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Federal Aviation Agency

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ADVISORY CIRCULAR

SUBJECT: AIRWAY AND ROUTE OBSTRUCTION CLEARANCE

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1. PURPOSE. This Circular advises all interested persons of the airspace areas within which obstruction clearance is considered in the establishment of Minimum En Route Instrument Altitudes (MEAs) for publication in Federal Aviation Regulations (FAR), Part 95.

2. BACKGROUND. Minimum en route altitudes are established by the Administrator after determination has been made that obstruction clearance is provided and that navigational aids are adequate and so oriented on the airways or routes that signal coverage is acceptable so that courses can be maintained within prescribed airway/route widths.

   Criteria for obstruction clearance airspace areas were formerly set forth in Regulations of the Administrator 14 CFR 610. However, since these criteria were not rules such were not included when Part 610 was recodified as Part 95. In addition, the more sophisticated navigation facilities and more widespread use of higher speed aircraft required that these criteria be re-evaluated. Considerable study has been completed in this area, and new criteria have been issued to personnel in the Agency for application to the establishment of MEAs.

3. CRITERIA. The revised airspace areas for protection from obstructions consider those areas required for straight flight and for turns from one airway or route segment to another. The airspace areas to be protected are identified as primary, secondary, turn, and termination areas.

   a. Primary Area. The primary en route obstruction clearance area extends from each radio facility on an airway or route to the next one. This area has a total width of eight nautical miles, four on each side of the airway or route centerline to a point where the boundaries intersect lines drawn 4.5 degrees on each side of the airway or route centerline, then along the 4.5 degree line to the Changeover Point. The 4.5 degree lines begin at the

navigation facility. (Figures 3-1, and 3-2.) The angle at one of the facilities can be greater than 4.5 degrees where a Changeover Point (COP) is not equidistant between two facilities. The COP in such cases is the dividing point of the segment, and lines are drawn at 4.5 degrees from the farthest radio facility to points opposite the COP. They are joined by lines from the nearer facility. (Figure 3-5.)

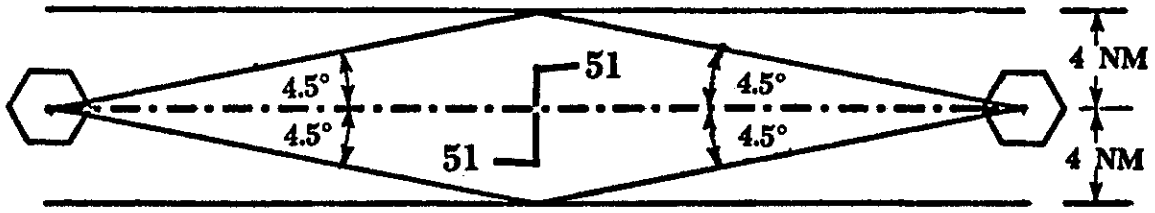

FIGURE 3-1. PRIMARY OBSTRUCTION AREA

Segment 102 NM or less. The 4.5 degree "System Accuracy" lines do not extend outside the 4 NM boundaries of the airway or route.

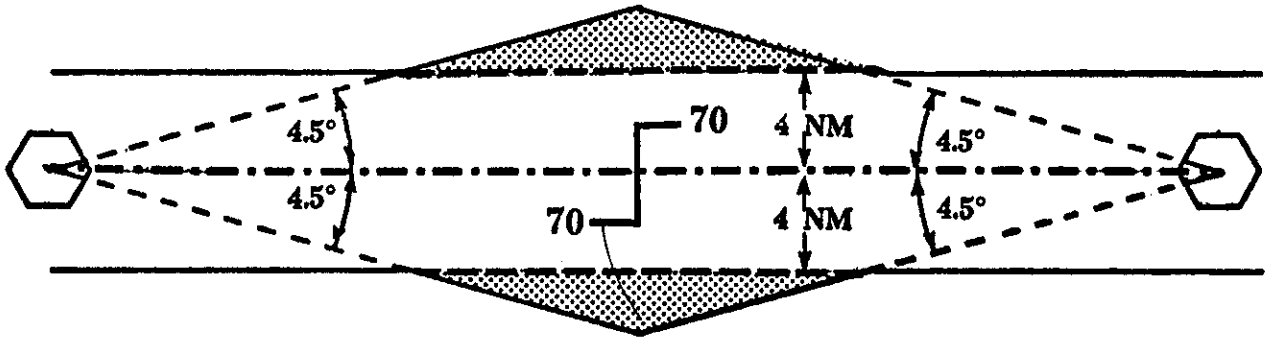

FIGURE 3—2. PRIMARY OBSTRUCTION AREA

Segment over 102 NM. The 4.5 degree "system accuracy" lines extends beyond the 4 NM boundaries of the airways or route. The shaded area in the drawing thus becomes part of the primary area.

