ORDER **U.S. DEPARTMENT OF TRANSPORTATION**
FEDERAL AVIATION ADMINISTRATION

8260.45A

7/14/00

SUBJ: **TERMINAL ARRIVAL AREA (TAA) DESIGN CRITERIA**

SECTION 1. GENERAL

1.0 PURPOSE.

This order defines TAA design criteria and establishes the Basic T segment configuration as standard for area navigation (RNAV) approach procedures within the TAA.

2.0 DISTRIBUTION.

This order is distributed in Washington headquarters to the branch level in the Offices of Airport Safety and Standards and Communications, Navigation, and Surveillance Systems; to Air Traffic, Airway Facilities, and Flight Standards Services; to the Aeronautical Information Division, ATA-100; to the National Flight Procedures Office, AVN-100, and the Regulatory Standards Division, AMA-200, at the Mike Monroney Aeronautical Center; to branch level in the regional Flight Standards, Airway Facilities, Air Traffic, and Airports Divisions; special mailing list ZVS-827, and to Special Military and Public Addressees.

3.0 CANCELLATION.

Order 8260.45, Terminal Arrival Area (TAA) Design Criteria, dated November 4, 1997, is canceled.

4.0 EFFECTIVE DATE. March 21, 2000.

5.0 BACKGROUND.

Historically, transition from en route flight to the terminal environment required specific ground tracks defined by ground based navigational aids (NAVAID's). These transitions were difficult to develop in areas where terrain features interfered with signal propagation and reception. The advent of RNAV navigation systems independent of conventional ground NAVAID's created the possibility of establishing a new transition system. Efforts toward standardization of efficient approach segment configurations generated the TAA random arrival concept.

Distribution: A-W(AS/ND/AT/AF/FS)-3; ATA-100 (15 CYS); AVN-100 (150 CYS); AMA-200 (80 CYS); A-X(FS/AF/AT/AS)-3; ZVS-827; Special Military and Public Addressees

Initiated By: AFS-420

6.0 EXPLANATION OF CHANGES.

Implementation of the original TAA concept was delayed due to design complexity and charting constraints. This change is the result of an ad hoc committee's recommendations to resolve these issues. Significant areas of new direction, guidance, and policy included in this change are as follows:

6.1 **CRITERIA FOR MINIMUM SAFE/SECTOR ALTITUDE (MSA)** development deleted. MSA's are not required when a TAA is developed.

6.2 **CRITERIA FOR INITIAL SEGMENT ALIGNMENT** to the intermediate segment are expanded to allow alternative alignment within +/- 30° of the desired 90°.

6.3 **TAA BOUNDARIES** are more clearly defined.

6.4 **SECTOR SIZE AND STEPDOWN** arc criteria limitations clarified.

6.5 **BUFFER AREAS FOR OBSTRUCTION CLEARANCE** more clearly defined.

6.6 **HOLDING PATTERN LEG LENGTH CRITERIA** modiified to specify leg lengths in NM.

6.7 **COURSE REVERSAL SECTOR CRITERIA** changed to specify a holding pattern in lieu of a procedure turn.

6.8 **CONTROLLED AIRSPACE REQUIREMENTS** made more stringent and policy added to delay TAA implementation until airspace rule-making actions are complete.

6.9 **FORMS COMPLETION** instructions clarified.

7.0 APPLICABLE DIRECTIVES.

Orders 8260.3B, United States Standard for Terminal Instrument Procedures (TERPS); 8260.38A, Civil Utilization of Global Positioning System (GPS); 8260.40B, Flight Management System (FMS) Instrument Procedures Development; and 8260.19C, Flight Procedures and Airspace, apply unless otherwise noted.

SECTION 2. TAA AND APPROACH SEGMENT CONSTRUCTION

8.0 MINIMUM SAFE/SECTOR ALTITUDE (MSA).

Do not publish an MSA for an approach with a TAA.

8.1 INITIAL, INTERMEDIATE, FINAL, AND MISSED APPROACH SEGMENTS.

The following application guidelines are specific to the TAA. The Basic T approach segment configuration, as described below, is the standard configuration for transition from the en route to the terminal environment. Deviations from the Basic T configuration should be made only when absolutely necessary.

8.1.1 Initial Alignment to the Intermediate Segment.

The OPTIMUM alignment of the initial segment to the intermediate segment is 90° (USAF: alignment shall **not** exceed 90°). See figure 1A. Allowable alternative alignment is within 30° of the optimum alignment; however, this deviation should be used only when necessary for obstruction or airspace constraints (see figure 1B). Determine the minimum length of the T initial segments by referring to **table 1**. Use the value for the highest approach category published on the procedure. Descent gradient considerations may require longer segment lengths. Maximum leg length is 10 NM. If initial segment descent gradient criteria cannot be met, eliminate the T initial

Figure 1A. BASIC T

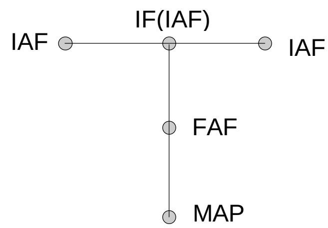
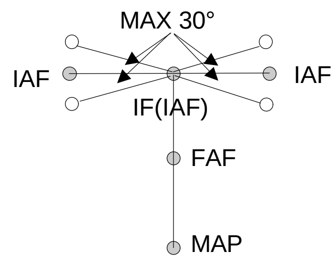


Figure 1B. Basic T Initial Segment Alignment Alternatives



approach fix (IAF). Then, aircraft arriving from the direction of the eliminated T IAF will fly the course reversal holding pattern (see figure 1C). For parallel runway configurations, construct T IAF's so that they serve all parallel intermediate segments (see figure 1D).

Figure 1C. Basic T
With an IAF Eliminated

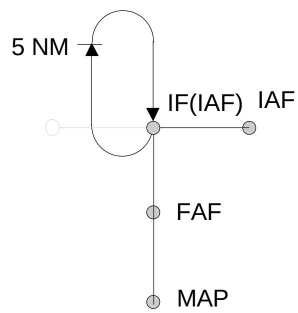


Figure 1D. BASIC T
Parallel Runway Application

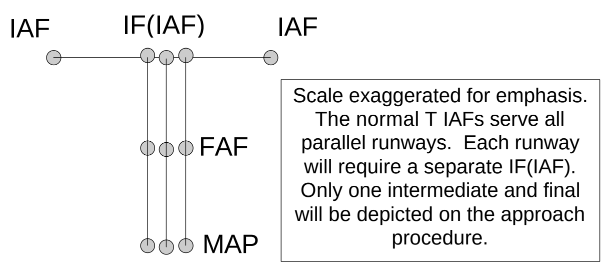


Table 1. Minimum Initial
Segment Length

Category	Minimum Length (NM)
A	3
B	4
C	5
D	5
E	6

8.1.2 Intermediate Alignment to the Final Segment.

Align the intermediate segment with the final segment; i.e., turns over the final approach fix (FAF) are not allowed.

