2	3400
741 - 760		1 3/4	2700		1 7/8	3000		2	3300		2	3500
761 - 800		1 3/4	2900		2	3200		2	3400		2 1/2	3600
801 - 850		1 7/8	3100		2	3400		2 1/2	3600		2 1/2	3800
851 - 900		2	3300		2 1/2	3600		2 1/2	3800		2 1/2	4000
901 - 950		2	3600		2 1/2	3900		2 1/2	4100		2 5/8	4300
951 - 1000		2 1/2	3800		2 1/2	4100		2 1/2	4300		3	4500
1001 - 1100		2 1/2	4100		2 1/2	4400		3	4600		3	4900
1101 - 1200		3	4600		3	4900		3	5000		3	5000
1201 - Above		3	5000		3	5000		3	5000		3	5000

[1] *RVR 1800 (550 m) is authorized for precision category I operations at 200-260 ft HATh, with TDZ/CL lights. Specify RVR 1800. No chart annotation required.*

[2] *RVR values less than 2400 (750 m) are authorized for precision category I operations to runways without TDZ/CL lights, provided there is unrestricted lateral and vertical navigation guidance to the DA/H (i.e., no flight inspection restrictions on localizer or glideslope), a TCH not greater than 60 ft, and the approach is flown using a flight director, HUD or coupled to an autopilot. Specify RVR 2400 and annotate the chart indicating that the RVR appropriate to the HATh is authorized with use of flight director, HUD or coupled autopilot to DA.*

Table 3-5b. *DoD Standard Minimums PAR with HATh < 200 ft (all CATs).*											
NO LIGHTS			ALS TDZ/CL			ALS/SSALR/SALS/ SSALR			MALSR/MALS/ODALS		
RVR	SM	M	RVR	SM	M	RVR	SM	M	RVR	SM	M
2400	1/2	750	1200	-	350	1600	1/4	500	2400	1/2	750

Table 3-6. *Minimum Visibility/RVR for Nonprecision Approach Procedures (i.e., No Vertical Guidance). Category A*												
NDB, VOR, VOR/DME, TACAN, LOC, LOC/DME, LDA, ASR, LP, and LNAV												
HATh/HAA	**LIGHTING FACILITIES**											
	FALS*			**IALS**			**BALS**			**NALS**		
	RVR	SM	M	RVR	SM	M	RVR	SM	M	RVR	SM	M
250-880	2400	1/2	750	4000	3/4	1200	4000	¾	1200	5500	1	1600
881 and above	4000	3/4	1200	5500	1	1600	5500	1	1600	6000	1 1/4	2000

** **FALS** - For NDB approaches, raise visibility values by 1/4 SM (i.e., use IALS column)*

Table 3-7. *Minimum Visibility/RVR for Nonprecision Approach Procedures (i.e., No Vertical Guidance). Category B*												
NDB, VOR, VOR/DME, TACAN, LOC, LOC/DME, LDA, ASR, LP, and LNAV												
HATh/HAA	**LIGHTING FACILITIES**											
	FALS*			**IALS**			**BALS**			**NALS**		
	RVR	**SM**	**M**	**RVR**	**SM**	**M**	**RVR**	**SM**	**M**	**RVR**	**SM**	**M**
250-740	2400	1/2	800	4000	3/4	1200	4000	3/4	1200	5500	1	1600
741-950	4000	3/4	1200	5500	1	1600	5500	1	1600	6000	1 1/4	2000
951 and above	5500	1	1600	6000	1 1/4	2000	6000	1 1/4	2000		1 1/2	2400

** **FALS** - For NDB approaches, raise visibility values by 1/4 SM (i.e., use IALS column).*

Table 3-8. *Minimum Visibility/RVR for Nonprecision Approach Procedures (i.e., No Vertical Guidance). Category C/D/E*						
Procedure Conditions:	**- Final Course-RWY C/L offset: < = 5° - Final Approach segment > = 3 NM - With FAF procedure - **FAF to RWY TH < = 8 NM (**Timed approaches ONLY)**			**ALL OTHERS**		
A/C CATEGORY	**RVR (ft)**	**Prevailing Visibility (SM)**	**(m)**	**RVR (ft)**	**Prevailing Visibility (SM)**	**(m)**
C/D/E	**2400**	**1/2**	**750**	**4000**	**3/4**	**1200**