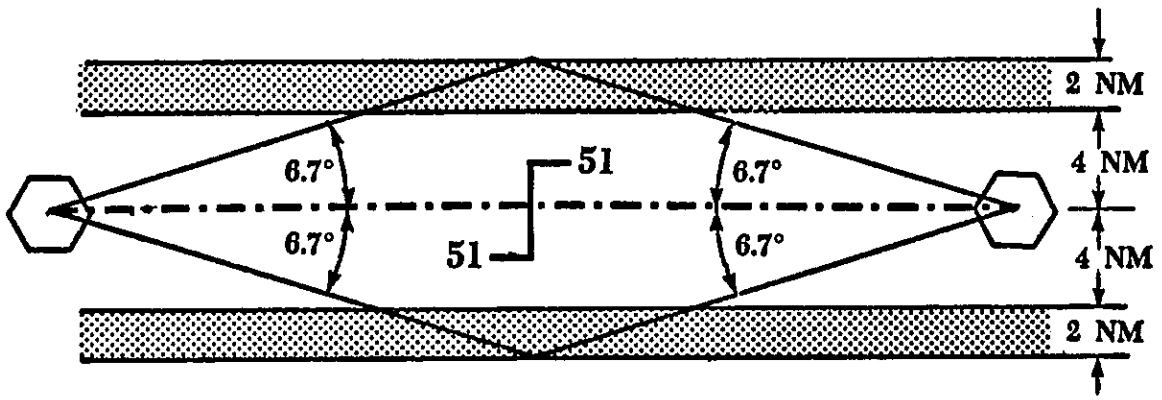

FIGURE 3-3. SECONDARY OBSTRUCTION AREAS

Segment 102 NM or less. The 6.7 degree "system accuracy" lines do not extend beyond the normal secondary area boundaries, which are placed 2 NM on each side of the normal primary area, (6 NM on each side of the segment centerline.)

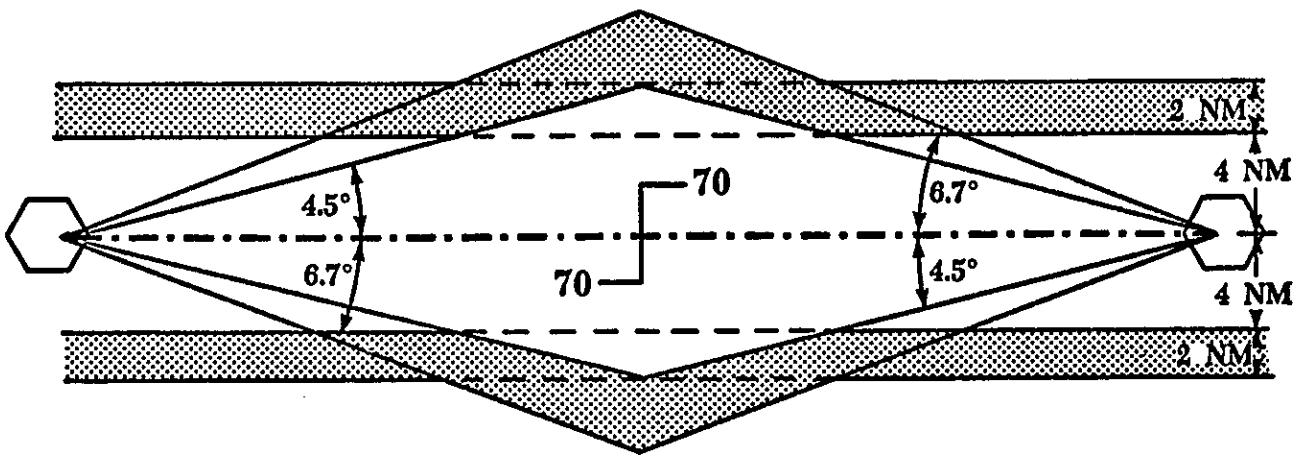

FIGURE 3—4. SECONDARY OBSTRUCTION AREAS

Segment over 102 NM. The 6.7 degree "System Accuracy" lines penetrate the normal secondary area boundaries, thus changing the secondary areas at the COP. Note that the new secondary area boundaries follow the 6.7 degree lines, and are not merely lines drawn 2 NM on each side of the primary area boundaries.

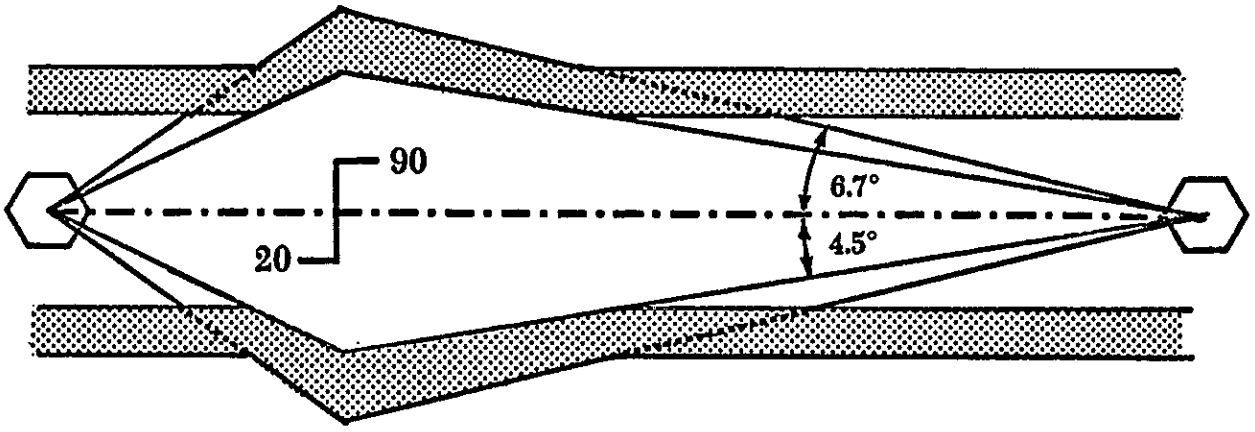

FIGURE 3—5. OFFSET COP

Use system accuracy lines from FARTHEST facility.