8.1.3 Establish a holding pattern at the IF(IAF).

The inbound holding course shall be aligned with the inbound intermediate course (see figure 1C). Express all RNAV holding patterns in nautical mile (NM) leg lengths vice timed holding under Order 7130.3, Holding Pattern Criteria.

8.1.4 Missed Approach Segments.

OPTIMALLY, construct missed approach segments to allow a "direct entry" into a missed approach holding pattern as illustrated in figure 2A. If the missed approach routing terminates at a T IAF, OPTIMUM alignment of the missed approach holding pattern is with the initial inbound course, with a direct entry into holding (see figure 2B).

Figure 2A. OPTIMUM Missed Approach Holding

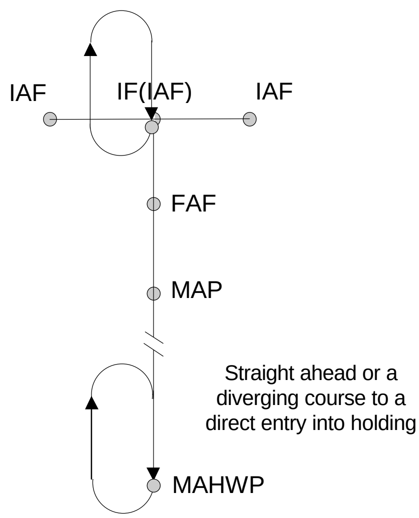
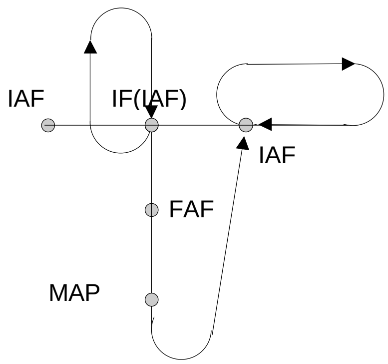


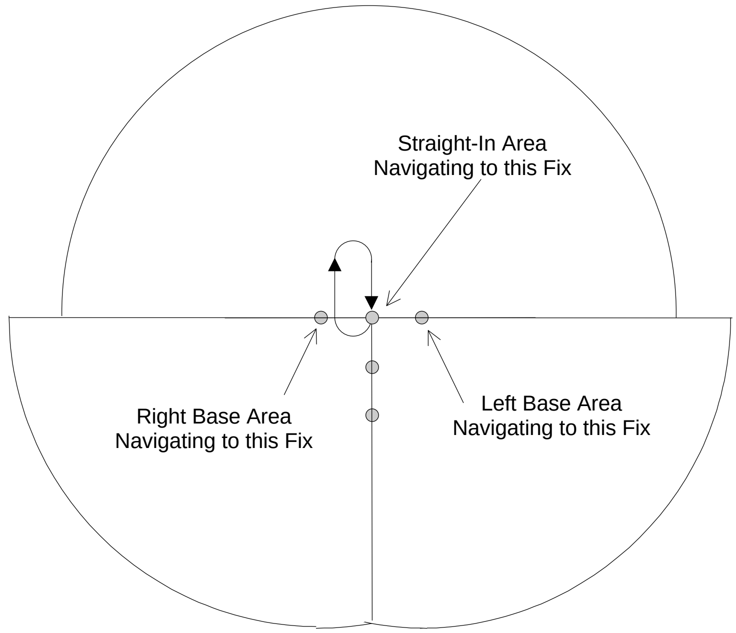
Figure 2B. Missed Approach Holding at an IAF



8.2 STANDARD TAA AREAS.

The standard TAA contains three areas defined by the basic T segment centerline extensions: the straight-in area, right base area, and the left base area (see figure 3A). The TAA boundaries shall coincide with procedure flight tracks; e.g., the boundary between the straight-in area and either base area shall be the initial segment centerline extended; and the boundary between base areas shall be the intermediate segment centerline extended.

Figure 3A. Standard TAA



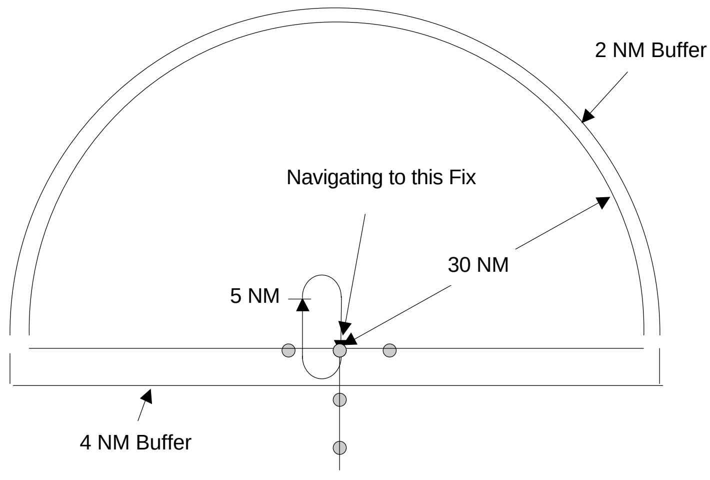
8.2.1 Straight-In Area.

The arc boundary of the straight-in area is equivalent to a feeder fix. When crossing the boundary or when released by ATC within the straight-in area, an aircraft is expected to proceed direct to the IF(IAF).

8.2.1 **a. Construction.** Draw a straight line through the T IAF's, extending 30 NM in each direction from the IF. Then, on the side of the line away from the airport, scribe a 30-NM arc centered on the IF connecting the straight-line end points (see figure 3B).

8.2.1 **b. Obstacle Clearance.** The area considered for obstacle clearance includes the entire straight-in area and its associated buffer areas (see figure 3B). TERPS paragraph 1720 applies.

Figure 3B. Straight-In Area



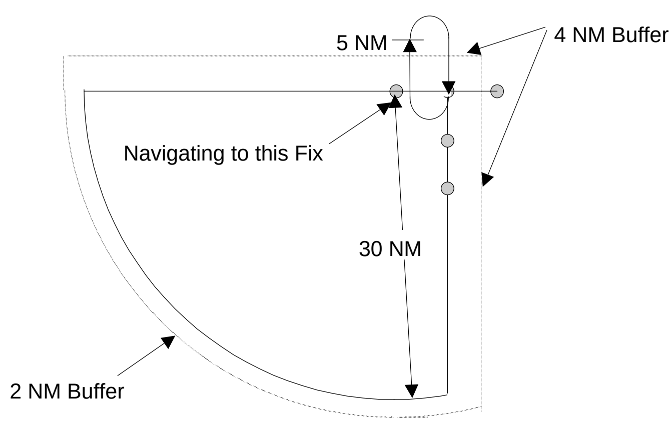
8.2.2 Right Base Area.

