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CIVIL AERONAUTICS MANUAL 60

U. S. Department of Commerce — Civil Aeronautics Administration

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SUBJECT: 60.46
Instrument Approach Procedure

The Office of Aviation Safety announces the adoption of the attached policies with respect to the establishment of instrument approach procedures. The material contained in the attachments is basically the same as was published in the Federal Register of November 16, 1949. The notable changes include (1) rewording for clarification, (2) magnetic bearings on radio facilities regarded as acceptable fixes and (3) obstruction clearance on final approach when radio facility is located more than 7 and less than 12 miles from airport.

The attached policies are effective immediately and supersede the CAM 60.46-3 and the CAM 60.46-6 published in the Federal Register of November 16, 1949.

60.46-3 RADIO RANGE PROCEDURES DETERMINATION

60.46-6 AUTOMATIC DIRECTION FINDING PROCEDURES DETERMINATION

The attached new pages headed "60.46-3 RADIO RANGE PROCEDURES DETERMINATION" and "60.46-6 AUTOMATIC DIRECTION FINDING PROCEDURES DETERMINATION" should be retained as pages in the series of statements that will be used explaining or implementing Civil Air Regulation 60.

William D. Davis
for E. S. Hensley
Director, Office of
Aviation Safety

Attachments

Distribution: Air 4, 4A, 5, 6, 9, 14, 20A (3 each), 20A-1 (3 each), 20B-1 (3 each), 22B-1 (3 each), 22C (3 each), 22C-1 (3 each), 33 (3 each), 33-1 (3 each), 33A, 40 all tabs, 40F-1.

60.46-3 RADIO RANGE 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 radio range procedures including those prescribed in CAM 60.46-4 and 60.46-5.

(1) DEVIATIONS. The criteria outlined herein will normally be adhered to in all procedures; however, if any deviation is necessary a note will be included on the procedure outlining such deviation.

(2) NUMBER OF PROCEDURES ESTABLISHED. More than one radio range procedure may be established for a particular airport when a different direction of approach is involved. An instrument approach procedure may be established when a fan marker, compass locator or intersection is situated within seven miles of the airport and located on (i) a continuation of the course which passes over or is adjacent to the airport, or (ii) a range course other than the one serving for the approach from over the range station. The additional procedures will be established in the same manner as a procedure from over the radio range station and will be complete in all details including procedure turn, direction, and approach altitudes. To be usable for a final approach fix an intersection may consist of a radio bearing or range course. The station forming the fix, however, must be located within 25 miles of the intersection and the angle of intersection must be at least 45 degrees.

When additional procedures are established, these procedures will be numbered in accordance with the number of radio range procedures approved for the airport. Example: Stapleton Airport, Denver, Colorado has two radio range procedures. Procedure No. 1 uses the North course of the Denver range for final approach, and Procedure No. 2 uses the South course of the Denver range and the Aurora FM for final.

(b) INITIAL APPROACH PROCEDURE. The initial approach to the radio range station will normally be made from a primary fix (radio range, reliable intersections--including bearings or "H" type radio beacon) located on a course and more than 25 miles from the radio range station to be used for the approach.

(1) ALTITUDES. Initial approach altitudes are the minimum en route cruising altitudes authorized between the last radio fix and the range station. These clearances are based solely on clearances above terrain and obstructions. They will normally comply with established altitudes where such altitudes have been published as minimum en route altitudes along a designated course. Where adequate radio fixes exist, altitudes will be established for all range courses, either on or off the airways, and where no radio fix exists the term "minimum en route altitude" will be used to specify the altitude for the direction involved. Where there is no

published en route altitude along a course, the altitude will be based on the same criteria as used in determining minimum en route altitudes providing at least 1000 feet clearance above all terrain and obstructions, except in those areas designated as mountainous areas. Normally, initial approach altitudes in mountainous areas will provide a clearance of at least 2000 feet above terrain and obstructions. All altitudes will be computed to the nearest 100 feet (i.e., 1150 feet will be indicated as 1100 feet, 1151 feet will be indicated as 1200 feet, etc.) and will provide the above altitude clearance in an area five miles on each side of the course from the last primary fix to the station providing that no maneuvering is contemplated on this course. Where it is anticipated that maneuvering will be necessary, either for holding purposes or otherwise, a minimum lateral clearance of ten miles from the center line of the range course will normally be provided for the maneuvering side and five miles for the opposite side.