3.3.3 Establishing Circling Visibility Minimums

3.3.3 a. **<u>STEP 1</u>.** Determine MAP to nearest landing surface distance (*see figure 3-3b*):

3.3.3 a. (1) When published in conjunction with Straight-in minimums. [*paragraph 3.3.1b(3)]* or when the HAA is less than 1,000 ft proceed to *STEP 3*.

3.3.3 a. (2) **For "Circling-only" procedures not meeting straight-in alignment requirements *[paragraph 3.3.1b(1)]*.** When the MAP is located prior to nearest landing surface, measure the shortest distance from the plotted position of the MAP in SM (*see figure 3-3b*) and proceed to *STEP 2*. When the landing surfaces are encountered prior to the MAP, proceed to *STEP 3*.

3.3.3 a. (3) **When Straight-in alignment requirements are met,** but descent gradients/ angles preclude publication of straight-in minimums *[paragraph 3.3.1b(2)]*. Apply *paragraph 3.3.2a (see figure 3-3a)* to determine the distance and proceed to *paragraph 3.3.2b STEP 2*.

3.3.3 b. **<u>STEP 2</u>. Publishing "Fly Visual to Airport" (Flight Standards approval required).** When the MAP to nearest landing surface distance is greater than or equal to 3 SM **<u>AND</u>** the HAA is greater than or equal to 1,000 ft, specify visibility as 3 SM and annotate the procedure "Fly visual to airport." *See Order 8260.19, paragraph 855k for charting requirements.*

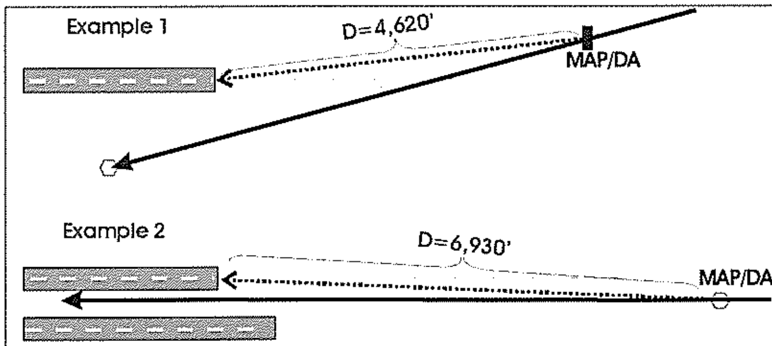
<u>Note</u>: The FAA, in the preamble to a Title 14 Code of Federal Regulations (14 CFR) Part 91 change, has declared that the Administrator must retain the authority to approve instrument approach procedures where the pilot may not necessarily have one of the visual references specified in Part 91.175, and related rules such as 121.651, 135.225, and 125.381 which refer to and incorporate 91.175. There are other cases where the Administrator's authority to issue special provisions must also be available to approve visual approaches, contact approaches, helicopter procedures, or other items such as waivers for all-weather takeoff and landing research and development. It is NOT a function of procedure design to ensure compliance with Part 91.175. The annotation "Fly Visual to Airport" provides relief from Part 91.175 which should not be granted routinely.

3.3.3 c. **<u>STEP 3</u>.** Determine circling visibility/RVR from the appropriate table(s). Find the <u>highest</u> value from *tables 3-9, 3-10, and 3-11*.

3.3.3 c. **(1) *Table 3-9* specifies the lowest civil and military HAA** and visibility authorized for circling approaches. If the computed HAA is greater than the minimum specified in *table 3-9*, refer to *table 3-10* to determine the minimum visibility based on the resultant HAA applicable to the appropriate aircraft category. In addition, *table 3-11* specifies the minimum visibility based on facility to runway distance and is applicable to circling visibility for conventional NPA procedures.