The arc boundary of the right base area is equivalent to a feeder fix. When crossing the boundary or when released by ATC within the right base area, an aircraft is considered at the feeder fix and is expected to proceed direct to the IAF.

8.2.2 **a. Construction.** To construct the top boundary, extend the line from the IF through the T IAF for 30 NM beyond the T IAF. Draw a 30-NM arc, centered on the T IAF, from the end point of the top boundary counter-clockwise to the point it intersects a straight-line extension of the intermediate course (see figure 3C).

8.2.2 **b. Obstacle Clearance.** The area considered for obstacle clearance includes the entire right base area and its associated buffer areas. TERPS paragraph 1720 applies.

Figure 3C. Right Base Area



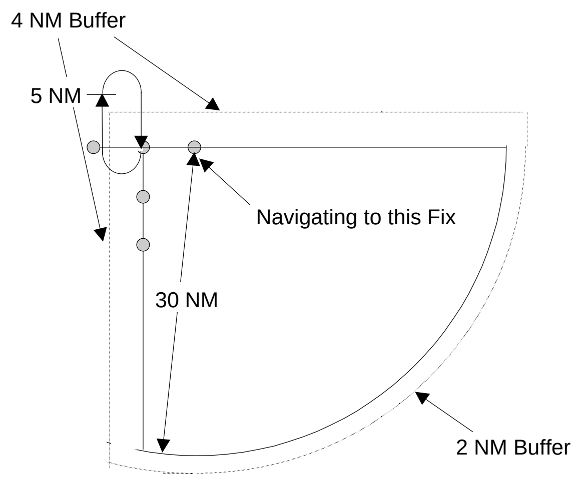
8.2.3 Left Base Area.

The arc boundary of the left base area is equivalent to a feeder fix. When crossing the boundary or when released by ATC within the left base area, an aircraft is considered at the feeder fix and is expected to proceed direct to the IAF.

8.2.3 **a. Construction.** To construct the top boundary, extend the line from the IF through the T IAF for 30 NM beyond the T IAF. Draw a 30-NM arc, centered on the T IAF, from the end point of the top boundary clockwise to the point it intersects a straight-line extension of the intermediate course (see figure 3D).

8.2.3 **b. Obstacle Clearance.** The area considered for obstacle clearance includes the entire left base area and its associated buffer areas. TERPS paragraph 1720 applies.

Figure 3D. Left Base Area



8.3 ALTITUDE SELECTION WITHIN THE TAA.

OPTIMALLY, all TAA areas, course reversal holding pattern, and initial segment minimum altitudes should be the same. All NoPT routings shall join the IF(IAF) at a common altitude. When terrain or operational constraints force high area altitudes that do not allow descent within gradient limits, the course reversal pattern at the IF(IAF) shall allow descent from the highest minimum sector altitude to the common IF(IAF) altitude.

8.3.1 Sectors/Stepdown Arcs.

When necessary to accommodate terrain diversity, operational constraints, or excessive descent gradients, the straight-in, left, and right base areas may be subdivided to gain relief, within the limitations noted below. Stepdown arcs, when used, shall be no closer than 4 NM from the waypoint (WP) upon which the arc is based and must be a minimum of 4 NM from the TAA outer boundary.

8.3.1 **a. Straight-in Area.** The straight-in area may be divided into as many as three sectors defined radially by magnetic inbound course to the IF(IAF). Each sector may be further sub-divided by a single stepdown arc centered on the IF(IAF). The minimum sector size shall be 30°; except the minimum sector size shall be 45° when the sector contains a stepdown arc and its radial boundaries terminate at the IF(IAF) (see figures 4A through 4D).

8.3.1 **b. The left and right base areas may not be radially sectored.** Only stepdown arcs (centered on the fix that defines the area) may be used, but are limited to one per sector (see figures 4A through 4D).

