ORDER

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

8260.37

9/27/91

SUBJ: HELIPORT CIVIL UTILIZATION OF COLLOCATED MICROWAVE LANDING SYSTEMS (MLS)

1. PURPOSE. This order provides criteria for the development of helicopter precision instrument approach procedures using collocated microwave landing system (MLS) facilities. These criteria are applicable for all heliports, including obstacle-rich confined-area heliports served by collocated MLS sites. Helicopter precision instrument approach procedures to runways served by non-collocated MLS facilities should be developed using a combination of criteria contained in Order 8260.36, Civil Utilization of Microwave Landing System (MLS), and chapter 11, Order 8260.3B, U.S. Standard for Terminal Instrument Procedures (TERPS).

2. DISTRIBUTION. This order is distributed to the branch level in the Offices of Aviation Policy and Plans, Aviation Safety Oversight, and Airport Safety and Standards; the Flight Standards, Air Traffic Rules and Procedures, Research and Development, and Systems Maintenance Services; the Aviation Standards National Field Office; and the Program Director for Navigation and Landing; to the branch level in the regional Flight Standards, Air Traffic, Airway Facilities, and Airports Divisions; to the National Engineering Field Support Division and the Aviation Standards Branch at the Aeronautical Center; to all Flight Standards District Offices; to all Flight Inspection Field Offices, International Field Offices; and to all Airway Facilities Sectors and Sector Field Offices.

3. BACKGROUND. Collocated MLS facilities, by international agreement, are those facilities where the azimuth and elevation antennas are separated by the distances no greater than those specified in paragraph 7a. These criteria are provided to develop helicopter precision instrument approach procedures to heliports.

4. GENERAL. The criteria contained in this order are designed for heliports based upon collocated MLS facilities and apply only to helicopter procedures for precision final approach and missed approaches. These criteria apply to airspeeds of less than 91 knots. Additionally, turning missed approach airspeeds and flight track radii are specified to provide minimums for speed categories for 61-90 knots and 60 knots or less. Where application of these criteria require a difference in minima, separate speed category minimums may be published. Application of these criteria presumes no runway and that all FAA heliport requirements pertaining to air-ground communications, air traffic control, NAVAID siting and monitoring, meteorological observations and reporting, precision heliport marking and lighting, and heliport imaginary surfaces are in full compliance with appropriate directives. Order 8260.3B shall apply unless otherwise specified in this order.

5. SYSTEM COMPONENTS. The MLS consists of three components listed in the following subparagraphs. A precision approach is not authorized if any component is inoperative.

a. Azimuth (Course Guidance). Lateral guidance is provided by a signal emanating from the azimuth antenna aligned along the final approach course. The magnetic final approach course is automatically transmitted to the airborne receiver by the ground system. The inbound course may also be set by the pilot in an appropriately equipped helicopter.

b. Elevation (Vertical Guidance). Vertical guidance is provided by a signal emanating from the elevation antenna phase center. The glidepath angle established for the procedure is automatically transmitted to the airborne receiver by the ground system. The procedurally prescribed glidepath angle may also be manually selected by the pilot in an appropriately equipped helicopter.

Distribution: A-W(PO/OV/AS/FS/TP/RD/SM/VN/NN)-3; A-X(FS/AT/AF/AS)-3 ASM-600(2CYS); ATR-160(2CYS); A-FFS-4,5,7(STD); A-FAF-2,3,7(LTD); AAC-950(80CYS)

Initiated By: AVN-540/AFS-420

c. Precision or Conventional (Narrow Spectrum) Distance Measuring Equipment (DME/P or DME/N). The DME/P is a distance measuring system installed with the MLS, which provides an accuracy of ± 279 to 820 feet when the airborne system is in the initial approach mode and ± 100 to 279 feet when in the final approach mode. The selection of initial or final approach mode is accomplished automatically by the airborne system based on proximity to the DME/P antenna. DME/N provides an accuracy of better than 1/2 mile or 3 percent of the distance, whichever is greater. The application of the criteria contained in this order requires a DME/P or DME/N antenna be installed within 400 feet of the azimuth antenna. DME/P or DME/N values shall be published at the precision final approach fix (PFAF) and missed approach point (MAP) to the nearest 0.1 mile to provide distance information from the DME antenna. See figure 1.

6. PROCEDURE IDENTIFICATION. Order 8260.3B, paragraph 1105 applies, e.g., Copter MLS 214°.

7. DEFINITIONS.

a. Collocated MLS Facilities. An MLS facility in which the elevation and azimuth antennas are separated by a distance less than 656 feet measured parallel to the final approach course and 400 feet perpendicular to the final approach course. Reference appropriate siting documents for recommended siting of heliport MLS.

b. Final Approach Reference Area (FARA). The FARA is an area where the approach may be terminated in a hover or touchdown. It is an obstacle-free area, 150 feet square, overlying an approved landing area, surveyed for location and elevation, with its center aligned on the final approach course (FAC). The helipad for intended landing may not necessarily be located at the FARA. See figure 4.

c. FARA Elevation. The highest mean sea level (MSL) elevation of the landing surface underlying the FARA. The elevation of the FARA and helipoint shall be determined by the highest point on the surface suitable for landing underlying the FARA.

d. Glidepath Angle. The angular displacement from a horizontal plane, expressed in tenths of a degree, of the vertical path passing through the antenna phase center. See figure 7. This angle is published on the approach chart.

e. Height Above Helipoint (HAH). The height of the decision height (DH) or minimum descent altitude (MDA) above helipoint elevation.

f. Helipoint. A designated arrival/departure point, centered in the FARA, used for reference and control of instrument arrivals and departures of helicopters.

g. Helipoint Crossing Height (HCH). The computed height of the vertical guidance path above the helipoint elevation at the helipoint. See figure 7.

h. Helipoint Elevation. The FARA elevation.

i. Heliport Approach Lighting System (HALS). See paragraph 16d(2) and figure 13 of this order.

j. Heliport Instrument Lighting System (HILS). See paragraph 16d(3) and figure 13 of this order.

k. MLS Category I. An MLS approach procedure which provides for an approach to a height above helipoint of not less than 200 feet.

l. Obstacle Free Zone (OFZ). A prescribed surface area located on or over ground or water to which vertical and lateral clearance from obstacles must be provided during instrument flight operations. See paragraph 10c and figure 2 of this order for dimensional requirements.

m. Precision Final Approach Fix (PFAF). The point where the glidepath intercepts the intermediate altitude. This point is the beginning of the final approach segment. The distance from the DME/P or DME/N antenna shall be published at this point.

n. Precision Heliport Imaginary Surfaces. Surfaces encompassing the FARA adjoining the final approach area with special dimensions. See figure 2 and paragraph 9c.

o. Reference Area Extended Centerline. A line through the center (helipoint) of the FARA extending into the final approach. See figure 13. The FARA and azimuth antenna are aligned symmetrically on the reference area extended centerline.

p. Speed Categories. Apply to airspeeds flown on final approach and turning missed approach segments with the turning missed approach obstacle evaluation areas based on the following flight track radii:

Airspeed of 60 knots or less = radius 4,000 feet

Airspeed of 61 to 90 knots = radius 6,000 feet

8. INTERMEDIATE SEGMENT. Except as stated in this paragraph, the criteria for the intermediate segment are contained in Order 8260.3B, chapter 2, section 4. The intermediate segment begins at the point where the initial approach course intercepts the final approach azimuth course. The minimum length of the intermediate segment depends on the angle at which the initial approach course intersects the final approach azimuth course, as specified in table 1. Angles greater than 90° require a lead radial, as specified in Order 8260.3B, paragraph 232.a, and further interpretive analogy in paragraph 922.

Table 1. MINIMUM INTERMEDIATE COURSE LENGTH

Course Intercept Angle (Degrees)	Minimum Length (Nautical Miles)
0 - 60	2.0
90	3.0
120	5.0

NOTE: Table may be interpolated.

9. FINAL APPROACH SEGMENT. The final approach segment consists of the final approach primary and transitional areas. The final approach area begins 1,225 feet from the back of the FARA and extends to the PFAF. See figure 1.

a. Final Approach Course (FAC) Alignment. The final approach course originates at the azimuth antenna, is coincident with the reference area extended centerline, and is normally aligned with the center of the azimuth scan. Where an operational advantage is achieved, the FAC may be aligned on other than the center of azimuth scan.

b. Final Approach Primary Area. The final approach primary area normally has the dimensions described in paragraphs 9b(1) and 9b(2) and is centered on the final approach course. When certain combinations of the glidepath angle, HAH, and HCH occur, the dimensions of the area extend inside the 1,225-foot point. The conditions in which this extension will occur are given in paragraph 9b(3). See figure 3.