NOTE: For obstruction clearances purposes airways or routes based upon L/MF navigation facilities have a width of ten statute miles (8.68 NM), five miles on each side of the course centerline until its boundaries intersect 5.0 degree lines from the facility, then along the 5.0 degree lines on each side of the centerline to the COP. For these facilities the COP is considered to be at the midpoint between each segment.

b. Secondary Area. The secondary en route obstruction area extends for two nautical miles on each side of the primary area until its boundaries intersect lines drawn 6.7 degrees on each side of the airway or route centerline, then along the 6.7 degree lines to the Changeover Point. (Figure 3-3, and 3-4.) The 6.7 degree lines begin at the navigation facility. The angle at one facility can be greater than 6.7 degrees as explained in paragraph a. above when the COP is not at the midpoint of the segment. (Figure 3-5.)

NOTE: For airways or routes based upon L/MF navigation facilities the secondary area width is five statute miles on each side of the primary area until the secondary area boundaries intersect lines whose angle of divergence is 7.5 degrees on each side of the course centerline, then along the 7.5 degree lines to the COP. The COP is considered to be at the midpoint between each segment.

c. Turn Areas. The turning area extends the primary and secondary obstruction areas when a change of course is necessary. The turning area criteria supplements the primary and secondary en route airspace for obstruction protection. The flight track resulting from a combination of turn delay, inertia, turning rate, and wind effect is represented by a parabolic curve. For ease of application, a radius of arc has been developed for field use which can be applied to any scale chart. The arc is based upon a 400 knot true airspeed and has a radius of 4 NM for the primary area boundary, and 6 NM for the secondary area boundary for altitudes below 8000 feet MSL; and for altitudes from 8000 feet up to but not including 18,000 feet MSL a radius of 6 NM for the primary area boundary, and 8 NM for the secondary area boundary. Turning criteria is not included for altitudes above 18,000 feet as it is not anticipated that en route turns will be made over areas where obstructions penetrate 16,000 feet MSL.

In the use of the turning areas, it is necessary, considering system accuracy factors, to apply them to the most adverse displacement of the radio fix or airway boundaries at which the turn is made. The 4.5 and 6.7 degrees factors apply to the VHF radial being flown, but since no pilot/aircraft factor exists in the measurement of an intersecting radial, a navigation facility factor of plus-or-minus 3.6 degrees is used. (Figures 3-6, 3-7, and 3-7a.) If the radio fix is formed by intersecting signals from two LF or one LF and one VHF facility, the obstruction area boundary lines are 5.0 (primary) and 7.5 (secondary) degrees from the LF facility(s), except when the intersecting course is a VHF facility, in which case the VHF factor of 3.6 degrees for the cross reference radial is used. If the fix is overhead a facility, the geographic position of the facility will be considered to be displaced laterally and longitudinally by a two nautical mile factor, at all altitudes. (Figure 3-7b.) This more than adequately compensates for facility cone effect as well as the turn factors previously mentioned, and will simplify field application considerably.

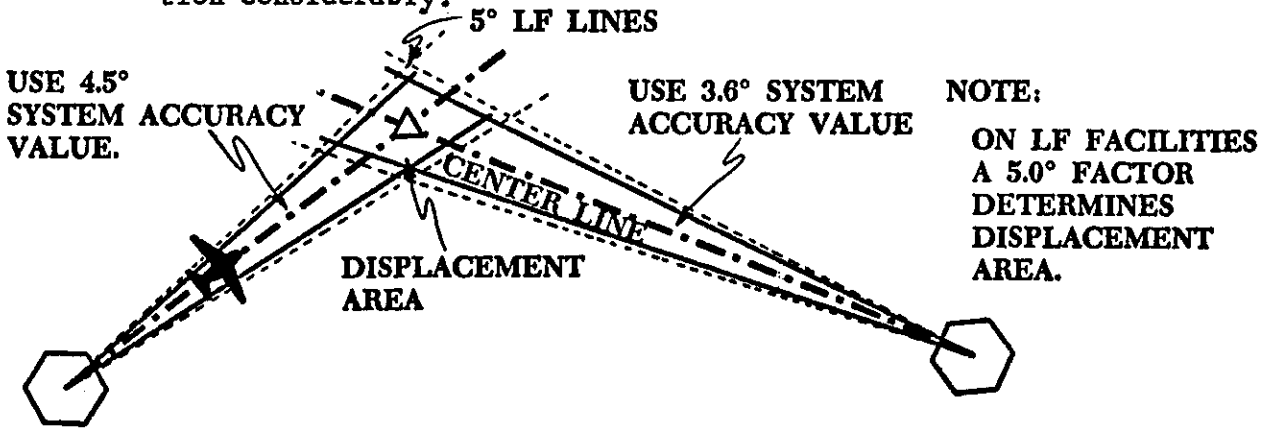

FIGURE 3-6. FIX DISPLACEMENT.

