U. S. Department of Commerce — Civil Aeronautics Administration

Civil Aeronautics Manuals and supplements thereto are issued by the Office of Aviation Safety, Civil Aeronautics Administration, for the guidance of the public and are published in the Federal Register and the Code of Federal Regulations.

Supplement No. 8 — July 15, 1952

SUBJECT: 60.1 Scope.

The purpose of this supplement is to make available current policies regarding the issuance of certificates of waiver for air races, air meets and similar aeronautical demonstrations.

60.1-1 CERTIFICATES OF WAIVER ISSUED FOR AIR SHOWS

Attached hereto is a new page headed "60.1" which should be retained as one in a series of statements that will be issued explaining or implementing Civil Air Regulation 60. The CAA policies contained in the attachment became effective on publication in the Federal Register of September 27, 1951. The attachment eliminates "radio" from 60.1-1(b), as initially published in the Federal Register, to provide for other satisfactory means of control. This amendment was published in the Federal Register and shall become effective August 15, 1952.

David L. Posner
for E. S. Hensley
Director, Office of
Aviation Safety

Attachment

Distribution: AIR 11, 14, 20A (3 each), 20A-1 (3 each), 20B-1 (air mail 3 each), 22B-1 (air mail 3 each), 22C (4 each), 22C-1 (4 each), 33 (3 each), 33-1 (3 each), 40 all tabs, 40-F-1 (air mail), 33C (3 each), 33C-1 (3 each), 4, 4A, 5, 6, 9, 40-1.

60.1 Scope. The air traffic rules in this part shall apply to aircraft operated anywhere in the United States, including the several States, the District of Columbia, and the several Territories and possessions of the United States, including the territorial waters and the overlying airspace thereof, except:

(a) Military aircraft of the United States armed forces when appropriate military authority determines that noncompliance with this part is required and prior notice thereof is given to the Administrator, and

(b) Aircraft engaged in special flight operations, requiring deviation from this part, which are conducted in accordance with the terms and conditions of a certificate of waiver issued by the Administrator.

Note: Specific operations which cannot be conducted within the provisions of the regulations in this part, such as air races, air meets, acrobatic flights, or certain pest control or seeding operations require, prior to commencement of the operation, a certificate of waiver which may be obtained from the nearest office of CAA.

60.1-1 Certificates of waiver issued for air shows (CAA policies which apply to 60.1(b)). It is the policy of the Administrator of Civil Aeronautics to issue certificates of waiver for "air races", "air meets", or similar aeronautical demonstrations, only when it is shown that such activities will contribute directly to the advancement of, and public confidence in, aviation. No certificate of waiver will be issued for any "air race", "air meet", or similar aeronautical demonstration which includes any of the following types of aircraft operations: (a) Intentional aircraft crashes; (b) acrobatics not under direct control provided by the holder of the certificate of waiver; (c) delayed parachute jumping; (d) dog fighting; (e) "crazy" flying; or (f) similar unusual and hazardous types of aircraft operation.

APPENDIX A

Civil Aeronautics Administration U. S. Department of Commerce

REGULATIONS OF THE ADMINISTRATOR

Excerpts from Part 609

Standard Instrument Approach Procedures

April 1, 1952

Sec.

AUTHORITY: §§ 609.1 to 609.12 issued under sec. 205, 54 Stat. 984, as amended; 49 U. S. C. 425. Interpret or apply sec. 601, 52 Stat. 1007, as amended; 49 U. S. C. 551.

§ 609.1 *Definitions.* As used in this part:

(a) "Act" shall mean Civil Aeronautics Act of 1938, as amended.

(b) "Administrator" shall mean Administrator of Civil Aeronautics.

§ 609.2 *Basis and purpose.* (a) The basis of this part is found in sections 205 (a) and 601 of the act and §§ 42.56, 60.46, and 61.273 of this title.

(b) The purpose of this part is to prescribe standard instrument approach procedures.

§ 609.3 *Introduction*—(a) *Persons to whom applicable.* The standard instrument approach procedures prescribed in this part (including ceiling and visibility minimums for take-off and landing at particular airports) shall be identical for all users, with the following exceptions: The take-off and landing minimums shall not apply to (1) military aircraft, or (2) users for whom the Administrator has specifically authorized lower minimums. The take-off minimums shall not apply to those users for whom the Administrator has not been authorized to prescribe take-off minimums.