(1) Length. The standard length is 25,000 feet measured outward along the final approach course from a point 1,225 feet from the back of the FARA. Where operationally required for procedural

considerations, the length of the primary area may be increased or decreased symmetrically, but shall not be less than 2 miles.

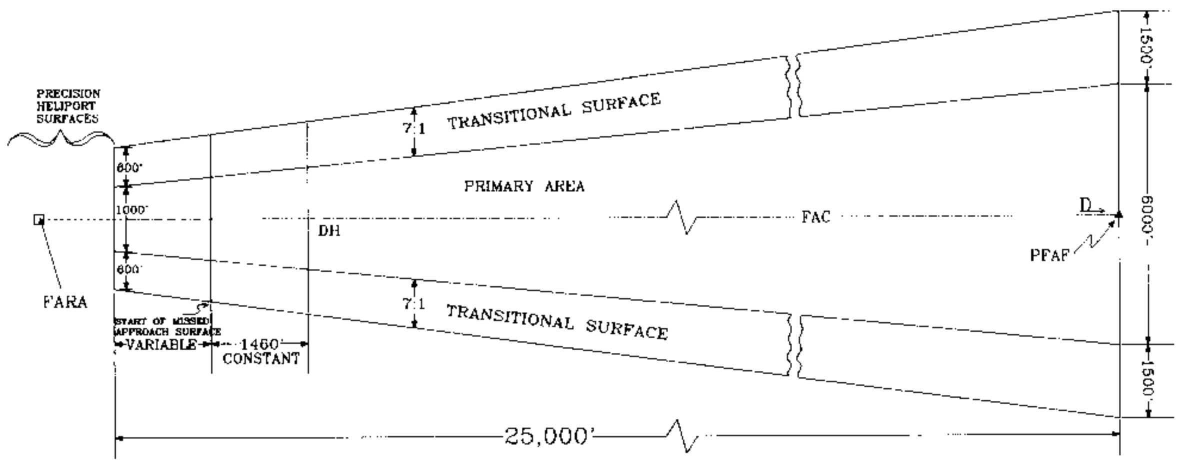

FIGURE 1. FINAL APPROACH AREA, PARAGRAPHS 9 & 10.

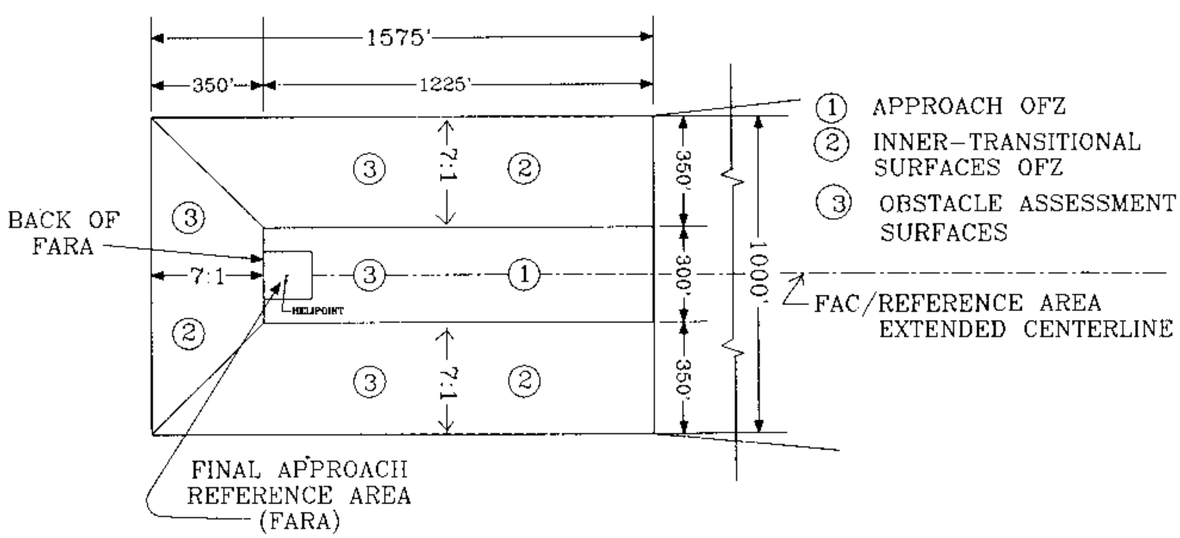

FIGURE 2. PRECISION HELIPORT IMAGINARY SURFACES, PARAGRAPH 10C.

(2) Width. The area is symmetrically centered on the final approach course. The area has a total width of 1,000 feet at a point 1,225 feet from the back of the FARA, and expands uniformly to a width of 6,000 feet at a point 25,000 feet from the 1,225-foot point. The width is uniformly expanded or reduced where an adjustment of the length is required. As shown in figure 1, the width either side of the centerline at a given distance "D" from the 1,225-foot point can be determined by the formula: $1/2W = 0.1D + 500$ feet.

(3) Special Dimensions. Certain combinations of the glidepath angle, HAH, and HCH will extend the final approach area inside the 1,225-foot point. The width of the extension inside the 1,225-foot point is a constant 1,000 feet. The length is determined by the amount that the 1,460-foot point extends inside the 1,225-foot point. This extension inside the 1,225-foot point will occur when the following formula is applied and its resultant is less than 1,150 feet from the helipoint. See figure 3.

$$\text{IF:} \quad \frac{\text{HAH - HCH}}{\text{TAN Glidepath Angle}} - 1{,}460 < 1{,}150 \text{ feet;}$$

THEN: Extensions of the final approach segment inside the 1,225-foot point will occur.

For example, a 6° glidepath with a 262-foot HAH (DH) and a 20-foot HCH will have an 842.5-foot length of OFZ from the helipoint to the beginning of the final approach obstacle clearance surface; thus, an extension of the final approach area of 307.5 feet inside the 1,225-foot point.

c. Transitional Surfaces. At 25,000 feet from the 1,225-foot point, the surfaces are 1,500 feet wide, measured from the outer edge at right angles to the final approach course, and taper uniformly to a 600-foot width at the 1,225-foot point. The width of the surface on either side at a given distance "D" from the 1,225-foot point can be determined by the formula:

$$\text{Transitional surface width} = 0.036D + 600 \text{ feet}$$

If the final approach surface begins inside the 1,225-foot point, the transitional surfaces will be maintained at a constant 600-foot width back to the 1,225-foot point. See paragraph 10b and figure 3.

10. APPROACH AND LANDING OBSTACLE CLEARANCE SURFACES.

a. Final Approach Obstacle Clearance Surface. The final approach obstacle clearance surface overlies the final approach area. See figure 1. The surface begins at the 1,225-foot point at the FARA elevation and rises at the gradient specified in table 2. When the glidepath angle, HAH, and HCH combinations cause the beginning of the missed approach surface, which occurs at a point 1,460 feet beyond the decision height (DH), to fall inside the 1,225-foot point, the final approach surface will begin at the 1,460-foot point, remain at the approach OFZ elevation to the 1,225-foot point, then rise at the gradient specified in table 2. See figure 3.

b. Transitional Surfaces. These surfaces are inclined planes overlying the transitional areas described in paragraph 9c, which begin at the height of the applicable final approach obstacle clearance surface and extend outward and upward at a gradient of 7:1 at right angles to the FAC. The surface areas will be maintained at a constant 600-foot width from the 1,225-foot point if the final approach surface begins inside the 1,225-foot point. See figure 3.

