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SUBJECT: 60.46
Instrument Approach Procedure

The Office of Aviation Safety announces the attached policy on the formulation and approval of instrument landing system procedures. The material contained in the attachment is substantially the same as was reproduced in the Federal Register of November 16, 1949. The notable changes include (1) the substitution of the term "interception of the glide path" in the concluding paragraph of (e)(5) "Criteria" in lieu of the term "outer marker" contained in (e)(8) "Criteria" of the policy previously published in the Federal Register; and (2) the inclusion of material on "Standard Missed Approach Procedure."

The attached policy supersedes the policy in CAM 60.46-8 published in the Federal Register of November 16, 1949, and the material contained in Aviation Safety Release No. 316 dated March 24, 1949.

60.46-8 Instrument Landing System Procedures Determination

The attached new page headed "CAM 60.46-8 Instrument landing system procedures determination" should be retained as a page in the series of statements that will be issued explaining or implementing Civil Air Regulation 60.

John T. Warlick
fkr E. S. Hensley
Director, Office of
Aviation Safety

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60.46-8 INSTRUMENT LANDING SYSTEM PROCEDURES DETERMINATION (CAA policies which apply to section 60.46).

(a) GENERAL. The policies set forth herein will be used by the Civil Aeronautics Administration in formulating and approving all instrument landing system procedures including those prescribed in CAM 60.46-9.

(b) INITIAL APPROACH PROCEDURE. The initial approach to the ILS will normally be made on the associated primary navigation facility, radio range or radio beacon, or from an intersection thereof. Transition from the primary radio facility to the ILS localizer course will be made from specified points (radio range, reliable intersections—including bearings, localizer courses, fan markers, or compass locators) on predetermined established tracks between such fixes and the localizer course or the outer marker compass locator of the ILS. In some cases, however, it may be desirable to proceed first to the radio range station, thence to the ILS localizer course to start the approach.

All altitudes pertaining to initial approach including outbound flight on the localizer will provide vertical and lateral clearance in accordance with CAM 60.46-3 (b).

(c) PROCEDURE TURN.

(1) ESTABLISHMENT. Procedure turns are established and specified in ILS procedures for use in a return to final approach course (inbound) when dictated by direction of approach. In this connection and in order to expedite the handling of traffic, the specified procedure turn need not necessarily be made, unless so desired, when the final approach course can be established prior to commencing descent on the glide path to final approach minimums, and (i) the final approach course (inbound) can be intercepted at an angle of less than 90 degrees and within five miles of the outer marker from an established radio fix on a course specified in the ILS procedure, or (ii) the final approach can be accomplished from an established holding pattern.

(2) PROCEDURE TURN WITHIN FIVE MILES OF THE OUTER MARKER. A procedure turn within five miles of the outer marker, and with an initial turn to the left, followed by a turn to the right for a return to the final approach course will be standard whenever terrain, obstructions, and traffic will permit. The degree at which the turns are to be made is left to the discretion of the pilot but the maneuver will be completed within that area for which the altitude has been established to provide the required obstruction clearance.

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(i) ALTITUDE. The minimum altitude, at which the procedure turn within five miles of the outer marker is to be executed, will not be less than the altitude of the glide path at the outer marker and will be established on an assumption that the turn will be made within five miles of the outer marker. Accordingly, the established altitude will provide clearance of at least 1,000 feet above the terrain and all obstructions for an area five miles on each side of the center line of the localizer course. Where necessary, however, an upward adjustment of the minimum altitude will be made to insure safe clearance of any prominent obstruction or terrain immediately beyond the specified area.

(3) PROCEDURE TURN BEYOND FIVE MILES FROM OUTER MARKER. Where necessary or advisable to effect proper interception with the glide path, a procedure turn may be made beyond five miles from the outer marker.

(i) ALTITUDE. The minimum altitude, at which the procedure turn beyond five miles from the outer marker is to be executed, will not be less than the altitude of the glide path at the outer marker and will provide clearance of at least 1,000 feet above the terrain and all obstructions in an area five miles on each side of the center line of the localizer course.