3.3.3 d. **<u>STEP 4</u>.** Determine **visibility based on evaluation of the visual** portion of the final approach segment (*see paragraph 3.3.2d*).

Figure 3-3a. *SI Alignment and SI with Circling Minimums.*



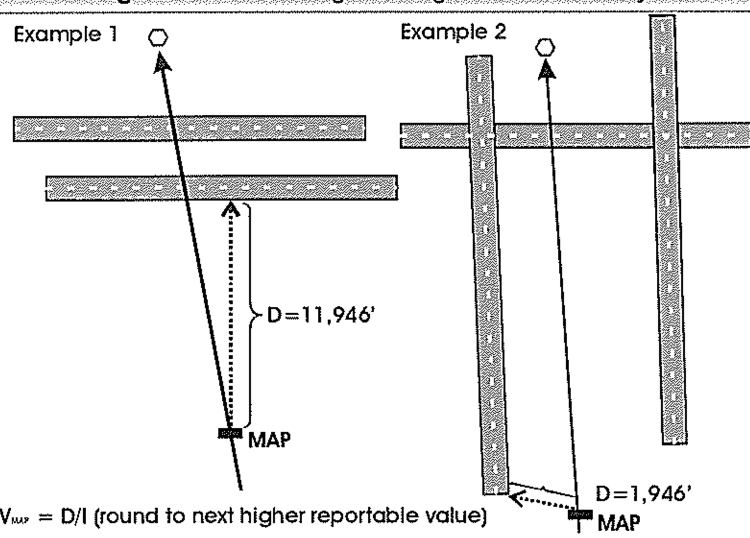
V_{MAP} = D/I (round to next higher reportable value)

Where
D = Shortest distance from MAP/DA to threshold
I = statue mile increment in feet (i.e. 1/8 = 660' 1/4 = 1,320', etc.)

Example 1
V_{MAP} = 4,620/660' = 7
V_{MAP} = 7/8th SM

Example 2
V_{MAP} = 6,930/1,320' =5.25
V_{MAP} = 5.25/4 (round up to 1 ½ SM)

Figure 3-3b. *Circling Not Aligned with Runway.*



V_{MAP} = D/I (round to next higher reportable value)

Where
D = Shortest distance from MAP to nearest landing surface
I = statue mile increment in feet (i.e. 1/8 = 660' 1/4 = 1,320', etc.)

Example 1
V_{MAP} = 11,946'/1320= 9.05
V_{MAP} = 9.05/4 (round up to 2 ½ SM)

Example 2
V_{MAP} = 1,946'/660' =3=2.95
V_{MAP} = 2.95/8 (round up to 3/8 SM)

Table 3-9. *Lowest Authorized Circling HAA and Visibility/RVR.*

Aircraft Category	A	B	C	D	E
Height Above Airport Elevation in Feet	350	450	450	550	550
Visibility in SM/meters	1 / 1600		1 1/2 / 2400	2 / 3200	

Table 3-10. *Effect of HAA on Circling Visibility Minimums.*

HAA (ft)	**351 - 810**				**811 & ABOVE**		
CAT A	1				1 1/4		
HAA (ft)	**451 - 810**				**811 - 950**		**951 & ABOVE**
CAT B	1				1 1/4		1 1/2
HAA (ft)	**451 - 600**	**601 - 670**	**671 - 740**	**741 - 810**	**811 - 880**	**881 - 950**	**951 & ABOVE**
CAT C	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
HAA (ft)	**551 - 670**		**671 - 740**	**741 - 810**	**811 - 880**	**811 & ABOVE**	
CAT D	2		2 1/4	2 1/2	2 3/4	3	
HAA (ft)	**551 - 600**	**601 - 670**	**671 - 740**	**741 - 810**	**811 & ABOVE**		
CAT E	2	2 1/4	2 1/2	2 3/4	3		