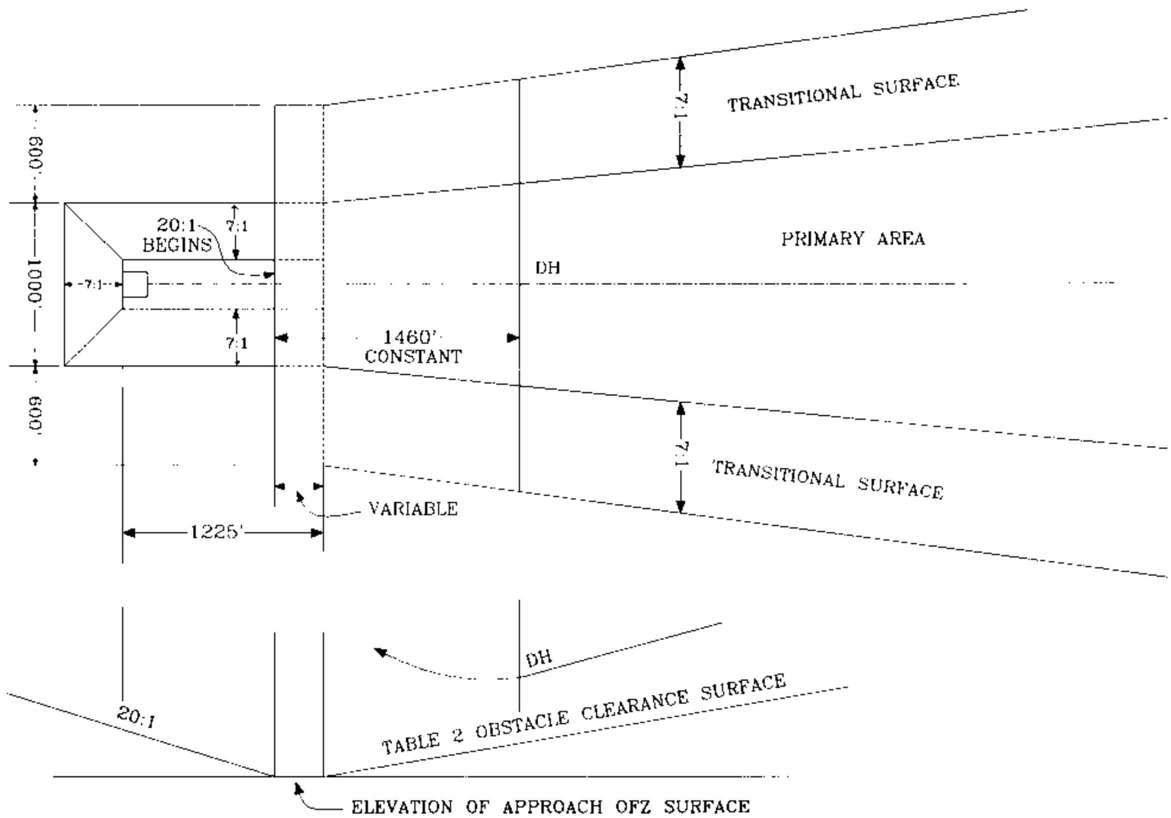

FIGURE 3. PRECISION HELIPORT IMAGINARY SURFACES WITH CERTAIN APPROACH ANGLE, HAH, AND HCH COMBINATIONS, PARAGRAPHS 9 AND 10.

Table 2. GLIDEPATH ANGLES WITH ASSOCIATED OBSTACLE CLEARANCE SLOPES

Glidepath Angle °	Slope (may be interpolated)	Glidepath Angle°	Slope (may be interpolated)
3.0	34.0:1		
3.1	32.9:1	4.6	22.2:1
3.2	31.9:1	4.7	21.7:1
3.3	30.9:1	4.8	21.2:1
3.4	30.0:1	4.9	20.8:1
3.5	29.1:1	5.0	20.4:1
3.6	28.3:1	5.1	20.0:1
3.7	27.6:1	5.2	19.6:1
3.8	26.8:1	5.3	19.2:1
3.9	26.1:1	5.4	18.9:1
4.0	25.5:1	5.5	18.5:1
4.1	24.9:1	5.6	18.2:1
4.2	24.3:1	5.7	17.9:1
4.3	23.7:1	5.8	17.6:1
4.4	23.2:1	5.9	17.3:1
4.5	22.7:1	6.0	17.0:1

c. Precision Heliport Imaginary Surfaces. The heliport surfaces adjoining the final approach area are composed of the FARA, an approach OFZ, an inner-transitional surface OFZ, and an obstacle assessment surface (OAS).

(1) Approach OFZ. The approach OFZ begins at the back edge of the FARA at helipoint elevation, is 300 feet wide and centered on the FAC. When HCH is 15 feet or above, it extends outward in the direction of the final approach area for 325 feet. It then rises at 20:1 to 8 feet above helipoint elevation and remains at that elevation to 1,225 feet from the back of the FARA or until adjoining the final approach area, whichever occurs first. When HCH is less than 15 feet, it extends in the direction of the approach at helipoint elevation until adjoining the final approach area. See figures 2, 3, 4, and 5.

(2) Inner-Transitional Surfaces OFZ. The inner-transitional surface areas are 350 feet wide and composed of two side surfaces and one end surface. The total length of the side surfaces is 1,575 feet and the end surface is 350 feet long, expanding from 300 feet at back edge of FARA to the obstacle assessment surface (OAS) width of 1,000 feet. The side inner-transitional surfaces begin at the side edge of the approach OFZ surface and extend upward at a slope of 7:1. The end surface begins at the OFZ back edge and extends upward at a slope of 7:1 measured perpendicular to the OFZ back edge. The three surfaces join as depicted in figure 2.

(3) Obstacle Assessment Surface (OAS) Area. The OAS area is 1,000 feet wide, centered on the FAC, and begins 350 feet beyond the back edge of the FARA and extends to the beginning of the final approach area. The OAS consists of the OFZ and the 7:1 surfaces defined in paragraph 10c(2). See figure 2.

(4) Extension of Precision Heliport Imaginary Surfaces. Where the landing area with HILS is not the FARA, the heliport surfaces shall be extended from the final approach area to encompass the landing area. The center of the landing area shall be located, from the center of the FARA, not more than:

(a) Two hundred feet laterally from the helipoint;

(b) Six hundred fifty feet beyond the helipoint; and

(c) No closer to the MAP than the helipoint.

Obstacle evaluations for all extensions shall be the same as for the FARA. See figure 4.

11. APPROACH AND LANDING OBSTACLE CLEARANCE.

a. No obstacle shall penetrate the obstacle clearance surfaces specified in paragraphs 10a and 10b, except as defined by 11b and 11c.

b. Only essential (required by function) frangible (FAA ER 530-81-04, Structural/Mechanical Design Requirements for Low Impact Resistance for MLS Structures) heliport visual aids shall be permitted to penetrate the surfaces specified in paragraphs 10c(1) and 10c(2).

c. Any obstacle which penetrates the OAS, paragraph 10c, shall be evaluated to determine if upward adjustments in visibility should be required. See table 3. Visibilities of less than 1 mile shall not be published if the OAS is penetrated by an obstacle higher than 20 feet above helipoint elevation. Such obstacles will be marked and lighted in accordance with Advisory Circular (AC) 70/7460-1G, Obstruction Marking and Lighting.

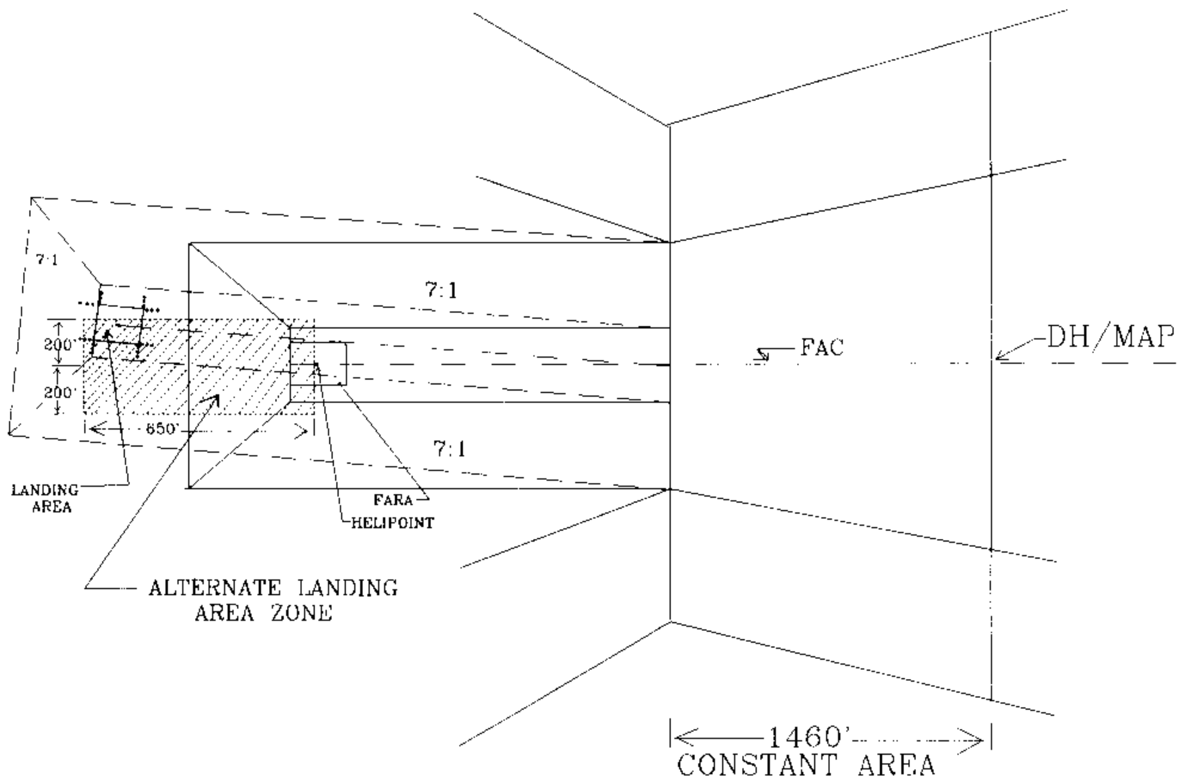

FIGURE 4. EXTENSION OF PRECISION HELIPORT IMAGINARY SURFACES, PARAGRAPH 10c(4).