Initial approaches to a radio range station will be shown only along the range course associated with the facility. Example: Madison, Wisconsin has no courses along any airway although the west course of Milwaukee lies along the center line of an airway and across Madison range. The initial approaches will not be shown along airways from Milwaukee but only along courses of Madison. The direction from Milwaukee is covered by published minimum en route altitudes.

(i) SECONDARY FIXES. Fixes and fan markers located less than 25 miles from the range station will be shown as secondary fixes. These fixes may provide for lower altitudes than from primary fixes on the same course. Reductions may be made even in mountainous country, provided that a minimum obstruction clearance of 1000 feet is provided from these fixes to the station.

(c) SHUTTLE. Where necessary, a shuttle between two fixes or within a specified distance of the range station will be prescribed to allow for descent to a lower altitude after initial approach and prior to commencement of the final approach. Horizontal and lateral clearance will be provided as in the case of initial approach.

(d) PROCEDURE TURN. Procedure turns are established and specified in radio range procedures for use in a return to final approach course (inbound) when dictated by direction of approach. Direction of the turn will be specified as north, south, east, or west side of final approach course. Normally, a procedure turn involves an initial left turn through the range course, followed by a turn to the right in a return to the final approach course. This type of procedure turn will be standard whenever terrain, obstructions, and traffic will permit. The degree at which the turns will be made is left to the discretion of the pilot, but the maneuver will be completed within that area and at the altitude established to provide the required obstruction clearance.

(1) ALTITUDES. A minimum altitude will be established for a procedure turn within a distance of ten miles from the radio range station and will normally provide terrain and obstruction clearance of 1000 feet for ten miles from the center line of the range course on the maneuvering side and for five miles on the opposite side of the range course. Altitudes based on above criteria will also be established for procedure turns at distances of 15, 20, and 25 miles from the range station and will be included in the procedure as an advisory item in the event it is necessary or advisable to go beyond the normal ten-mile limit. Where procedure turns at distances of 15, 20, and 25 miles are not desired the term "Not Authorized" (NA) will be used.

(2) DEVIATIONS. Deviations from the standard procedure turn will be made in the following order: When a turn cannot be made on the left side of the course due to unusually high obstructions, such as the mountain ranges on the west side of the Denver, Colorado radio range, the turn will be made on the right side of the course and an explanatory note will be included in the procedure as, "all turns will be made on the east side of the north course, high terrain west side of north course."

(e) FINAL APPROACH. The term "final approach" as used in radio range procedures is defined as beginning at the point where the procedure turn is completed, the aircraft headed back toward the range station, and ending at the point where missed approach commences. There will be only one final approach in any one procedure.

(1) ALTITUDES. The altitude over the radio range station on final approach will be based on an assumption that the procedure turn will be made within ten miles from the radio range station. The established altitude will be at least 500 feet above all terrain and obstructions between the point where the procedure turn is completed and the range station, and normally will provide this clearance for an area of five miles on either side of the center line of the radio range course. The final approach, if commenced more than ten miles from the radio station, will provide for at least 1000 feet clearance above terrain and obstructions and be reduced to 500 feet only when within ten miles. These altitudes will be shown to the nearest 20 foot interval (i.e., 510 feet will be indicated 500 feet, 511 feet will be indicated as 520 feet, etc.).

(i) FACILITY TO AIRPORT. For that part of the final approach which lies between the range station and the nearest usable portion of the field, a minimum clearance of at least 300 feet above obstructions will be provided for an approach area two miles either side of the center line provided the facility is located within seven miles of the airport.

Where the terrain features are ideal and flight from the range station to the airport would not be over thickly populated areas nor hazardous obstructions, an instrument approach procedure may be established and

approved for an airport located at a distance in excess of seven miles. When there is need for establishing an instrument approach procedure to an airport located in excess of seven miles, consideration will be given to the following policy:

(a) SEVEN TO TEN MILES. When located seven to ten miles, obstruction clearance of 500 feet will be provided for an area two miles each side of the center line of the proposed course.

(b) TEN TO TWELVE MILES. When located from ten to 12 miles, obstruction clearance of 700 feet will be provided for an area two miles each side of the center line of the proposed course.

(c) TWELVE MILES OR MORE. When located 12 miles or more, operations will be conducted in accordance with visual flight rules from the radio facility.

(2) FINAL APPROACH FROM A FAN MARKER OR OTHER RADIO AID. For each procedure there may be one direction from which the initial approach may become the final approach with the resulting elimination of a procedure turn. This may be accomplished only if such an approach is from a fan marker or other radio aid so situated on a final radio course and close enough to the range station that it may be reasonably considered as assisting the final approach in its true sense. The distance of this facility from the range station will not normally exceed ten miles. The altitude up to this final marker will provide 1000 feet clearance to the marker and will provide at least 500 feet from such fix or marker to the range station.