Figure 4A. A Sectorized TAA with Stepdown Arcs

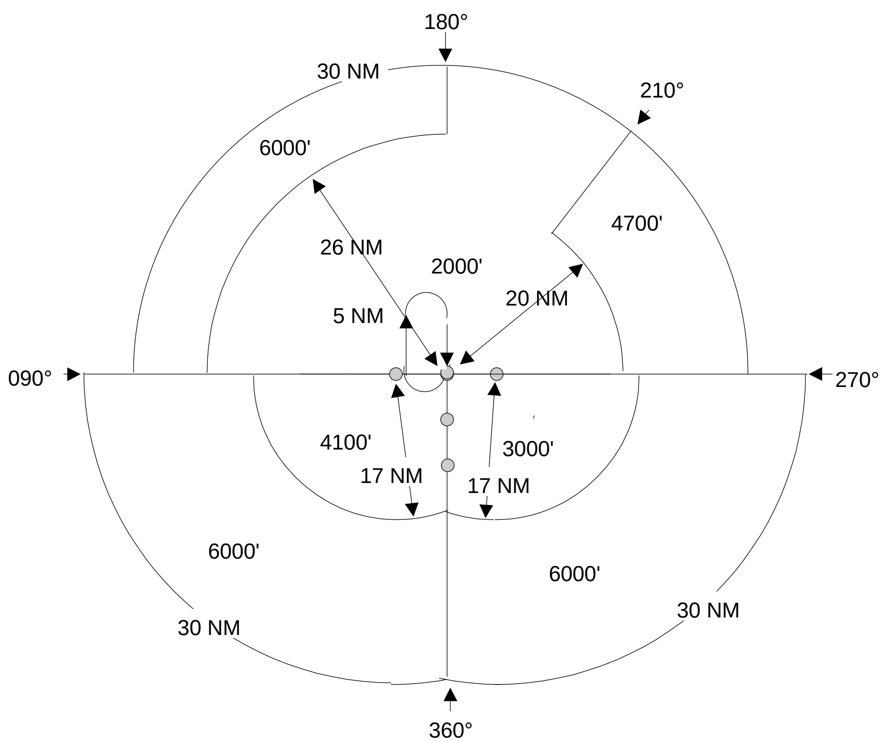


Figure 4B. TAA Maximum Sectorization with Maximum Stepdown Arcs

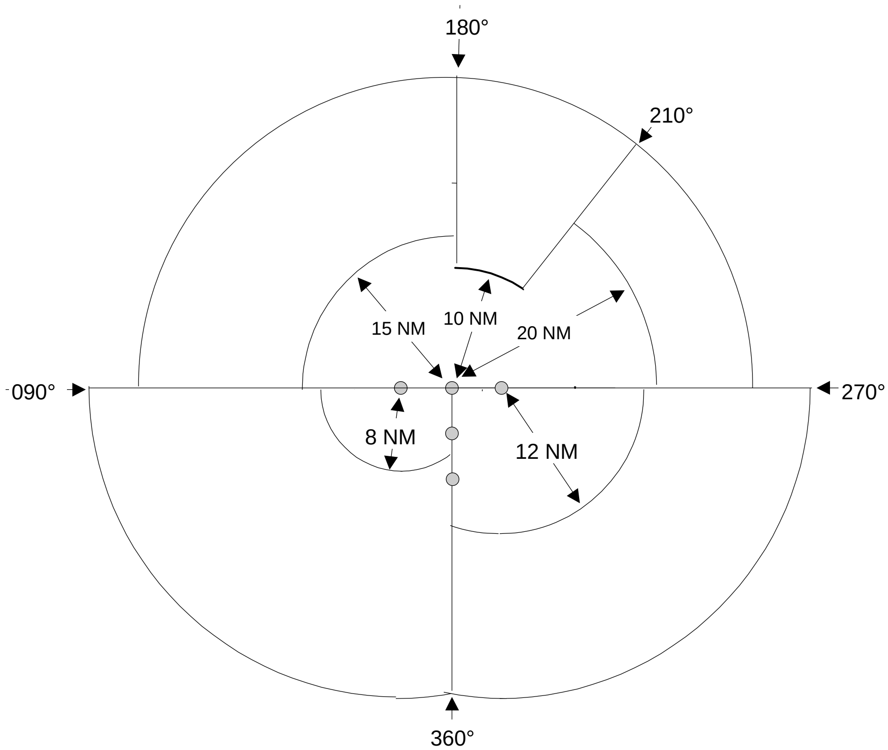


Figure 4C. TAA Maximum Sectorization with Maximum Stepdown Arcs

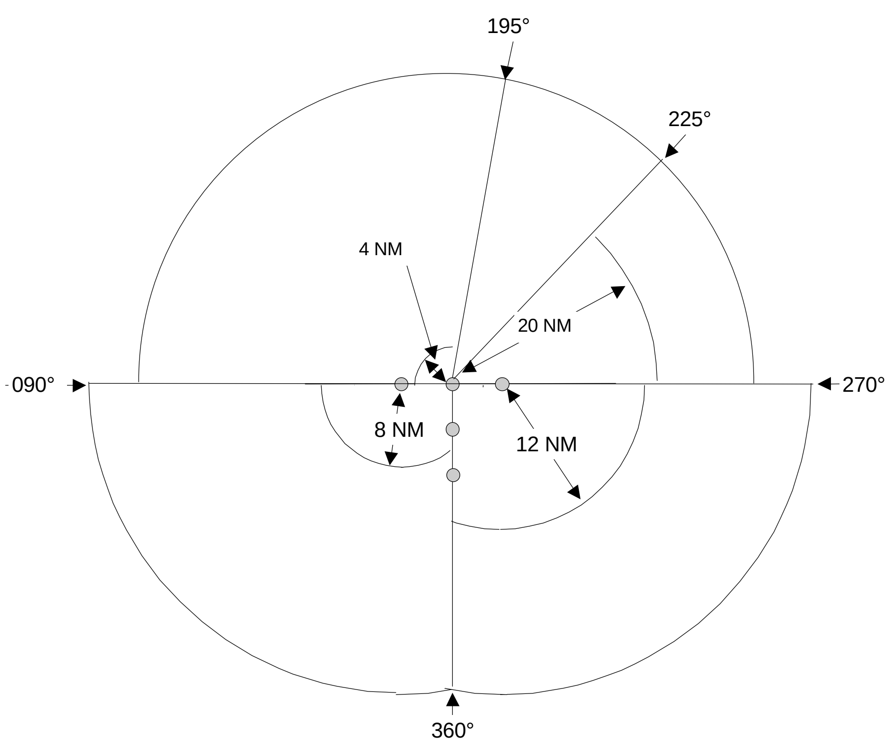
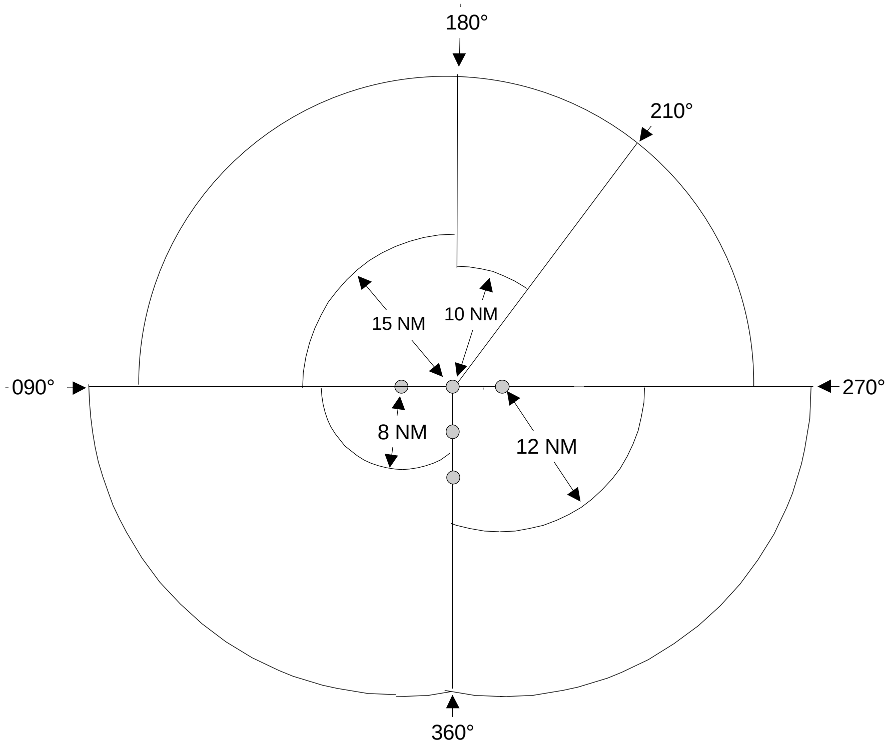


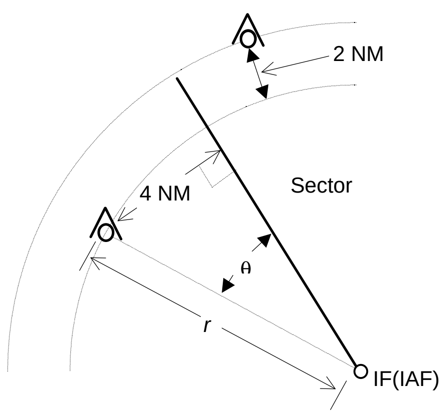
Figure 4D. TAA Maximum Sectorization with Maximum Stepdown Arcs



8.3.2 Altitude Sectors.

Sectors must provide appropriate required obstacle clearance within the sector boundaries and over all obstacles within a 4-NM buffer area (measured perpendicular to the radial boundary line) and within a 2-NM buffer from the outer boundary and any stepdown arcs. See figure 4E for a method to calculate the distance from a straight-in boundary line.