Table 3-11. *Facility Distance Effect on Circling Visibility Minimums.*

NAVAID TYPE	CAT	DISTANCE FROM FACILITY TO MAP OR NEAREST LANDING SURFACE (whichever is farther)				
		0 – 10 NM	**> 10 – 15 NM**	**> 15 - 20 NM**	**> 20 - 25 NM**	**> 25 - 30 NM**
ASR	**A**	1	1	1	N/A	N/A
	B	1	1 1/4	1 1/4	N/A	N/A
	C	1	1 1/2	1 1/2	N/A	N/A
	D/E	1	2	2	N/A	N/A
NDB DF	**A**	1	1	N/A	N/A	N/A
	B	1	1 1/4	N/A	N/A	N/A
	C	1	1 1/2	N/A	N/A	N/A
	D/E	1	2	N/A	N/A	N/A
VOR/TACAN LOC SDF LDA	**A**	1	1	1	1	1
	B	1	1	1	1 1/4	1 1/4
	C	1	1	1 1/4	1 1/2	1 1/2
	D/E	1	1 1/4	1 1/2	1 3/4	2

3.3.3 e. <u>STEP 5</u>. **Applicable only when required to permit circling** from a straight-in aligned procedure *[paragraph 3.3.1b(2)]*, compare circling visibility to the SI visibility.

3.3.3 e. (1) **The circling visibility must not be less than published SI no-light visibility** of the highest NPA line of minima published on the same chart. When PA or APV procedures are published standalone, i.e., without an accompanying NPA line of minima, the circling visibility must not be less than the SI no-light visibility of the highest PA or APV line of minima published on the same chart.

Note: *When dual minimums are authorized, the circling visibility is compared against the SI MDA associated with the corresponding minima set (i.e., circling with stepdown minimums checked against SI with stepdown minimums.*

3.3.3 **f.** **STEP 6. Establish circling visibility** as the highest value determined from *STEPS 2-5* (as applicable).

Chapter 3. Takeoff and Landing Minimums.
Section Four. Alternate Minimums.

3.4. **Establishing Alternate Minimums (Other than Standard).** Establish alternate minimums (other than standard) for **each** applicable aircraft category whenever the ceiling and/or visibility of the *highest no-light minimums (category specific) exceed the standard specified in *table 3-12*.

*Note: * Highest set when more than one set (e.g. dual minimums) published (remote altimeter not applicable).*

3.4. a. **ILS and LOC alternate minimums are specified separately.** Alternate minimums for RNAV procedures are based on the no-light minimums of the highest NPA line when published. Otherwise base RNAV alternate minimums on no-light minimums of the highest APV line.

3.4 b. **Published alternate minimums** may be no lower than the applicable circling ceiling and/or visibility. *See Order 8260.19 and appropriate DoD directives for additional guidance.*

3.4. c. **When only the ceiling or visibility of the highest minimums exceeds** the *table 3-12* standard, use the higher values. *See table 3-12 example.*

Table 3-12. *Standard Alternate Minimums.*

Approach Type	Ceiling	Visibility
NPA or APV	800	2
PA	600	2

Example (PA)

Highest Ceiling/Visibility	Alternate Minimums
CAT A/B = 700 – 1 1/4	Not Published (Ceiling/Vis < Standard)
CAT C = 700 – 2 1/4	800 – 2 1/4
CAT D = 900 – 2 1/2	900 – 2 1/2

Chapter 3. Takeoff and Landing Minimums.
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3.5 Standard Takeoff Minimums.

Title 14 CFR Part 91.175 (f) civil takeoff minimums relate to the number of engines on the aircraft as shown in *table 3-13*. However, a ceiling value may also be required to see and avoid an obstacle. In this case, the published procedure must identify the location of the obstacle(s) that must be avoided. See Order 8260.46, *Departure Procedure (DP) Program*, or appropriate DoD directives for guidance on how and when other than standard takeoff minimums and/or obstacles are defined. Takeoff minimums for DoD operations must be as stated in the appropriate service directives.

Table 3-13. *Standard Civil Takeoff Minimums.*

Number of Engines	Visibility (SM)
1 or 2	1
3 or more	1/2