(3) MAGNETIC BEARING FROM RANGE STATION TO AIRPORT. The bearing from the range station is normally the magnetic bearing from the range station to the nearest usable runway or landing area of the airport.

(4) DISTANCE FROM RANGE STATION TO AIRPORT. The distance from the range station to the airport is normally measured on a straight line from the radio range station to the nearest usable runway or landing area of the airport.

(f) MISSED APPROACHES. The point at which the instrument approach will be discontinued and the missed approach started will be either at the range station, or within a specified distance of the radio range station not to extend beyond the nearest usable portion of the airport expressed in miles. Time limitations will not be used due to the variations in the approach speed of different types of aircraft. In the establishment of a missed approach procedure, careful consideration will be given to obstructions to flight in the missed approach area. Normally, the recovery will be made on the range course whose outbound bearing most nearly approxi-

mates a continuation of the final approach. Deviations from this standard will be permitted when terrain, obstructions, or hazards to flight exist, which precludes the establishment of a missed approach procedure in accordance with the above instructions.

(1) ALTITUDES. The altitude to which the flight will proceed in execution of a missed approach will not be less than that established for initial approach altitude, and will normally be specified to within 25 miles of the range station.

(2) ALTERNATE MISSED APPROACH PROCEDURES. Consideration will be given to the establishment of an alternate missed approach procedure only when such a procedure will facilitate the handling of air traffic.

60.46-6 AUTOMATIC DIRECTION FINDING 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 automatic direction finding procedures including those prescribed in CAM 60.46-7.

(1) DEVIATIONS. The criteria outlined herein will normally be adhered to in all procedures; however, if any deviation is necessary a note will be included on the procedure outlining such deviation.

(2) NUMBER OF PROCEDURES ESTABLISHED. There may be more than one ADF procedure approved for an airport depending upon the number of facilities available for ADF approaches or directions of approach. These procedures will be numbered in accordance with the number of ADF procedures approved for the airport. Example: Chicago Midway Airport has two ADF procedures. Procedure No. 1 is based on a compass locator on the back course of the ILS localizer; frequency 248 kcs, identification IH. The procedure approved for the compass locator at the ILS outer marker, frequency 219 kcs, identification CH, is assigned number 2.

(b) INITIAL APPROACH TO RADIO FACILITY. The initial approach to the radio facility will normally be made from a primary fix (primary fixes will be either radio stations or reliable intersections--including bearings available from range stations).

(1) MAGNETIC HEADINGS. Magnetic headings used in ADF procedures will always be computed using the isogonic line nearest the radio facility for which the procedure is being formulated.

(2) ALTITUDE. Initial approach altitudes are the minimum en route cruising altitudes authorized between the last radio fix and the facility. These clearances are based solely on clearance above terrain and obstructions. They will normally comply with established altitudes where such altitudes have been published as minimum en route altitudes along a designated track. Where there is no published en route altitude along a track the altitude will be based on the same criteria as used in determining minimum en route altitudes providing at least 1000 feet clearance above all terrain and obstructions, except in those areas designated as mountainous areas. Normally, initial approach altitudes in mountainous areas will provide a clearance of at least 2000 feet above obstructions. All altitudes will be computed to the nearest 100 feet (i.e., 1150 feet will be indicated as 1100 feet, 1151 feet will be indicated as 1200 feet, etc.) and will provide the above altitude clearance in an area five miles on each side of the track from the last primary fix to the station providing that no maneuvering is contemplated on this track. Where it is anticipated that maneuvering will be necessary, either for holding purposes or otherwise, a minimum lateral clearance of ten miles from the center line of the track will normally be provided for the maneuvering side and five miles for the opposite side.

(i) SECONDARY FIXES. Fan markers, compass locators, and "H" type radio beacon facilities or intersections close in, including bearings, will be utilized where a lower altitude can be authorized than is provided for by the use of primary radio fixes.

(c) SHUTTLE. Where necessary, a shuttle between two fixes or within a specified distance of the station will be prescribed to allow for descent to a lower altitude after initial approach and prior to commencement of the final approach. Horizontal and lateral clearance will be provided as in the case of initial approach.