12. GLIDEPATH ANGLE. In addition to the required obstacle clearance, the following shall apply to selection of a glidepath angle and antenna location.

a. Glidepath Angle. MLS facilities should be commissioned with the lowest glidepath angle, which allows the lowest minimums. Angles below 3° or over 6° shall not be established without an approved waiver from the Flight Standards Service, FAA, Washington, D.C.

b. Elevation Antenna.

(1) The elevation antenna will be located in accordance with appropriate siting requirements, except it shall not penetrate approach or inner transitional OFZ surfaces.

(2) The HCH optimum height is 8 feet. It shall not be less than 8 feet nor should it be greater than 20 feet above the helipoint. See figures 5 and 6.

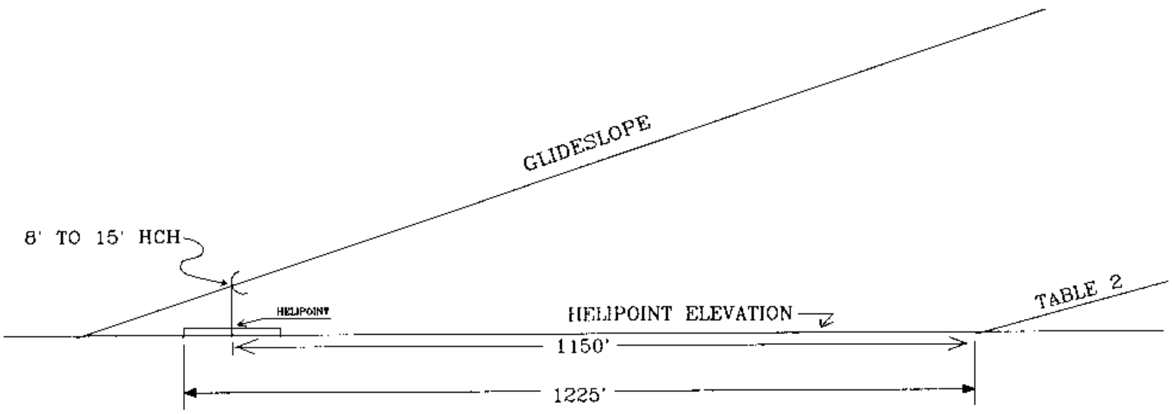

FIGURE 5. 8- TO 15-FOOT HELIPOINT CROSSING HEIGHT APPROACH OFZ SURFACE, PARAGRAPH 10.

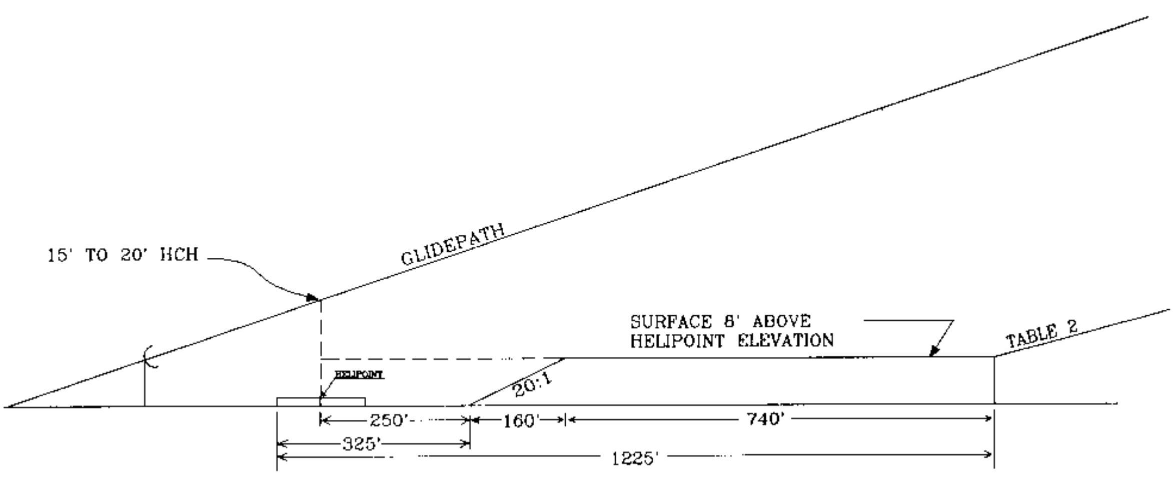

FIGURE 6. 15- TO 20-FOOT HELIPOINT CROSSING HEIGHT APPROACH OFZ SURFACES, PARAGRAPH 10.

(3) HCH is computed, as shown in figure 7, according to the following formulas:

$$h = d \times \tan \text{glidepath angle}$$

$$HCH = h + p$$

(a) Where "d" is the distance from the helipoint to the elevation antenna, measured parallel to the final approach course.

(b) Where "p" is the height of the antenna phase center above helipoint elevation.

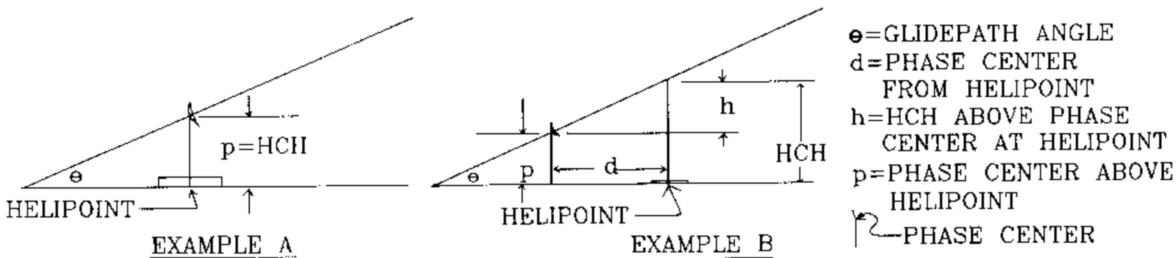

FIGURE 7. HCH DIAGRAM, PARAGRAPH 12.

13. AZIMUTH-ONLY. Applies only to precision MLS dual minima approaches when no useable glide slope is available, provided the azimuth-only final approach fix (FAF) is inside or at the same location as the precision final approach fix (PFAF). The location of the FAF for an azimuth-only approach shall be identified on the FAC by a crossing radial or bearing, navaid or DME, but the FAF should not be closer to the MAP than the PFAF. The optimum length of the final approach is 5 miles. It may be reduced or extended where an operational requirement exists. The minimum descent altitude (MDA) shall be adjusted to preclude descent gradients exceeding 800-feet-per-mile, and assure that no obstacles penetrate the transitional surfaces. The minimum obstacle clearance in the final area shall be 250 feet and the transitional surfaces in azimuth-only approaches begin not less than 250 feet below MDA. MDA adjustments specified in Order 8260.3B, paragraph 323, shall be considered.

14. MISSED APPROACH SEGMENT. The missed approach segment begins at the DH/MAP and ends at a point or fix where initial approach or en route obstacle clearance is provided. The primary area equals the width of the primary area at the end of section 1a, and its edges splay 20° relative to the missed approach course until reaching its maximum width 4 NM each side of the missed approach course. Secondary areas for the missed approach join at the edges of the final approach transitional surfaces and the edges splay 30° relative to the missed approach course until reaching a constant width of 2,500 feet measured perpendicular to the edge of the primary area. Positive course guidance should be provided where possible. See figures 8 through 12. Where no positive course guidance is provided, the total area defined by the 30° splay is considered primary area.

a. The 20:1 missed approach obstacle clearance surface and splay begin 1,460 feet beyond the MAP toward the missed approach area. The height of the missed approach obstacle clearance surface begins at the elevation of the final approach obstacle clearance surface. See figure 9. The slope of the surface from the MAP to the 1,460-foot point is specified in table 2.

b. Straight Missed Approach Area. The straight missed approach (maximum turn of 15° from the final approach course) area is centered on the missed approach course and is composed of two sections, 1a and 1b. Section 1a begins at the MAP and is equal to the width of the final approach primary and secondary areas, respectively, at the MAP and overlies the final approach area and ends at a point 1,460 feet beyond the MAP. Section 1b begins where section 1a ends and extends to the end of the missed approach segment. See figure 8.