If termination is at a fix not overhead of a facility, radius of the area arcs is at farthest edge of fix displacement area "on course centerline."

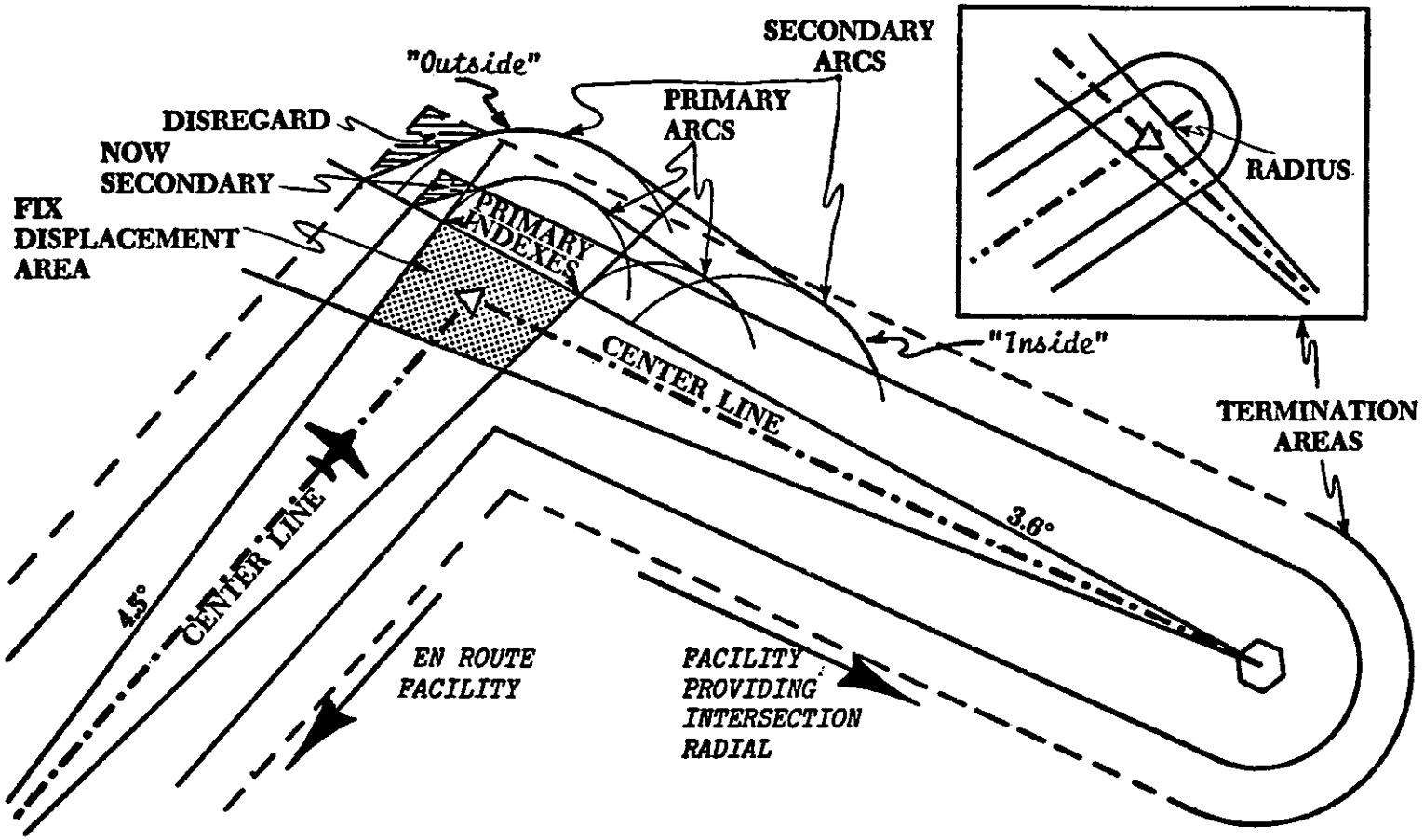