(4) ALTITUDE PRIOR TO INTERCEPTION OF THE GLIDE PATH. Prior to the interception of the glide path on the localizer course from (i) an established radio fix, (ii) a holding pattern, and (iii) a procedure turn, the minimum altitude will provide clearance of at least 1,000 feet above the terrain and all obstructions and will not be less than the altitude of the glide path at the outer marker. This altitude and clearance will also be maintained until interception of the glide path in the case of a straight-in approach on the localizer course.

(5) DEVIATIONS. Where strict adherence to the distances specified in the preceding subparagraphs would establish an undesirable instrument approach procedure, minor deviations may be permitted provided safety will not be adversely affected.

(d) FINAL APPROACH. The term "final approach" as used in the ILS procedure is defined as that portion of the approach (inbound) on the localizer course after the glide path has been intercepted at or immediately beyond the outer marker and descent to authorized landing minimum altitude is started.

The altitude on the final approach will provide for clearance of terrain and obstructions in the approach area as hereinafter specified in "Obstruction Clearance for Final Approach."

(e) OBSTRUCTION CLEARANCE FOR FINAL APPROACH. The approach zone to instrument runways, together with the minimum obstruction clearances required for glide path, is defined as:

(1) APPROACH SURFACE. The approach surface is an inclined surface located directly above the approach area. The dimensions of the approach area are measured horizontally.

(i) LENGTH. The approach area has a length of 50,000 feet beginning 200 feet from the approach end of each instrument runway and extending outward on the extended center-line of the runway.

(ii) SLOPE. The slope of the approach surface along the runway center-line extended is fifty to one (50:1) for the inner 10,000 foot section and forty to one (40:1) for the outer 40,000 foot section.

(iii) WIDTH. The approach area is symmetrically located with respect to the extended runway center-line, and has a total width of 1,000 feet at a point 200 feet outward from the approach end of the runway. The approach area flares uniformly to a total width of 4,000 feet at the end of the 10,000 foot section, and to a total width of 16,000 feet at the end of the additional 40,000 foot section.

(2) HORIZONTAL SURFACE. The horizontal surface is a circular plane, 150 feet above the established airport elevation, having a radius of approximately 12,000 feet from the reference point at the center of the airport and connecting with the transitional surfaces or approach surfaces as hereinafter specified.

(3) TRANSITIONAL SURFACES. The transitional surfaces are inclined planes with a slope of seven to one (7:1) extending upward on either side of, and at right angles to, the runway center-line or the runway center-line extended.

Transitional surfaces inward from the approach end of the runway extend upward to an intersection with the horizontal surface from lines which are level with, parallel to, and 500 feet from the runway center-line.

The transitional surfaces for 200 feet outward from the approach end of the runway extend upward to an intersection with the horizontal surface from lines which are level with the runway center-line at the approach end of the runway, and are parallel to and 500 feet from the runway center-line extended.

Transitional surfaces more than 200 feet outward from the approach end of the runway extend upward from the outer edges of the approach surface to an intersection with the horizontal surface where the approach surface is below the horizontal surface, and for a lateral distance of 5,000 feet where the approach surface is outward from the horizontal surface.

(4) MINIMUM OBSTRUCTION CLEARANCE. For that part of the approach from the interception of the glide path by the aircraft, the minimum terrain and obstruction clearance is that obtained between a two and one-half degree path passing through a point 20 feet above and 500 feet inward from the approach end of the runway and the fifty to one (50:1) and forty to one (40:1) approach surface as previously defined.[1]

(5) CRITERIA. The minimum clearance in feet is a function of the distance D outward from the glide path unit as follows:

(i) For D less than 10,950 feet, minimum clearance 0.02366D + 28 feet.

(ii) For D between 10,950 feet and five miles, minimum clearance 0.01866D + 83 feet.

Example: If an obstruction is 10,250 feet from the glide path unit, formula (i) would apply, and the minimum clearance above the obstruction (10,250' X 0.02366) + 28' = 243' + 28' = 271'.

It should be noted that the criteria provides a minimum clearance of approximately 500 feet at the interception of the glide path with a gradually reduced clearance from that point inward. This clearance is a minimum requirement. However, a greater clearance may be necessary due to terrain features adjacent to the approach area of the instrument runway or peculiarities of the installation which are revealed by flight check.