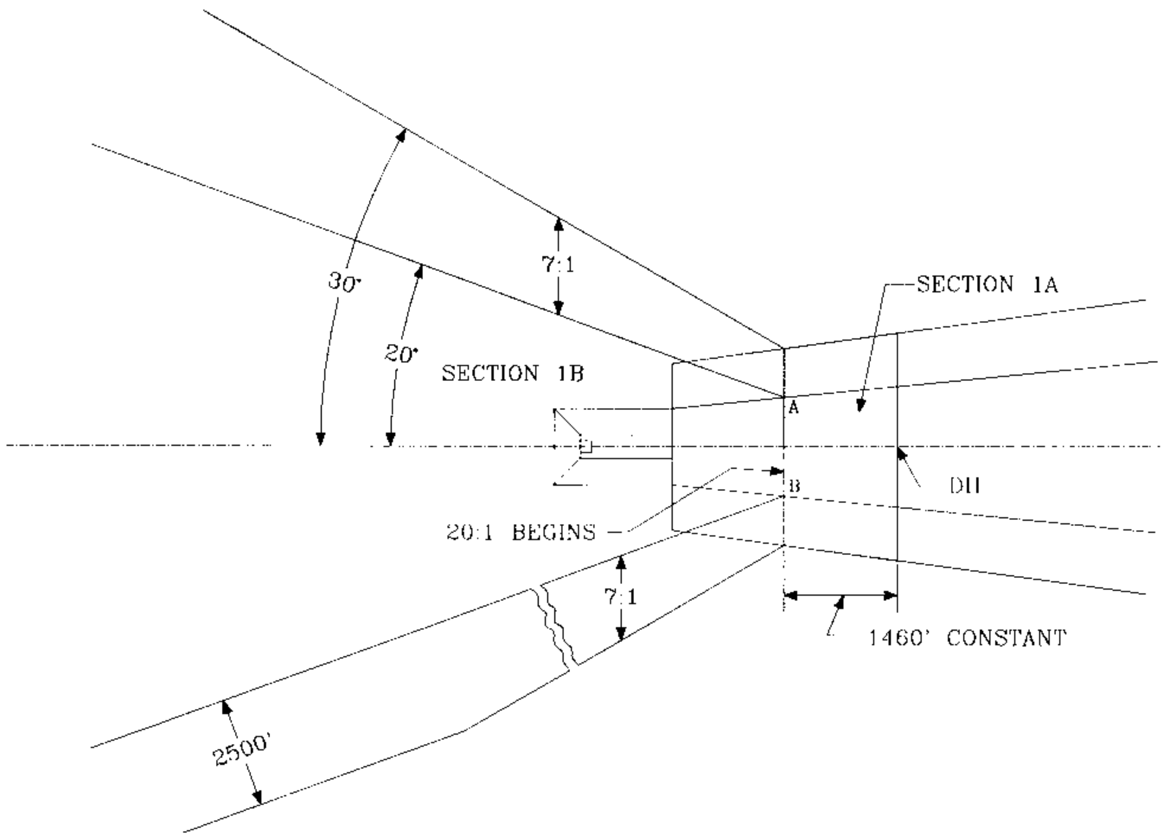

FIGURE 8. MISSED APPROACH AREA BEGINNING SEGMENT, PARAGRAPH 14.

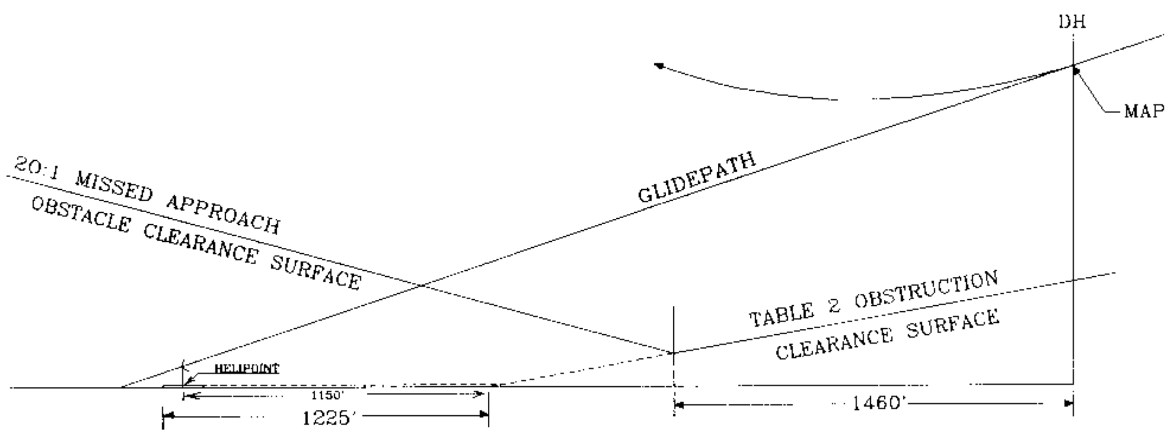

FIGURE 9. MISSED APPROACH OBSTACLE CLEARANCE SURFACE, PARAGRAPH 14.

c. Turning Missed Approach. Turning missed approach criteria apply when a turn of more than 15° from the final approach course is required. See figure 10. Two separate turning missed approach areas shall be evaluated to determine if obstacles dictate publication of speed category minimums based on the following flight track turning radii:

4,000 feet shall be the flight track radius for airspeeds of 60 knots or less.

6,000 feet shall be the flight track radius for airspeeds of 61-90 knots.

Where obstacle evaluations determine separate minimums for the two areas, speed categories shall be published.

(1) Turns may commence at an altitude, a fix, or a point to intercept a course but not at an altitude of less than 400 feet above helipoint elevation.

(2) All turning missed approach areas shall have a straight segment for a specified distance from the MAP aligned with the final approach course to the turn commencement point.

(a) The straight segment shall not be less than 0.5 miles.

(b) The straight segment shall also be established by the distance achieved when a 352-foot-per-mile climb gradient from the HAH reaches an altitude of 400 feet above helipoint elevation.

NOTE: The 352-foot-per-mile climb gradient should be noted on the procedure until published in the Airman's Information Manual (AIM).

Example: A 352-foot-per-mile climb gradient will provide 48-feet-per-mile missed approach obstacle clearance.

(3) The flight track turning radius "R" shall be evaluated separately for both 4,000 feet and 6,000 feet to determine if separate minimums are required to be published under speed categories. These radii establish the reference center vertex for the spiral by measuring perpendicular to the final approach course at the end of the straight segment.

(4) The area shall be established in the following manner:

(a) The outer boundary of the primary area measured from the vertex of the flight track turning radius is described by the spiral formula:

$$R_p = W_p + R + 25.41(t)$$

where "R_p" = spiral radius of primary area boundary;

where "W_p" = 1/2 width of the primary area at the end of the straight segment where the turn begins. This width is used in all R_p and R_s (see paragraph 14c(4)(b)) iterations;

where "R" = projected flight track radius extended off the end of the straight segment perpendicular to centerline forming the pivotal point for a turning missed approach (4,000 feet for the 60 knots or less evaluation and 6,000 feet for the 61-90-knot evaluation); and where "t" = the progressive total degrees of turn, beginning at turn initiation at the end of the straight segment until turn completion on the missed approach heading. It may be computed in 15° increments and entered into the formula as the number of degrees turned at that specific plotted iteration (e.g., with a total turn of 50°; t=15 in the 1st iteration and respectively, 30, 45, and 50 in the 2nd, 3rd, and 4th iterations). See example figures 10, 11, and 12.

(b) The outer boundary of the secondary area measured from the vertex of the flight track turning radius is described by the spiral formula:

$$R_s = W_s + W_p + R + 40.31(t)$$

where "R_s" = spiral radius of secondary area boundary;

where "W_s" = width of outside of the secondary area at the end of the straight segment where the turn begins. This width is used in all R_s iterations;

where "R" = same as in 4(a) above; and

where "t" = same as in 4(a) above.

(c) For turns less than 90°, the inside turn boundaries for primary and secondary areas shall have equal symmetry to the outer boundaries from the point of turn completion outward to the end of the missed approach. From the turn completion point inward connect the inner primary and secondary points to the primary and transitional surfaces of the final approach at the MAP. See figure 10.

(d) For turns of 90° through 180°, the inside turn boundaries for the primary and secondary areas shall commence from the primary edge of the final approach area at the MAP and splay as described in paragraph 14, from a line parallel to the missed approach track after turn completion. See figure 11.

(e) For turns greater than 180°, the inside turn boundaries connect to the outer primary and secondary points at the end of the straight segment and splay, as described in paragraph 14, from a line parallel to the missed approach track after turn completion. See figure 12.

(5) Turn at an altitude, a fix, or to intercept a selected course, a bearing or radial. A missed approach turning at an altitude, fix, or at some point to intercept a radial or bearing is a straight missed approach procedure until reaching the point where the turn is started. The outer primary and secondary boundary arcs splay in accordance with paragraph 14c.