FIGURE 3-7. TURNING AREA — RADIO FIX.
(INTERSECTION)
BELOW 8,000′ MSL-FACILITIES WITHIN 51 NM

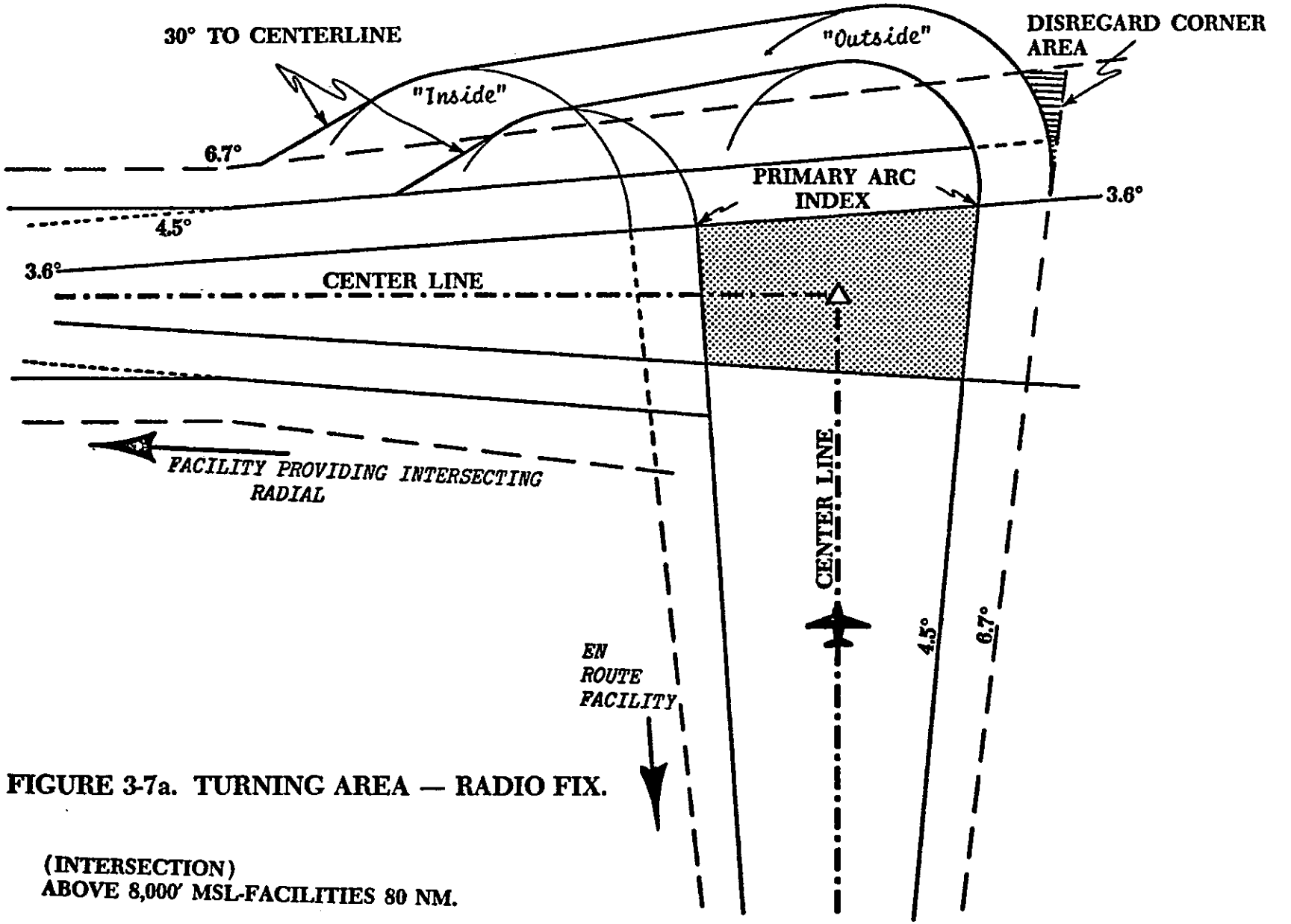

FIGURE 3-7a. TURNING AREA — RADIO FIX.

(INTERSECTION)
ABOVE 8,000′ MSL-FACILITIES 80 NM.