(f) GLIDE PATH SETTING. Where the minimum obstruction clearance can be obtained in the approach area and adjacent transition surfaces inward from the point of interception of the glide path, the glide path will be set to the normal optimum setting of two and one-half to two and three-fourths degrees. This will result in obtaining the desirable intersection of the glide path and middle marker at an elevation of about 200 feet above the runway.

Where terrain and obstruction clearances more than that established by the criteria can be provided, the glide path may be set at a lesser angle. The minimum glide path angle will be two degrees.

When necessary to obtain the minimum obstruction clearance, the glide path may be raised to a maximum angle of three degrees. Angles greater than three degrees will not normally be used. Where the minimum obstruction clearance cannot be obtained with the maximum three degree glide angle and the length of the runway permits, consideration may be given to locating the glide path unit inward from the standard location a distance necessary to obtain the specified minimum clearance.

[1]This is the condition when the glide path unit is located the minimum distance of 750 feet from the runway end. The lower end of the glide path is assumed to be 20 feet above the runway at a distance of 250 feet outward from the glide path unit, at which distance the aircraft would be in contact with the runway and the aircraft antenna exactly on course.

(g) ADJUSTMENT OF CEILING MINIMUMS FOR OBSTRUCTION CLEARANCE. When minimum obstruction clearance cannot be obtained with a maximum three degree glide path angle, and the length of the runway does not permit a compensating adjustment, consideration will be given to establishing ceiling minimums which will afford comparable safety. In this event, the ceiling minimums will be determined by application of the following formula to all obstructions projecting above the established slope line and located in the approach area within a distance of five miles outward from the end of the runway.

(1) FORMULA. Extend a line horizontally outward from the top of each obstruction and parallel with the runway center line to a point of intersection with the established slope line, and from that point extend a line vertically to a point of intersection with the glide path. The point of intersection at the highest level of the glide path as established by the foregoing formula will determine the minimum ceiling that may be considered.

Where minimum obstruction clearances cannot be met in the transitional and horizontal surfaces immediately adjacent to the approach area and when deemed necessary, consideration will be given to an adjustment in the ceiling minimums commensurate with the degree of interference presented by the particular obstruction or obstructions.

(h) CLEARANCE ON BACK COURSE OF ILS. The minimum obstruction clearance required for pull-out on the end of the runway opposite the approach end will normally be that required for take-off of all types of aircraft or for the class and weight of particular aircraft being used.

(i) STANDARD MISSED APPROACH PROCEDURE. A standard missed approach procedure will be formulated and approved for use when necessary. The recovery will be made normally on a course which most nearly approximates a continuation of the final approach course after due consideration of obstructions, terrain, and other factors influencing the safety of the operation. A missed approach will be initiated at the point where the aircraft has descended to authorized landing minimums if (1) visual contact is not established, (2) the landing has not been accomplished, or (3) directed by Air Traffic Control.

(1) ALTERNATE MISSED APPROACH PROCEDURE. Where considered necessary, an alternate missed approach procedure will be formulated. An alternate missed approach procedure will be used only on prior approval of Air Traffic Control.

(j) UTILIZATION OF BACK COURSE OF ILS. Utilization of the back course of an ILS may be authorized if suitable fixes exist which will allow a pilot to establish his position and proceed on the localizer back course to the airport. Use of the back course will not be authorized, however, where there is likely to be interference with another ILS located in close proximity, or where the terrain or other features make use of the back course inadvisable from a safety standpoint.

(1) WITH GLIDE PATH. If the instrument approach runway is equipped with a glide path serving the back course of the Instrument Landing System localizer, separate procedure may be formulated and approved. When such a procedure is established, consideration will be given to ceiling and visibility minimums in accordance with the minimum terrain and obstruction clearance for glide path settings.

(2) WITHOUT GLIDE PATH. Where there is no glide path but a fan marker, compass locator, or other suitable fix exists on the localizer back course within seven miles of the airport, a straight-in approach may be formulated and approved using the minimums equivalent to straight-in range minimums.

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