(a) At an altitude. Altitudes required prior to commencing a turn shall be specified in the published procedure. The turn and outer boundaries begin where the straight segment ends, as determined in paragraph 14c(2) together with considerations of adjustments in DH as a result of backing up the 20:1 surface due to penetrations in the missed approach area. The inner primary and secondary boundaries begin at the MAP and for;

1 Turns less than 90° connect to the inner primary and secondary points at turn completion. See figure 10.

2 Turns 90° through 180° connect at the edge of the final approach primary and splay, as described in paragraph 14, from a parallel to the missed approach track after turn completion. See figure 11.

3 Turns greater than 180° connect to the outer primary and secondary points at the end of the straight segment and splay, as described in paragraph 14b, from a parallel to the missed approach track after turn completion. See figure 12.

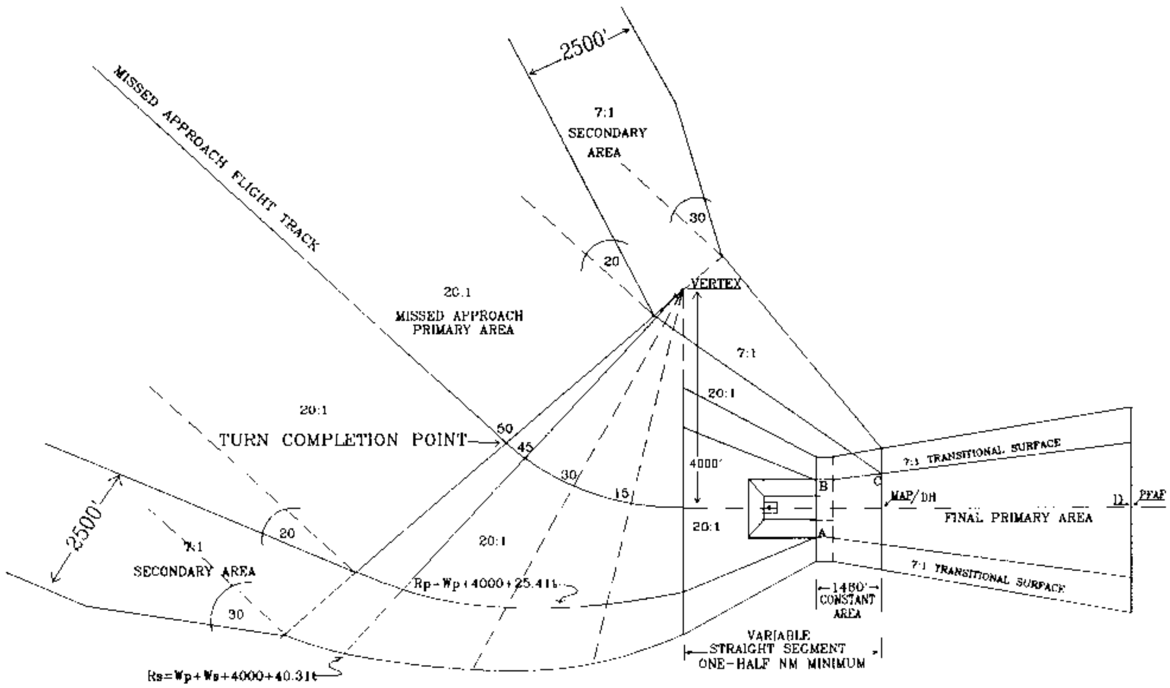

FIGURE 10. TURNING MISSED APPROACH, LESS THAN 90°, PARAGRAPH 14C.

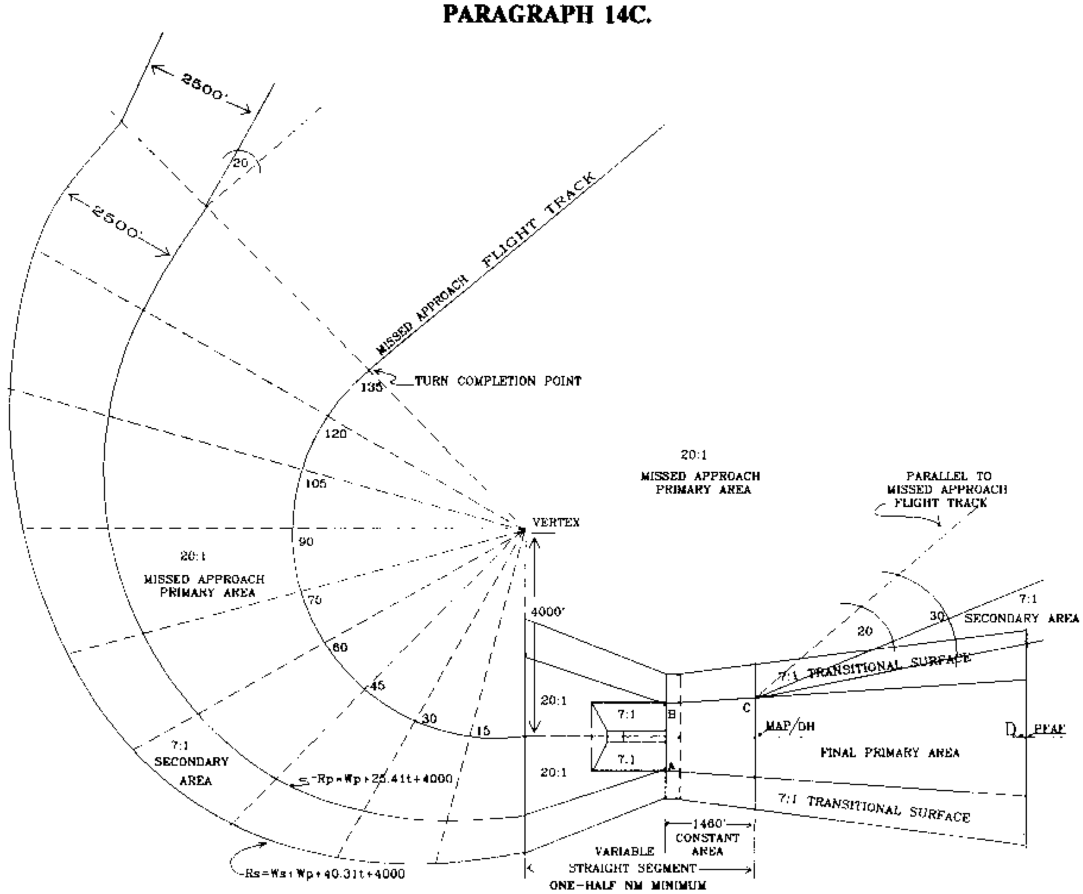

FIGURE 11. TURNING MISSED APPROACH, 90° THROUGH 180° PARAGRAPH 14C.