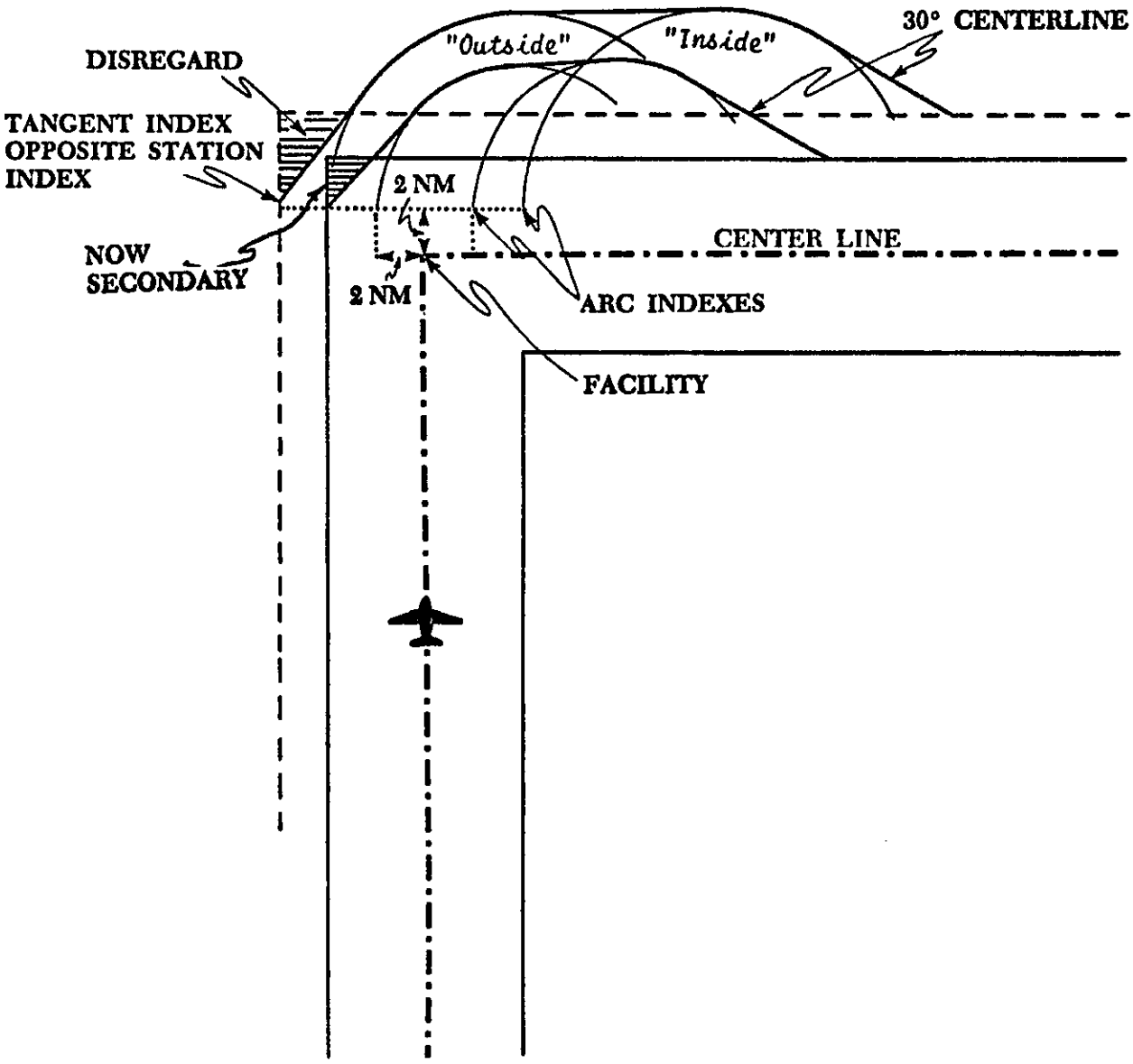

FIGURE 3-7b. TURNING AREA — OVERHEAD FACILITY.

d. Termination Areas. When the airway or route terminates at a radio facility or at an intersection radio fix the primary and secondary areas extend beyond the facility or fix. The boundaries of the termination areas may be defined as arcs which connect the ends of the segment boundaries. If the termination is at a radio facility the radii of the arcs will be centered at the facility. If the termination is at an intersection fix the radii will be centered on the airway or route centerline at the farthest edge of the intersection displacement area. (Figure 3-7.)

4. OBSTRUCTION CLEARANCE, PRIMARY AREA.

a. Nonmountainous Areas. The minimum obstruction clearance over areas NOT designated as mountainous areas under FAR 95 will be 1000 feet.

b. Mountainous Areas. Except as set forth in this paragraph, the minimum obstruction clearance over terrain designated as mountainous in FAR 95, Subpart B, will be 2000 feet over the highest terrain, and 1000 feet over manmade obstructions. (Figure 4-1.)

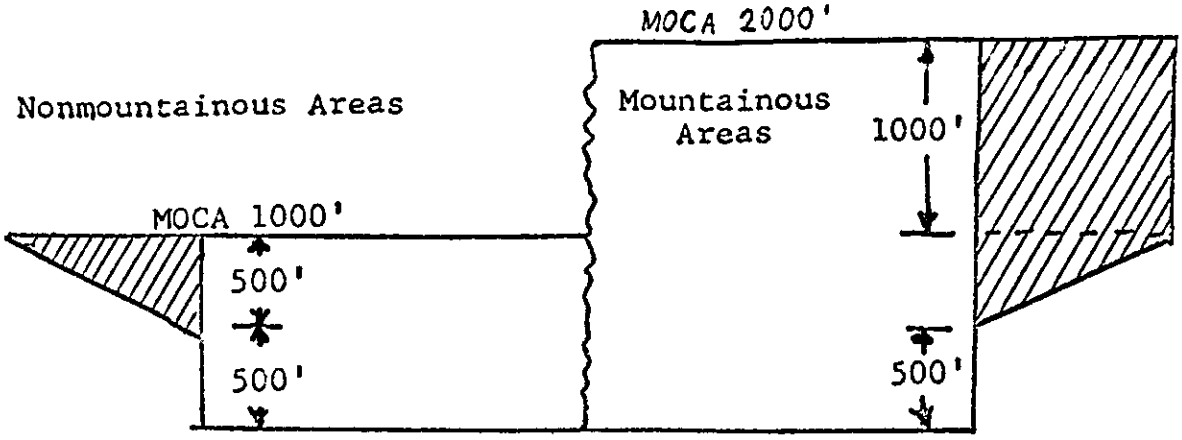

FIGURE 4—1. STANDARD CLEARANCES

(1) Altitudes may be authorized which will provide not less than 1500 feet of terrain clearance in designated mountainous areas of the eastern United States, the Commonwealth of Puerto Rico, and over land areas of Hawaii; and not less than 1700 feet in the designated mountainous areas of the western United States and Alaska. Before altitudes which provide less than 2000 feet of terrain clearance are authorized, consideration will be given to the following:

(a) Areas characterized by precipitous terrain.

(b) Weather phenomena peculiar to a particular area.

(c) Phenomena conductive to marked pressure differentials.

(d) Type of and distance between navigation facilities.

(e) Availability of weather service throughout an area.

(f) Number and reliability of altimeter resetting points in the area along airways or routes.

(2) Altitudes providing not less than 1000 feet of obstruction clearance over towers and/or other manmade obstructions may be authorized within designated mountainous areas. However, such obstructions must not be located on precipitous terrain and the airspace must not be subject to Bernoulli effect. (Figures 4-2, and 4-3.)