(b) *Use of additional data.* Because of obstructions or rugged terrain adjacent to many airports, the Coast and Geodetic Survey Charts, especially the approach and landing charts, covering the area where an instrument let-down is proposed, should be studied carefully before an approach is made.

(c) *Revisions of procedures.* Revisions of, or additions to standard instrument approach procedures will be published in the FEDERAL REGISTER, and may appear in the Airman's Guide and Flight Information Manual.

(d) *Use of radio navigational facilities requiring flight check.* When a flight check of a radio navigational facility is required, a NOTAM will be issued stating: "Ground checked only, awaiting flight check." When this type of NOTAM is issued, the following will apply:

(1) If the facility is very high frequency, the navigational feature will be shut down and no utilization for navigational purposes will be authorized.

(2) If the facility is low frequency (200 to 400 kcs) non-simultaneous type range, the navigational feature will be shut down and no utilization for navigational purposes will be authorized.

(3) If the facility is low frequency (200 to 400 kcs) simultaneous type range, it may be used as a homing facility only.

(i) In addition, this type of facility may be used as an ADF approach aid by scheduled air carriers, provided that their operations specifications authorize an ADF instrument approach to the airport concerned.

(ii) Irregular air carriers and other operators may use this type of facility as an ADF instrument approach aid if an ADF procedure for the airport concerned is prescribed by the Administrator, or if an approach is conducted using the same course for an ADF track as that specified in the approved range procedure and with identical altitudes as used in the range approach.

This paragraph shall not apply in the Territory of Alaska, including the Aleutian Islands, or in the central and western Pacific islands under United States jurisidiction, including the Territory of Hawaii and the islands of Canton, Wake, and Guam until further notice.

§ 609.4 *Symbols used in ceiling and visibility minimums.* Letters that appear in the standard instrument approach procedures tables under the column on ceiling and visibility minimums are explained as follows:

"R" means regular landing minimums. They are authorized when it is necessary to circle the airport or maneuver in any manner for landing. They apply to aircraft having stall speed as established in Airplane Operating Manual of more than 75 miles per hour at maximum certificated landing weight with full flaps, landing gear extended, and power off.

"(R)" means regular landing minimums for aircraft having stall speeds as established in the Airplane Operating Manual of 75 miles per hour or less at maximum certificated landing weight with full flaps, landing gear extended, and power off. When regular landing minimum for all aircraft are identical, only "R" will be used.

"S" means straight-in landing minimums [1] where minimums lower than regular landing minimums are possible. If no reduction for straight-in landings is authorized, regular landing minimums will apply for straight-in and "S" will not be shown. Reductions in regular minimums will be authorized only when landing can be accomplished straight in from the navigational facilities being used to the near end of the runway without exceeding 500 feet per minute rate of descent and without change of direction of more than 30 degrees. These reductions will apply to all types of aircraft, unless "(R)" is less than "S" in which case the lower minimum applies to the lower stall speed aircraft.

"A" means alternate minimums. They are authorized when an alternate airport is required. They apply to all types of aircraft.

"T" means take-off minimums. They apply to all types of aircraft.

"NA" means not authorized.

§ 609.5 *Radio range procedures determination*—(a) *General.* The policies set forth in this section will be used by the Civil Aeronautics Administration in formulating and approving all radio range procedures including those prescribed in §§ 609.6 and 609.7.

(1) *Deviations.* The criteria outlined in this section will normally be adhered to in formulating and approving all radio range procedures; however, if any deviation is necessary, a note will be included on the procedure stating that a deviation has been authorized.

(2) *Number of procedures established.* (i) 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 (a) a con-

[1] ILS Procedures: Straight-in landing minimums apply only when all components of ILS are operating and only to runway indicated. In other cases, minimums are designated by "R" and apply to aircraft with stall speed of more than 75 miles per hour. For aircraft with stall speed of 75 miles per hour or less, circling minimums may be reduced by 100 feet and one-half mile but in no case less than 500–1.

tinuation of the course which passes over or is adjacent to the airport, or (b) a range course other than the one serving for the approach from over the range station. To be usable for a final approach fix, an intersection may consist of a radio bearing or a 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. 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.