Figure 4E. Calculating Radial Sector Boundaries



$$q = \text{ArcSin}\left(\frac{4}{r}\right)$$

where: θ = angle in degrees
$r \geq 4$ NM

e.g. If r = 8 then

$$q = \text{ArcSin}\left(\frac{4}{8}\right) = 30°$$

8.4 TAA AREA MODIFICATIONS.

Modifications to the standard TAA design may be necessary to accommodate operational requirements. Variations may eliminate one or both base areas, and/or limit or modify the angular size of the straight-in area. If the left or right base area is eliminated, modify the straight-in area by extending its 30-mile radius to join the remaining base area boundary. If the left and right base areas are eliminated, extend the straight-in 30-mile radius to complete 360° of arc. Construct a sector that requires a course reversal in the extended straight-in area to accommodate entry at the IF(IAF) at angles greater than 120°. When the NoPT turn at the IF(IAF) is between 90° and 120°, apply TERPS table 3 to determine the minimum intermediate segment length. This sector does not count toward the sectorization limitation stated in paragraph 8.3.1a (see figures 5A through 5E).

8.5 CONNECTION TO EN ROUTE STRUCTURE.

Normally, a portion of the TAA will overlie an airway. If this is not the case, construct at least one feeder route from an airway fix or NAVAID to the TAA boundary aligned along a direct course from the en route fix/NAVAID to the appropriate IF(IAF) and/or T IAF(s) *(s*ee figure 5F). Multiple feeder routes may be established if the procedure specialist deems necessary.

8.6 AIRSPACE REQUIREMENTS.

The TAA should (USAF '**shall**') be wholly contained within controlled airspace insofar as possible. The TAA will normally overlie Class "E" airspace (1,200' floor) in the eastern 33 states, minus the upper Peninsula of Michigan and a portion of southwest Texas. The remaining states will require close study to ensure controlled airspace containment for the TAA.

8.6.1 **If the TAA overlies Class B airspace,** in whole or in part, the Air Traffic Control (ATC) facility exercising control responsibility for the airspace may recommend minimum TAA sector altitudes. It is the responsibility of the ATC facility providing approach control service for the airport to resolve TAA altitude and overlapping airspace issues with adjoining ATC facilities. Modify the TAA to accommodate controlled/restricted/warning areas as appropriate.

8.6.2 **When notified that an RNAV approach** and a standard TAA are being initiated for an airport not underlying controlled airspace, the regional Air Traffic division(s) shall initiate rule-making action to establish a 1,200 feet above ground level Class E airspace area with an appropriate radius of the airport reference point (ARP) to accommodate the TAA. If a modified TAA is proposed, the airspace will be sized to contain the TAA. The TAA will not be charted or implemented until controlled airspace actions are completed.