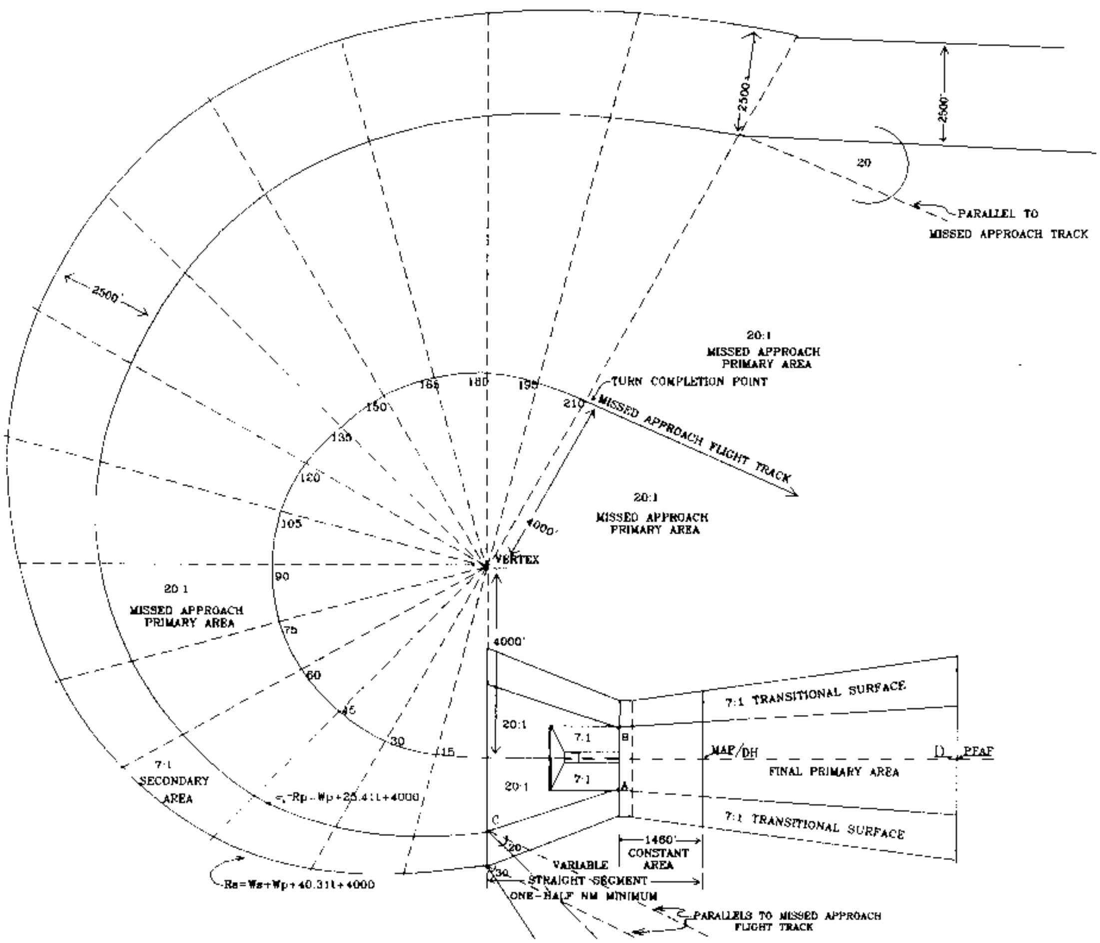

FIGURE 12. TURNING MISSED APPROACH, GREATER THAN 180°, PARAGRAPH 14C.

(b) At a fix. The turn and the outer boundaries begin at the latest point at which the fix can be received. The inner boundaries begin 1 mile back from the earliest point at which the fix can be received. The outer and inner boundaries shall not be less than those described in paragraph 14c(5)(a).

(c) To intercept a selected course, bearing, or radial. The outer boundary of the turning area begins abeam the latest point at which the selected radial or bearing can be received. The inner boundary begins 2 miles back from the earliest point at which the selected radial/bearing could show an on-course indication.

(d) Azimuth-Only. Where azimuth-only minimums are included with published precision minimums, the precision and nonprecision missed approach points should be the same. Unless otherwise stated, Order 8260.3B, paragraphs 1117 through 1124, apply for construction and obstacle evaluation of the missed approach areas.

15. MISSED APPROACH OBSTACLE CLEARANCE. The 20:1 missed approach obstacle clearance surface is predicated upon helicopter airspeeds not exceeding 90 knots during missed approach until reaching missed approach altitude. Additionally, for turning missed approaches, the aircraft selecting the lower minimums must not exceed 60 knots until turn completion. This is to insure that the aircraft will remain within the obstacle clearance area based on the 4,000-foot turn radius evaluation. See paragraph 16a(2).

a. Straight Missed Approach Area. No obstacle shall penetrate the missed approach obstacle clearance surface. This surface begins at the end (line AB) of the 1,460-foot constant area (section 1a) and slopes outward at a rate of 20 feet horizontally for each 1 foot vertically (20:1). Its dimensions are defined by the primary boundaries of the missed approach area. See figures 8 and 9. For computation of surface obstacle clearance, see paragraph 15b.

b. Turning Missed Approach Areas. The straight segment obstacle clearance is the same as for straight missed approaches. Line ABC is identified at the end of section 1a, to the MAP, or to the end of the straight segment, as appropriate, as the point from which the 20:1 originates for obstacle determinations. See example figures 10, 11, and 12. Thus, the height of the 20:1 missed approach surface over any obstacle in the primary area may be computed by measuring the distance from the obstacle to the nearest point on line ABC and computing the surface height at a 20:1 ratio, starting at the height of the missed approach surface at the end of the 1,460-foot constant area. The dimensions of the 20:1 surface are defined by the primary boundaries of the turning missed approach areas as determined in accordance with paragraph 14. When an obstacle is in a secondary area, measure straightline distance from the nearest point on line AB or ABC to the point on the inner edge of the secondary area which is nearest the obstacle. Compute the height of the 20:1 missed approach surface at this point; then from this height apply the 7:1 secondary area surface for the remaining distance to the obstacle.

c. Secondary Areas. No obstacle shall penetrate a surface sloping upward and outward at 7:1 from the missed approach surface measured at right angles to the missed approach course. Where no positive course guidance is provided, primary surface area consideration must be applied in the secondary areas.

d. Discontinuance. Further application of the 20:1 missed approach surface is not required when the surface reaches 1,000 feet below the missed approach altitude (Order 8260.3B, paragraphs 270 and 1731) where evaluation of the complete missed approach area assures no penetration of the surface from its beginning to end.

16. MINIMUMS. Order 8260.3B, chapter 3, applies as follows:

a. General Information, section 1. Paragraphs 310 and 311 apply except:

(1) Substitute "helipoint elevation" for "airport elevation" or "touchdown zone" in paragraph 310.

(2) These criteria apply to "helicopter only" operations, and only helicopter minimums should be published. These criteria are also subject to speed categories where evaluations of the 6,000-foot radius missed approach area require higher minimums than the 4,000-foot radius evaluation. Where separate minimums are determined to exist, minimums for the 4,000-foot radius shall be published under the "60 knots or less" category, and minimums for the 6,000-foot radius shall be published under the "61-90 knots" category. See generic depiction of possible minimums in the following examples.

(For Straight Missed Approach)

CATEGORY	COPTER
H-MLS 087	265 - 1/2 262 (300 - 1/2)
H-AZ 087	340 - 3/4 337 (400 - 3/4)
DO NOT EXCEED 90 KNOTS DURING MISSED APPROACH UNTIL REACHING (missed approach altitude).	

COPTER MLS 087

(For Turning Missed Approach)

CATEGORY	COPTER	
SPEED	60 KNOTS OR LESS	61-90 KNOTS
H-MLS 087	265 - 1/2 262 (300 - 1/2)	320 - 3/4 317 (400 - 3/4)
H-AZ 087	340 - 3/4 337 (400 - 3/4)	420 - 1 417 (500 - 1)
DO NOT EXCEED AIRSPEED FOR SELECTED MINIMA DURING MISSED APPROACH UNTIL TURN COMPLETION. DO NOT EXCEED 90 KNOTS UNTIL REACHING (missed approach altitude).		

COPTER MLS 087

NOTE: Inbound times from FAF to MAP shall not be published for speeds greater than 90 knots.

b. Altitude, section 2.

(1) Paragraphs 320, 321, and 322, addressing MDA's, apply to MLS instrument procedures that also include azimuth-only minimums except circling minimums do not apply.

(2) Paragraphs 323 and 324 addressing DH, apply, except in paragraph 324 "above helipoint elevation" is substituted for "above the highest runway elevation in the touchdown zone."

c. Visibilities, section 3.

(1) Paragraph 330 applies where azimuth-only minimums are to be included with precision minimums, except azimuth-only minimums shall not be less than those determined by paragraph 16e(2) of this order.

(2) Paragraphs 330, 331, and 332 do not apply where single precision minimums are published.

(3) To establish a visibility lower than 3/4 mile, no obstacle shall penetrate the first 10,000 feet of the final approach surface. See paragraph 11.

(4) Visibility values shall not be reduced to less than the distance from DH to helipoint unless an operational HALS has been installed and heliport landing area air-to-ground communication procedures have been established. The communication must confirm to the pilot that the FARA and/or the landing area, paragraph 10c(4), are clear for an unimpeded landing.

(5) Paragraphs 334 and 335 do not apply. No runway visual range standards for heliports have been established.

d. Heliport Lighting/Visibility Requirements.

(1) Section 4 does not apply.

(2) A standard Heliport Approach Lighting System (HALS) is to be used for heliport MLS precision approach operations. A 1,000-foot heliport IFR approach lighting system with 100-foot light bar spacing has been evaluated and approved. In order to obtain the lowest possible minimums, it is recommended as basic equipment. See figure 13. If a HALS is not installed, refer to Standard Minimums paragraph 16e, this order, for visibility adjustments.

(3) A Heliport Instrument Lighting System (HILS) shall be the minimum for all MLS instrument approaches to a heliport. See figure 13. The system includes:

(a) Perimeter Lights. A minimum of five omni-directional yellow lights on each side are spaced equidistantly and used to mark the edges of the FARA and/or the landing area, paragraph 10c(4). The front and back row of lights are augmented with an additional light between each fixture to provide enhanced brilliance in the direction of approach.

(b) Edge Light Bars. Three unidirectional white lights are used to extend the right and left line of perimeter lights forward and rearward on each side of the FARA and/or the landing area, paragraph 10c(4). These lights are spaced at 50-foot intervals as measured from the line of perimeter lights.