(ii) When additional procedures are established they 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.* (1) The initial approach to the radio range station will normally be made from a primary fix (radio range, fan marker, reliable intersection—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. Fixes located less than 25 miles from the range station will be shown as secondary fixes.

(2) Initial approaches to the radio range station will be shown only along the range course associated with the facility.

Example. Madison, Wisconsin, range has no course along any airway although the west course of the Milwaukee range lies along the center-line of an airway and across Madison range station. The initial approaches will not be shown along the airway from Milwaukee but only along courses of the Madison range.

(3) *Altitudes:* (i) Initial approach altitudes are the minimum en route cruising altitudes authorized between the last radio fix and the range station. These altitudes are based on the same criteria as used in determining minimum en route altitudes, providing at least 1,000 feet clearance above all obstructions within five miles on each side of the course except in those areas designated as mountainous areas. Normally, initial approach altitudes in mountainous areas will provide a clearance of at least 2,000 feet above obstructions within five miles on each side of the course.

(ii) Initial approach altitudes from primary fixes will be specified on the procedure for the direction involved by the term "minimum en route altitude" and will correspond to the authorized minimum en route altitude along the designated courses. The term "minimum en route altitude" will also be used to specify the initial approach altitude where no primary fix exists along the course.

(iii) Initial approach altitudes from secondary fixes will be specified on the procedure where such fixes provide for lower altitudes than from primary fixes on the same course. Reductions from established minimum en route altitudes will be made even in mountainous country provided that a minimum obstruction clearance of 1,000 feet in an area five miles on each side of the course is provided from the secondary fix to the radio range station. All altitudes specified will be computed to the nearest 100 feet (i. e., 1,150 feet will be indicated as 1,100 feet; 1,151 feet will be indicated as 1,200 feet, etc.).

(iv) The initial approach altitudes will be specified in all cases on all courses in areas outside the continental limits of the United States or its territories.

(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. Vertical and lateral clearance will be provided as in the case of initial approach.

(d) *Procedure turn.* Procedure turns will be established and specified in radio range procedures for use in a return to the final approach course (inbound). Normally, a procedure turn involves an initial left turn through the range course, followed by a turn to the right for a return to the final approach course. Direction of the turn will be specified as north, south, east, or west side of final approach course. This type of turn will be standard whenever terrain, obstructions, and traffic will permit. The degree of turn and the point at which the turn will be made is left to the discretion of the pilot, but the maneuver will be completed within the maneuvering area at or above 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 obstruction clearance of 1,000 feet for ten miles from the center-line of the range course on the maneuvering side and for five miles on the opposite side. Altitudes based on this criteria will be established also 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 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 each side of the center-line of the radio range course. The final approach, if commenced more than ten miles from the range station, will provide for at least 1,000 feet clearance above obstructions and will 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 as 500 feet, 511 feet will be indicated as 520 feet, etc.).

(i) *Range station to airport.* (a) For that part of the final approach which lies between the range station and the nearest usable portion of the airport, a minimum clearance of at least 300 feet above obstructions will be provided for an approach area two miles on each side of the center-line when the range station is located at or within seven miles of the airport.

(b) 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:

(*1*) *Over seven to ten miles.* When located from seven to ten miles, obstruction clearance of 400 feet will be provided for an area two miles on each side of the centerline of the proposed course.

(*2*) *Over ten to twelve miles.* When located from ten to twelve miles, obstruction clearance of 500 feet will be provided for an area two miles on each side of the centerline of the proposed course.

(*3*) *Over twelve miles.* When located more than twelve miles, operations will be conducted in accordance with visual flight rules from the radio range station.

(*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 fan marker or other radio aid from the range station will not normally exceed ten miles. The final approach altitude will provide at least 1,000 feet clearance up to the fan marker or other radio aid, and at least 500 feet of clearance from that point to the radio range station. This clearance will normally be provided for an area of five miles on either side of the centerline of the range course.