Figure 5A. TAA with Left and Right Base Areas Eliminated

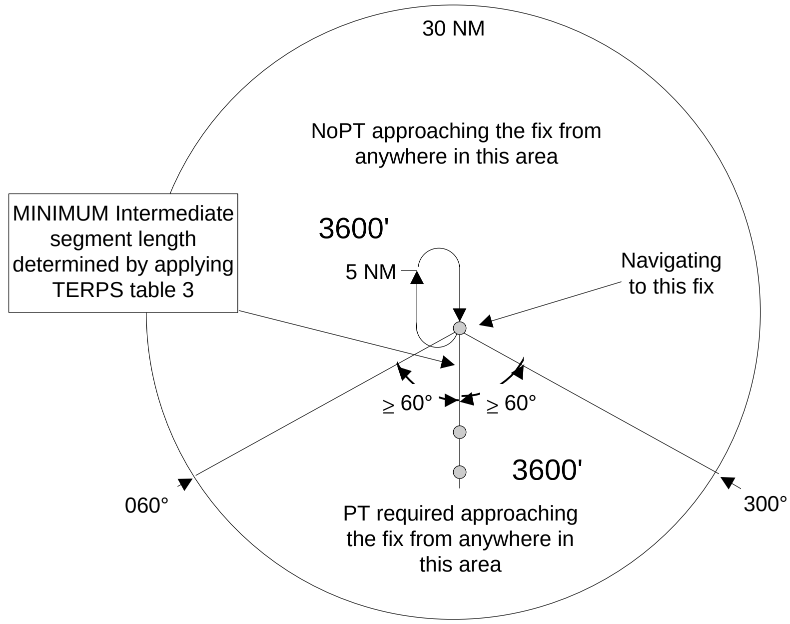


Figure 5B. TAA with Right Base Eliminated

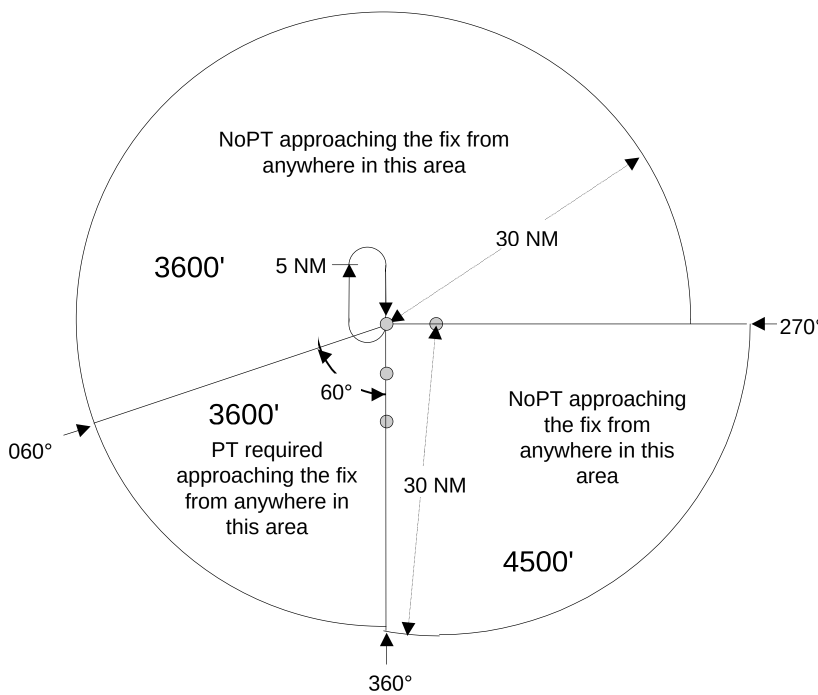


Figure 5C. TAA with Left Base Eliminated

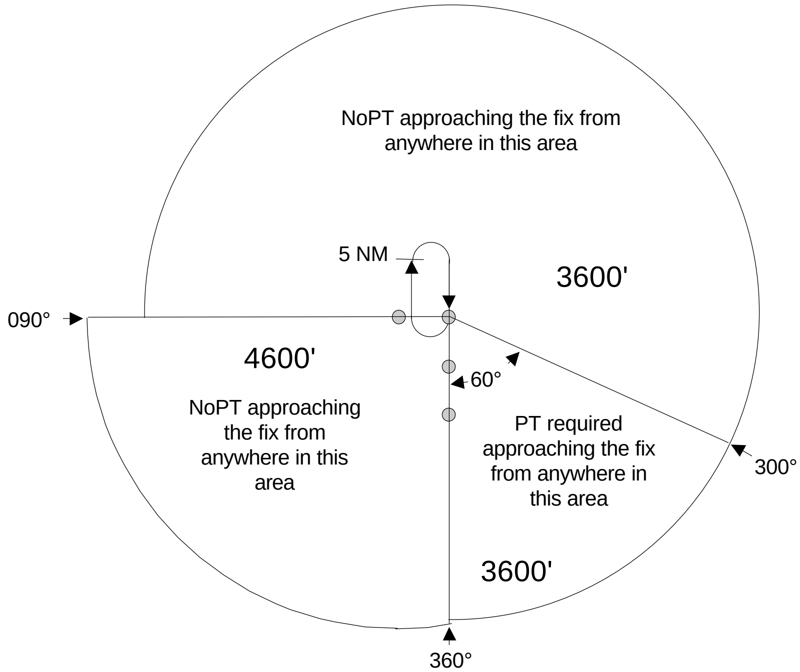


Figure 5D. TAA with Part of Straight-In Area Eliminated

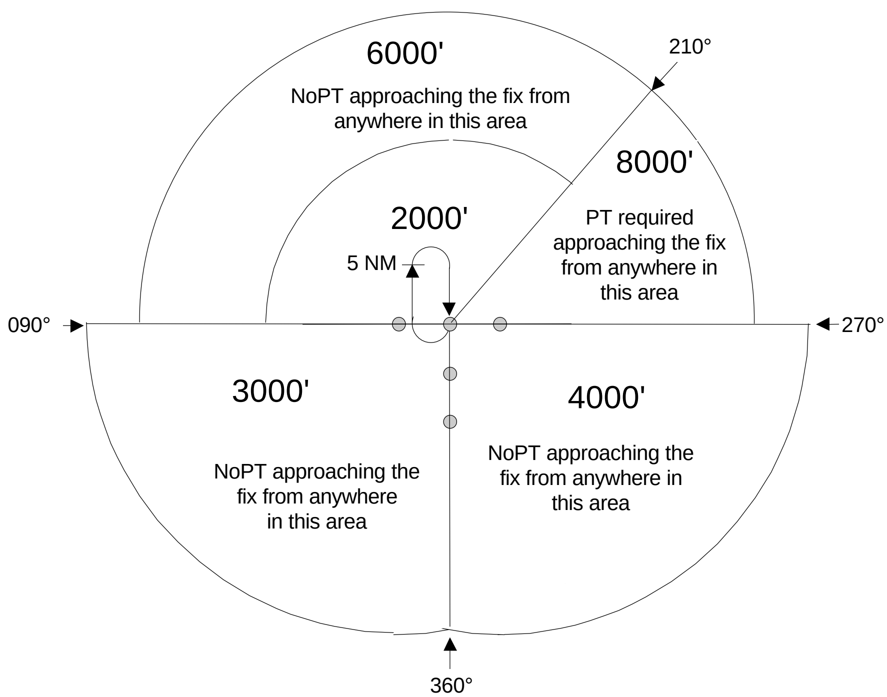


Figure 5E. **TAA Example with Left Base and Part of Straight-In Area Eliminated**

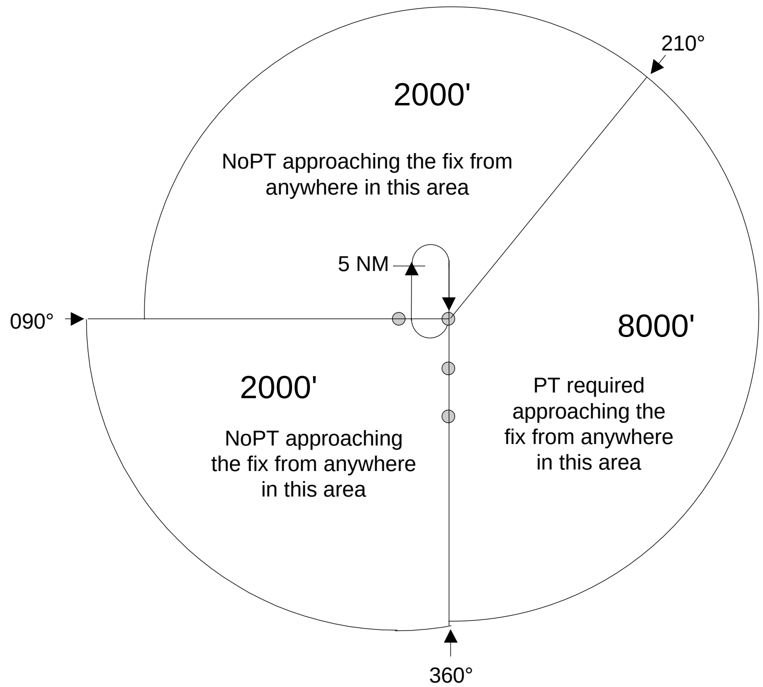
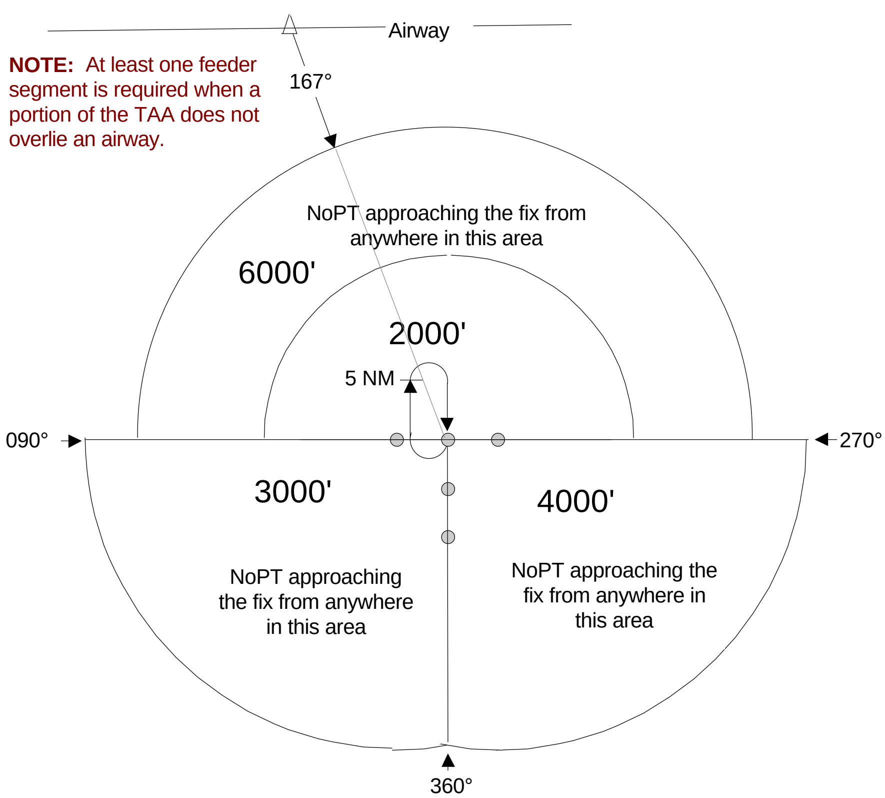