(d) PROCEDURE TURN. Procedure turns are established and specified in ADF procedures for use in a return to final approach course (inbound) when dictated by direction of approach. Direction of the turn will be specified as north, south, east, or west side of final approach track. Normally, a procedure turn involves an initial left turn through the outbound track, followed by a turn to the right in a return to the final inbound track. This type of procedure turn will be standard whenever terrain, obstructions, and traffic will permit. The degree at which the turns will be made is left to the discretion of the pilot, but the maneuver will be completed within that area and at the altitude established to provide the required obstruction clearance.

(1) ALTITUDES. A minimum altitude will be established for a procedure turn within a distance of ten miles from the facility and will normally provide terrain and obstruction clearance of 1000 feet for ten miles from the center line of the track on the maneuvering side and for five miles on the opposite side. Altitudes based on the above criteria will also be established for procedure turns at distances of 15, 20, and 25 miles from the facility and will be included in the procedure as an advisory item in the event it is necessary or advisable to go beyond the normal ten-mile limit. Where procedure turns at distances of 15, 20, and 25 miles are not desired the term "Not Authorized" (NA) will be used.

(2) DEVIATIONS. Deviations from the standard procedure turn will be made in the following order: When a turn cannot be made on the left side of the track due to unusually high obstructions the procedure turn will be made on the right side of the track and an explanatory note will be included in the procedure.

(e) FINAL APPROACH. The term "final approach" as used in ADF procedures is defined as beginning at the point where the procedure turn is completed, the aircraft headed back toward the station, and ending at the point where missed approach commences. It is normally the track having a bearing which most nearly approximates the magnetic track from the station to the airport. Specific tracks both outbound and inbound in degrees magnetic will be indicated in the instrument approach procedure to avoid any confusion. There will be only one final approach in any one procedure.

(1) ALTITUDES. The altitude over the station on final approach will be based on an assumption that the procedure turn will be made within ten miles from the facility. The established altitude will be at least 500 feet above all terrain and obstructions between the point where the procedure turn is completed and the station, and normally will provide this clearance for an area of five miles on either side of the center line of the track. The final approach, if commenced more than ten miles from the station, will provide for at least 1000 feet clearance above terrain obstructions and be reduced to 500 feet only when within ten miles. These altitudes will be shown to the nearest 20 foot interval (i.e., 510 feet will be indicated 500 feet, 511 feet will be indicated as 520 feet, etc.).

(i) FACILITY TO AIRPORT. For that part of the final approach which lies between the station and the nearest usable portion of the field, a minimum clearance of at least 300 feet above obstructions will be provided for an approach area two miles either side of the center line provided the facility is located within seven miles of the airport.

Where the terrain features are ideal and flight from the station to the airport would not be over thickly populated areas nor hazardous obstructions, an instrument approach procedure may be established and approved for an airport located at a distance in excess of seven miles. When there is need for establishing an instrument approach procedure to an airport located in excess of seven miles, consideration will be given to the following policy:

(a) SEVEN TO TEN MILES. When located seven to ten miles, obstruction clearance of 500 feet will be provided for an area two miles each side of the center line of the proposed track.

(b) TEN TO TWELVE MILES. When located from 10 to 12 miles, obstruction clearance of 700 feet will be provided for an area two miles each side of the center line of the proposed track.

(c) TWELVE MILES OR MORE. When located 12 miles or more, operations will be conducted in accordance with visual flight rules from the radio facility.

(2) MAGNETIC TRACK FROM STATION TO AIRPORT. The track from the facility is normally the magnetic bearing from the station to the nearest usable runway or landing area of the airport.

(3) DISTANCE FROM FACILITY TO AIRPORT. The distance from the station to the airport is normally measured on a straight line from the facility to the nearest usable runway or landing area of the airport.

(f) MISSED APPROACHES. The point at which the instrument approach will be discontinued and the missed approach started will be either at the station, or within a specified distance of the station not to extend beyond the nearest usable portion of the airport expressed in miles. Time limitations will not be used due to the variations in the approach speed of different types of aircraft.

In the establishment of a missed approach procedure, careful consideration will be given to obstructions to flight in the missed approach area. Normally, the recovery should be made on the track whose outbound bearing most nearly approximates a continuation of the final approach. Deviations from this standard will be permitted when terrain, obstructions, or hazards to flight exist, which precludes the establishment of a missed approach procedure in accordance with the above instructions.

(1) ALTITUDES. The altitude to which the flight will proceed in execution of a missed approach will normally not be less than that established for en route flight, and will normally be specified to within 25 miles of the station.

(2) ALTERNATE MISSED APPROACH PROCEDURES. Consideration will be given to the establishment of an alternate missed approach procedure only when such a procedure will facilitate the handling of air traffic.

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