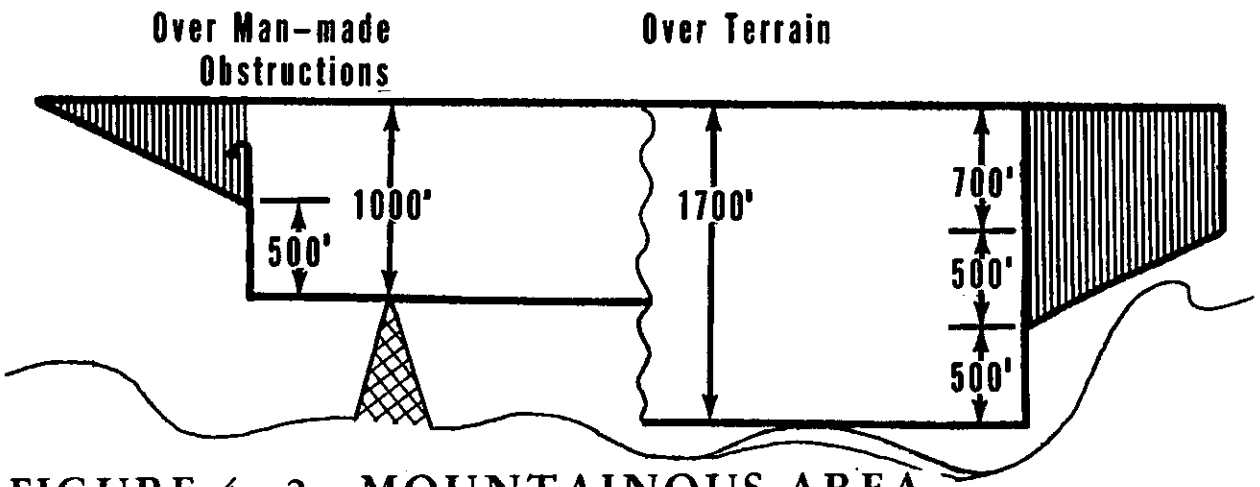

FIGURE 4—2. MOUNTAINOUS AREA WESTERN U.S. & ALASKA

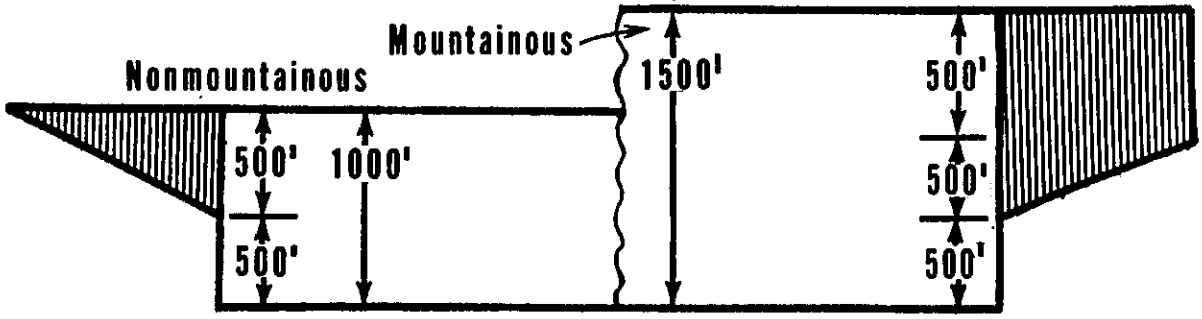

FIGURE 4—3. MOUNTAINOUS AREA EASTERN U.S., PUERTO RICO, & HAWAII

5. OBSTRUCTION CLEARANCE, SECONDARY AREA. In all areas, mountainous or nonmountainous, obstructions which are located in the secondary areas will be considered as obstructions to air navigation when they extend above the secondary obstruction clearance plane. This clearance plane begins at the outer boundary of the primary area 500 feet above the obstruction upon which the primary Minimum Obstruction Clearance Altitude (MOCA) is based, and slants upward and outward at an angle which will cause it to intersect the outer edge of the secondary area at a point 500 feet higher. When an obstruction penetrates this plane the MOCA in the primary area will be increased by adding the clearance required to the MSL height of the secondary area obstruction.

6. L/MF AIRWAY/ROUTE SECONDARY AREA CLEARANCE. The primary air navigation facility in the U. S. is the VORTAC. Obstruction clearance values in Paragraph 5 above are based upon VORTAC facilities. For airways or routes based upon L/MF navigation facilities the secondary obstruction clearance plane is as follows:

   a. Within 25 NM of the en route navigation facility the plane slants upward and outward at 50:1 from the outer boundary of the primary area, beginning at a point 500 feet above the obstruction upon which the primary MOCA is based. Where an obstruction penetrates this plane the primary area MOCA will be increased by addition to the MSL height of the secondary area obstruction the following values:

Distance from Primary Area Boundary to Obstruction	Add to MSL Height of Obstruction
0-1 Statute Miles	500 feet
1-2 Statute Miles	400 feet
2-3 Statute Miles	300 feet
3-4 Statute Miles	200 feet
4-5 Statute Miles	100 feet

   b. Beyond 25 NM from the en route navigation facility the plane extends outward in a horizontal plane from the outer edge of the primary area from a point 500 feet above the obstruction upon which the primary MOCA is based to the outer edge of the secondary area. Where an obstruction penetrates this horizontal surface the primary area MOCA will be increased by adding 500 feet to the MSL height of the secondary area obstruction.