Figure 5F. **Examples of a TAA with Feeders from an Airway**



SECTION 3. DOCUMENTATION AND PROCESSING

9.0 INSTRUCTIONS FOR 8260-SERIES FORMS.

9.1 DOCUMENTING THE TAA.

Enter all normal terminal route and TAA information on the appropriate 8260-series forms. If the entire TAA cannot be documented on the 8260-3/5/7, enter all TAA data on Form 8260-10, Continuation Sheet (see figures 6A and 6B). For TAA entries, the “From” and “To” entries do not describe routes of flight, but rather describe a volume of airspace within which an aircraft will proceed inbound from the 30-mile arc boundary toward an associated T IAF or IF(IAF). Enter the data in the specified standardized format detailed below to assist cartographers in developing the desired published display. Each entry shall coincide with the corresponding entry on Form 8260-9, Standard Instrument Approach Procedure Data Record, to provide correlation between terrain/obstacle data and the minimum altitude associated with the appropriate TAA area. Provide a graphic depiction of the TAA with areas defined and indicate the minimum altitude associated with each area/sector.
Do not establish minimum altitudes that will require aircraft to climb while inbound toward the respective T IAF. Comply with existing instructions in Order 8260.19C relative to terminal routes, except as noted below:

9.1.1 **From.** For TAA entries, begin at the outermost boundary and work inward toward the respective T IAF. Enter an area/sector description beginning with the inbound magnetic course that is used as the sector boundary between the right base and straight-in sectors and proceed in a clockwise direction. Enter the magnetic value of the straight-line boundary (or its extension) described “TO” the associated T IAF, followed by the arc boundary distance (NM) for that point, and separate the entries by a “/”; e.g., **090/30**. Then enter “**CW,**” followed by a point along the same arc boundary intersected by the next straight-line boundary; e.g., **270/30**. Thus, in a basic T configuration without stepdown sectors, the straight-in “From” entry would appear as “090/30 CW 270/30.” Enter data in a similar manner to describe other areas and sectors.

9.1.1 **a. Sequentially number** (1, 2, etc.) the first line entry describing the area/sector for which different minimum altitudes are established. It is possible for an area/sector to be irregularly shaped, but have only one minimum altitude. Enter the associated data for such an area together as a group of sequential line entries.

9.1.1 **b. Enter “NoPT” following each line entry** that contains the specific 30-mile arc boundary for which that label is appropriate. If a course reversal is required, make no entry regarding PT requirements on the line entry describing the 30-mile arc boundary.

9.1.2 **To. Enter area/sector straight-line/arc boundary descriptions** as above, which in combination with the associated entry in the "From" block, encloses the area being documented. For example, the "To" stepdown arc entry associated with the "From" entry above for a basic T configuration without stepdown sectors would be the T IAF; therefore, enter the appropriate WP name and fix type; e.g., POPPS IAF, MAACH IAF, etc. If the area has been sectored, the "To" entry could be "090/22 CW 180/22."

9.1.3 **Course and Distance.** No entry is required for TAA area/sector documentation. Course and distance for feeder routes, when required, will be to the appropriate T IAF or IF(IAF) using the provisions of Order 8260.19C.

9.1.4 **Altitude.** Enter the minimum altitude of the area/sector on each line.

9.2 Form 8260-9, Standard Instrument Approach Procedures (SIAP) Data Record.

Comply with existing Order 8260.19C instructions for documenting controlling obstacles/terrain, coordinates, minimum altitudes, etc., except as noted below:

9.2.1 **Part A, Block 1 - App. Segment.** Enter the number assigned to the particular area/sector as in paragraph 9.1.1a. Then enter associated documenting data across the form.

9.2.2 **Part A, Block 5 - Minimum Safe Altitudes.** Leave blank.

9.2.3 **Part C - Remarks.** Do not develop airspace data for the TAA. Develop airspace data for the approach procedure contained within the TAA under Order 8260.19C, paragraph 909c(6).

Figure 6A. Sample 1, FAA Form 8260-10

U.S. DEPARTMENT OF TRANSPORTATION - FEDERAL AVIATION ADMINISTRATION

RNAV **STANDARD INSTRUMENT APPROACH PROCEDURE**

FLIGHT STANDARDS SERVICE - FAR PART 97. **33**

Bearings, headings, courses, and radials are magnetic. Elevations and altitudes are in feet, MSL, except HAT, HAA, TCH, and RA. Altitudes are minimum altitudes unless otherwise indicated. Ceilings are in feet above airport elevation. Distances are in nautical miles unless otherwise indicated, except visibilities which are in statute miles or in feet RVR.

FROM:	TO:	ALTITUDE
1. 090/30 CW 180/30 (NoPT)	090/22 CW 180/22	6000
2. 210/30 CW 270/30 (NoPT)	210/20 CW 270/20	4700
3. 090/22 CW 180/22	POPPS (IAF)	2000
180/30 CW 210/30 (NoPT)	POPPS (IAF)	2000
210/20 CW 270/20	POPPS (IAF)	2000
4. 270/30 CW 360/30 (NoPT)	270/17 CW 360/17	6000
5. 270/17 CW 360/17	MAACH (IAF)	3000
6. 360/30 CW 090/30 (NoPT)	360/17 CW 090/17	6000
7. 360/17 CW 090/17	SISSY (IAF)	4100

(This example relative to figure 7A)

CITY AND STATE	ELEVATION: 123 TDZE: 123 / AIRPORT NAME:	FACILITY IDENTIFIER:	PROCEDURE NO. / AMDT NO. / EFFECTIVE DATE:	SUP: / AMDT: NONE / DATED:
ANYWHERE, VA	ANYWHERE AIRPORT	ANY	RNAV RWY 18, ORIGINAL	

FAA FORM 8260 - 10 / February 1995 (Computer Generated) Page 1 of 1 Pages

Figure 6B. Sample 2, FAA Form 8260-10

U.S. DEPARTMENT OF TRANSPORTATION - FEDERAL AVIATION ADMINISTRATION

RNAV — **STANDARD INSTRUMENT APPROACH PROCEDURE**

FLIGHT STANDARDS SERVICE - FAR PART 97. **33**

Bearings, headings, courses, and radials are magnetic. Elevations and altitudes are in feet, MSL, except HAT, HAA, TCH, and RA. Altitudes are minimum altitudes unless otherwise indicated. Ceilings are in feet above airport elevation. Distances are in nautical miles unless otherwise indicated, except visibilities which are in statute miles or in feet RVR.