(c) Wing Light Bars. Three unidirectional white lights are used to extend the front and rear line of perimeter lights outward on each side of the FARA and/or the landing area, paragraph 10c(4). These lights are spaced at 15-foot intervals as measured from the line of perimeter lights. For further guidance, reference Enhanced Lighting, chapter 7, AC 150/5390-2, Heliport Design.

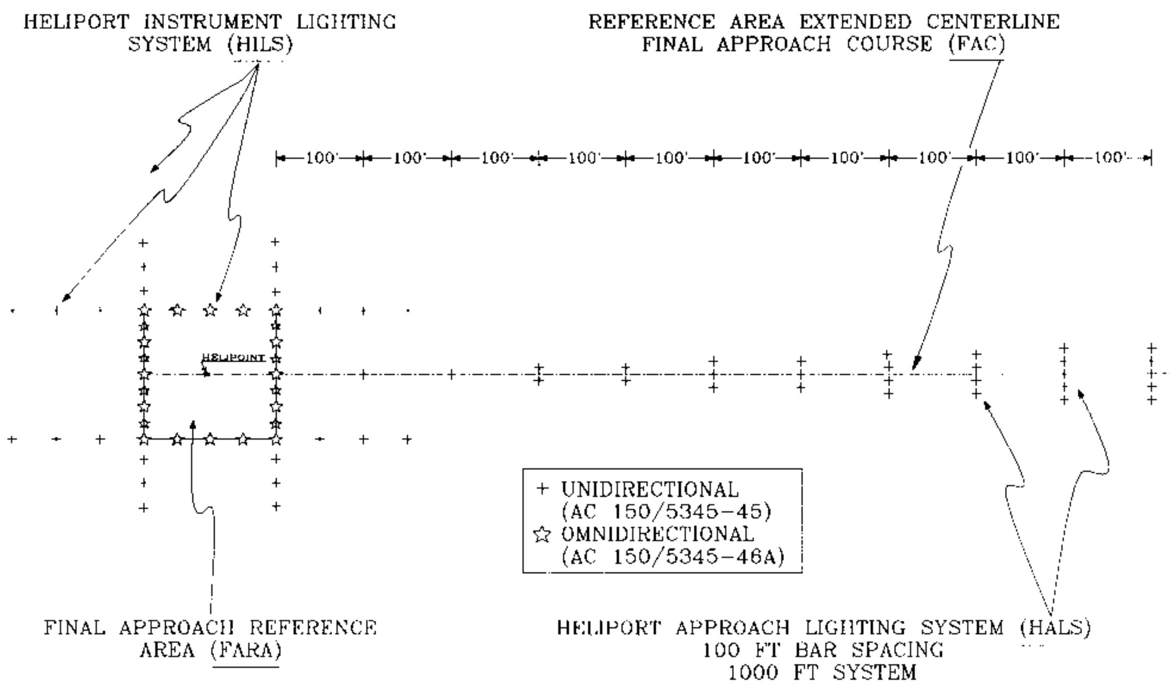

FIGURE 13. HELIPORT LIGHTING SYSTEM, PARAGRAPH 16.

e. Standard Minimums, section 5.

(1) Paragraphs 350 and 351 do not apply.

(2) An operational HILS shall be mandatory for all MLS approaches to heliports. Visibility values at heliports with NO HALS shall be increased by 1/2 statute mile (sm). The cumulative total visibility for inoperative HALS, or no HALS, need not exceed 1 1/2 sm. Therefore, to ensure necessary deceleration cuing with NO HALS, ADD 1/2 sm to the visibility value depicted in table 3 for a cumulative total not to exceed 1 1/2 sm. When a combination of glide slope angle and HAH dictate visibility values in excess of 1 1/2 sm, use table 3 values, not cumulative. See the examples following table 3.

Table 3. EFFECT OF HEIGHT ABOVE HELIPOINT
(Heliport Approach Lighting System Required)

Vis Min (sm)	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
GLIDEPATH ANGLE°	HEIGHT ABOVE HELIPOINT (FEET)						
3.0	* N/A	200 - 207	208 - 276	277 - 345	346 - 414	415 - 483	484 - 552
3.1	* N/A	200 - 214	215 - 285	286 - 356	357 - 428	419 - 499	500 - 570
3.2	* N/A	200 - 220	221 - 294	295 - 368	369 - 441	442 - 515	516 - 589
3.3	* N/A	200 - 227	228 - 303	304 - 379	380 - 455	456 - 531	532 - 607
3.4	* N/A	200 - 234	235 - 313	314 - 391	392 - 469	470 - 547	548 - 626
3.5	* N/A	200 - 241	242 - 322	323 - 402	403 - 483	484 - 563	564 - 644
3.6	* N/A	200 - 248	249 - 331	332 - 414	415 - 497	498 - 580	581 - 662
3.7	* N/A	200 - 255	256 - 340	341 - 425	426 - 510	511 - 596	597 - 681
3.8	* N/A	200 - 262	263 - 349	350 - 437	438 - 524	525 - 612	613 - 699
3.9	* N/A	200 - 269	270 - 358	359 - 448	449 - 538	539 - 628	629 - 718
4.0	* N/A	200 - 276	277 - 368	369 - 460	461 - 552	553 - 644	645 - 736
4.1	* N/A	200 - 282	283 - 377	378 - 471	472 - 566	567 - 660	661 - 754
4.2	* N/A	200 - 289	290 - 386	387 - 483	484 - 579	580 - 676	677 - 773
4.3	* N/A	200 - 296	297 - 395	396 - 494	495 - 593	594 - 692	693 - 791
4.4	200 - 202	203 - 303	304 - 404	405 - 506	507 - 607	608 - 708	709 - 809
4.5	200 - 206	207 - 310	311 - 414	415 - 517	518 - 621	622 - 724	725 - 828
4.6	**201 - 211	212 - 317	318 - 423	424 - 529	530 - 634	635 - 740	741 - 846
4.7	**205 - 216	217 - 324	325 - 432	433 - 540	541 - 648	649 - 756	757 - 865
4.8	**210 - 220	221 - 331	332 - 441	442 - 552	553 - 662	663 - 772	773 - 883
4.9	**214 - 225	226 - 338	339 - 450	451 - 563	564 - 676	677 - 789	790 - 901
5.0	**218 - 229	230 - 344	345 - 459	460 - 575	576 - 690	691 - 805	806 - 920
5.1	**223 - 234	235 - 351	352 - 469	470 - 586	587 - 703	704 - 821	822 - 938
5.2	**227 - 239	240 - 358	359 - 478	479 - 597	598 - 717	718 - 837	838 - 956
5.3	**231 - 243	244 - 365	366 - 487	488 - 609	610 - 731	732 - 853	854 - 975
5.4	**236 - 248	249 - 372	373 - 496	497 - 620	621 - 745	746 - 869	870 - 993
5.5	**240 - 252	253 - 379	380 - 505	506 - 632	633 - 758	579 - 885	886 - 1011
5.6	**244 - 257	258 - 386	387 - 515	516 - 643	644 - 772	773 - 901	902 - 1030
5.7	**249 - 261	262 - 393	394 - 524	525 - 655	656 - 786	787 - 917	918 - 1048
5.8	**253 - 266	267 - 399	400 - 533	534 - 666	667 - 800	801 - 933	934 - 1066
5.9	**257 - 271	272 - 406	407 - 542	543 - 678	679 - 813	814 - 949	950 - 1085
6.0	**262 - 275	276 - 413	414 - 551	552 - 689	690 - 827	828 - 965	966 - 1103

* Insufficient visibility, except it may be 200 where the HCH/DH combination places the aircraft 2,600 feet or less from the approach lights. See FAR 91.175.

** Limited by 2,500-foot deceleration distance.

G/S	HAH	VIS (sm) With HALS	Additive Value (sm)	VIS (sm) Without HALS
3.9°	450'	1 1/2	0	1 1/2 #
4.0°	555'	1 3/4	0	1 3/4 #
4.6°	425'	1 1/4	1/4	1 1/2
6.0°	290'	3/4	1/2	1 1/4
3.5°	675'	2	0	2 #
4.3°	200'	3/4	1/2	1 1/4

Actual table value applied.

(3) If the heliport has approach lights installed, the procedure shall be annotated, "IF APPROACH LIGHTS INOPERATIVE - INCREASE VISIBILITY MINIMUMS TO (the value computed in paragraph 16e(2)."

(4) The HAH shall not be less than 250 feet once DH adjustment above 200 feet has been made due to an obstruction in the final approach area.

(5) Azimuth-Only MDA shall not be less than 250 feet above the highest obstacle in the final approach area nor less than missed approach evaluation adjustment requirements.

f. Alternate Minimums, section 6. Paragraph 360 applies.

g. Departures, section 7. Paragraph 370 applies.

Thomas C. Accardi
Director, Flight Standards Service