   NOTE: Regardless of the type of navigation facility, in mountainous areas 1000 feet is added to the MOCA except where MOCAs in en route airspace areas are reduced under the provisions of Paragraph 4.b.(1).

7. MINIMUM CROSSING ALTITUDES (MCA). MCAs will be established in all cases where obstructions intervene to prevent maintaining obstruction clearance requirements during climb to a higher MEA immediately after the aircraft passes a point beyond which the higher MEA applies. The MEA will be established by using the following climb rates. Measurement will be from the MEA of the previous en route segment:

Sea level through 5000 feet	150 ft/NM
5000 feet through 10,000 feet	120 ft/NM
10,000 feet and over	100 ft/NM

When an MEA change is involved with a course change, navigational course guidance will be provided if the change in an MEA is more than 1500 feet and/or if the course change is more than 45 degrees.

EXCEPTION: Course changes of up to 90 degrees may be approved without course guidance provided obstructions do not penetrate the established MEA of the previous airway or route segment within 15 NM of the boundaries of the displacement area. (Figure 7-1.)

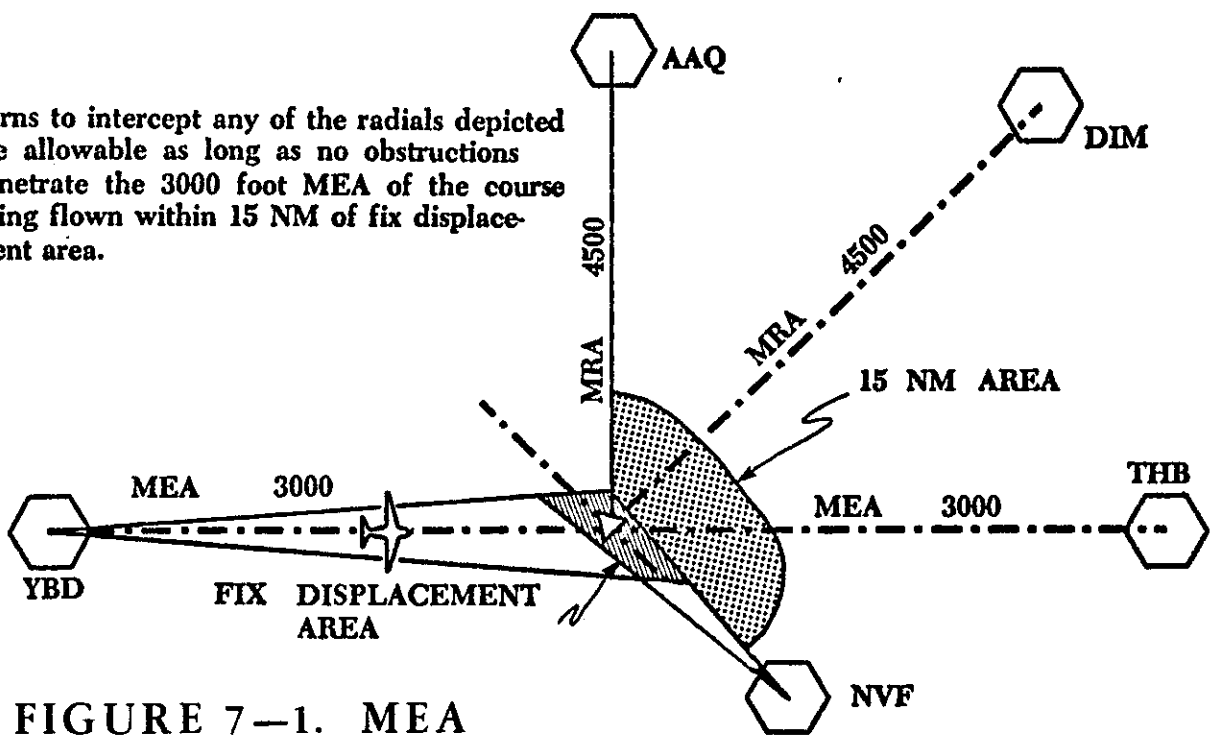

FIGURE 7—1. MEA (NO COURSE GUIDANCE)

8. NAVIGATION COVERAGE. In some instances the FAA may establish an MEA which may not provide continuous reception of the VOR signal over the entire airway or route segment, even though terrain and obstruction clearance requirements are satisfied. In these cases consideration will be given to the terrain features, distance between facilities, amount of signal gap, nearness of the airway or route segment to other airways or routes, and the location of radio fixes for MEA changes and reporting points. Notations will appear in FAR Part 95 and on appropriate aeronautical charts identifying the area in which course signals are substandard or non-existent.

Where navigational signal coverage provided by the VOR/VORTAC system requires establishment of an MEA higher than is necessary for obstruction clearance purposes, or where an MAA is established below the ceiling of the airway/route structure, ATC Radar may be used to complement the VOR/VORTAC system. Altitudes may be authorized lower than the MEA (but not below the MOCA) or higher than the MAA published, subject to continuous radar coverage and controller workload.

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