FROM:	TO:	ALTITUDE
1. 090/30 CW 210/30 (NoPT)	090/17 CW 210/17	6000
2. 090/17 CW 210/17	ALPHA (IAF)	2000
3. 210/30 CW 270/30	ALPHA (IAF)	8000
4. 270/30 CW 360/30 (NoPT)	BRAVO (IAF)	4000
5. 360/30 CW 090/30 (NoPT)	CHRLY (IAF)	3000

(This example relative to figure 7B)

CITY AND STATE	ELEVATION: **123** TDZE: **123** AIRPORT NAME:	FACILITY IDENTIFIER:	PROCEDURE NO. / AMDT NO. / EFFECTIVE DATE:	SUP: AMDT: **NONE** DATED:
ANYWHERE, VA	**ANYWHERE AIRPORT**	**ANY**	**RNAV RWY 18, ORIGINAL**	

FAA FORM 8260 - 10 / February 1995 (Computer Generated)

Page 1 of 1 Pages

Figure 7A. Example 1

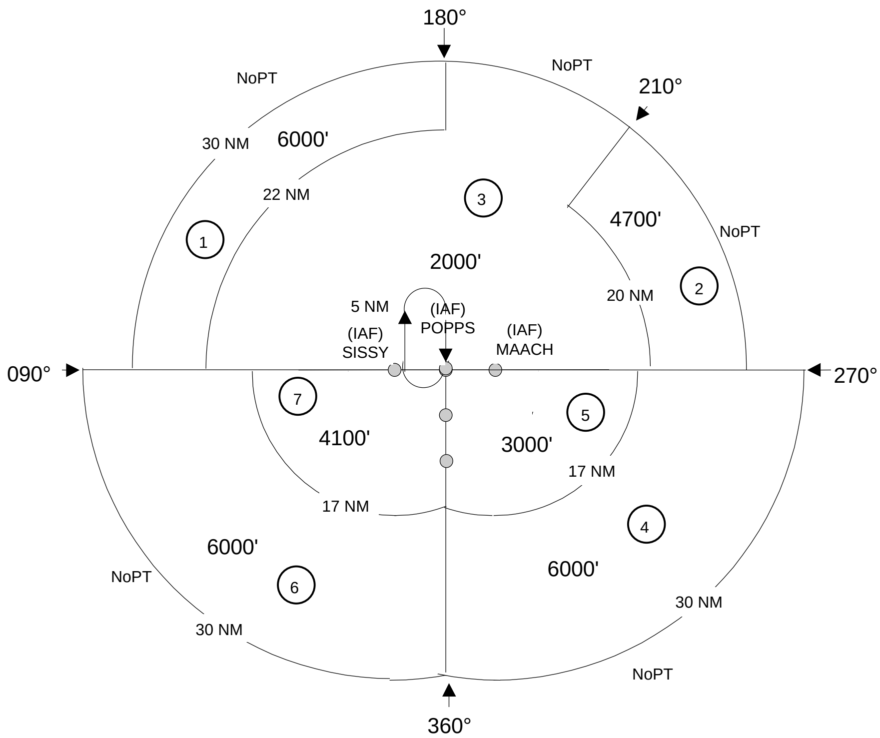
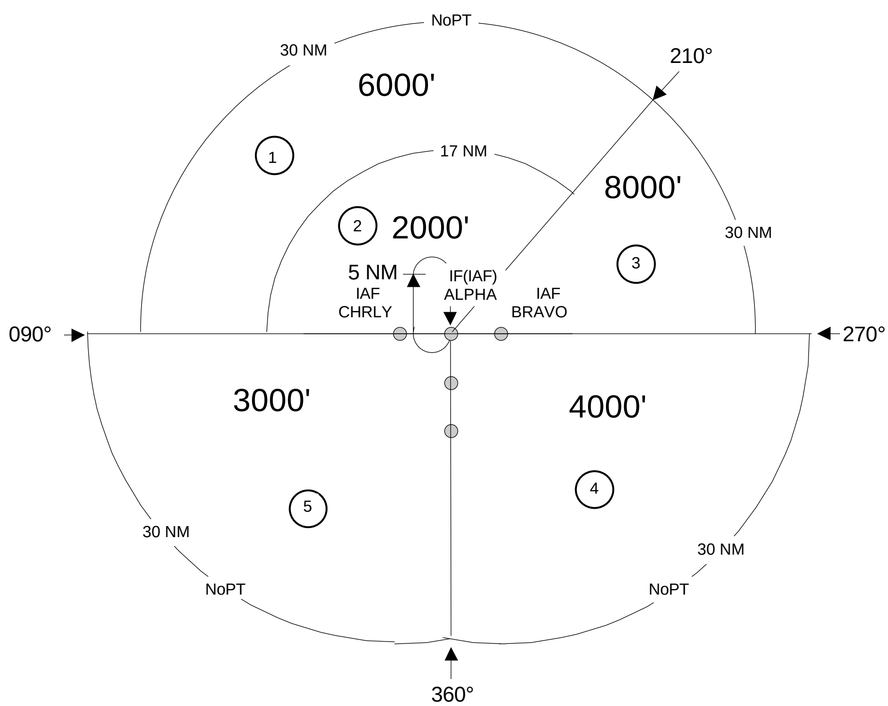


Figure 7B. Example 2



SECTION 4. DIRECTIVE FEEDBACK INFORMATION

10.0 INFORMATION UPDATE.

Forward for consideration any deficiencies found, clarification needed, or suggested improvements regarding the content of this order to:

DOT/FAA
Flight Procedure Standards Branch, AFS-420
P.O. Box 25082
Oklahoma City, OK 73125

10.1 **FAA Form 1320-19**, Directive Feedback Information**,** is included as the last page of this order, for your convenience. If an interpretation is needed immediately, you may call the originating office for guidance. Use this form as a follow-up to the verbal conversation.

10.2 **Use the "Other Comments" block** of this form to provide a complete explanation of why the suggested change is necessary.

L. Nicholas Lacey
Director, Flight Standards
Service

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U.S. Department
of Transportation

Federal Aviation
Administration

Directive Feedback Information

Please submit any written comments or recommendations for improving this directive, or suggest new items or subjects to be added to it. Also, if you find an error, please tell us about it.

Subject: Order 8260.45A, Terminal Arrival Area (TAA) Design Criteria

To: Flight Procedure Standards Branch, AFS-420
P.O. Box 25082
Oklahoma City, OK 73125

(Please check all appropriate line items)

An error (procedural or typographical) has been noted in paragraph _______ on page ______.

Recommend paragraph ______ on page ______ be changed as follows:
(*attach separate sheet if necessary*)

In a future change to this directive, please include coverage on the following subject:
(*briefly describe what you want added*):

Other comments:

I would like to discuss the above. Please contact me.

Submitted by: ______________________________ Date: ___________________

FTS Telephone Number:______________________ Routing Symbol: ________