(*3*) *Magnetic course from range station to airport.* When plotting the magnetic course from the range station to the airport, two conditions will be considered. Where the bearing from the range station to the end of the runway to be used does not diverge more than 30° from the direction of that runway, and a reasonable rate of descent is possible, the magnetic course shown will correspond with the bearing from the range station to the approach end of the runway, and a straight-in approach may be authorized. Where this condition is not possible, the magnetic course from the range station toward the approximate center of the airport landing area will be shown. This bearing shall be that which bisects the angle formed by two straight lines extending from the range station to the outer ends of the airport runways.

(*4*) *Distance from range station to*

airport. The distance from the range station to the airport is normally measured on a straight line along the magnetic course from the range station to the approach end of the runway. If, however, a straight-in approach cannot be authorized by application of subparagraph (3) of this paragraph, the distance will be measured along the magnetic course from the range station to the first point of intersection of the course with any runway on the airport. At airports where no runways exist, the distance will be measured along the magnetic course from the range station to the point of intersection with the nearest boundary of the landing area.

(f) *Missed approach procedure.* A 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 (i) at the point where the aircraft has descended to authorized landing minimums if visual contact is not established, or (ii) if the landing has not been accomplished, or (iii) when directed by Air Traffic Control. Time limitations will not be used due to the variations in the approach speed of different types of aircraft.

(1) *Altitudes.* The altitude to which the flight will proceed in execution of a missed approach will not be less than that established for en route flight, 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. When an alternate missed approach procedure is formulated, it will be approved by the local Aviation Safety Office, Civil Aeronautics Administration, and made known to the appropriate air traffic control personnel. An alternate missed approach procedure will be indicated under the missed approach item of the instrument approach procedure by the phrase "or as directed by air traffic control."

§ 609.8 *Automatic direction finding procedures determination.*—(a) *General.* The policies set forth in this section will be used by the Civil Aeronautics Administration in formulating and approving all automatic direction finding procedures including those prescribed in § 609.9.

(1) *Deviations.* The criteria outlined in this section will normally be adhered to in formulating and approving all ADF procedures; however, if any deviation is necessary, a note will be included on the procedure stating that a deviation has been authorized.

(2) *Number of procedures established.* (i) More than one ADF procedure may be established for a particular airport depending upon the number of facilities available for ADF approaches and the directions of approach involved. The additional procedures will be established in the same manner as the first procedure and will be complete in all details including procedure turn, direction and approach altitudes.

(ii) When additional procedures are established, they 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 uses a compass locator on the back course of the ILS localizer; frequency 248 kc, identification IH, and Procedure No. 2 uses the compass locator at the ILS outer marker, frequency 219 kc, identification CH.

(b) *Initial approach procedure.* (1) The initial approach to the radio facility will normally be made from a primary fix (radio range, fan marker, reliable intersection—including bearings or "H" type radio beacon) located on a course and more than 25 miles from the radio facility to be used for the approach. Fixes located less than 25 miles from the radio facility will be shown as secondary fixes.

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

(3) Altitudes: (i) Initial approach altitudes are the minimum en route cruising altitudes authorized between the last radio fix and the radio facility. These altitudes are based on the same criteria as used in determining minimum en route altitudes, providing at least 1,000 feet clearance above all obstructions within five miles on each side of the course except in those areas designated as mountainous areas. Normally, initial approach altitudes in mountainous areas will provide a clearance of at least 2,000 feet above obstructions within five miles on each side of the course.

(ii) Initial approach altitudes from primary fixes will be specified on the procedure for the direction involved by the term "minimum en route altitude" and will correspond to the authorized minimum en route altitude along the designated courses. The term "minimum en route altitude" will also be used to specify the initial approach altitude where no primary fix exists along the course.

(iii) Initial approach altitudes from secondary fixes will be specified on the procedure where such fixes provide for lower altitudes than from primary fixes on the same course. Reductions from established minimum en route altitudes will be made even in mountainous country: *Provided,* That a minimum obstruction clearance of 1,000 feet in an area five miles on each side of the course is provided from the secondary fix to the radio facility. All altitudes specified will be computed to the nearest 100 feet (i. e., 1,150 feet will be indicated as 1,100 feet; 1,151 feet will be indicated as 1,200 feet, etc.).

(iv) The initial approach altitudes will be specified in all cases on all courses in areas outside the continental limits of the United States or its territories.

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

(d) *Procedure turn.* Procedure turns will be established and specified in ADF procedures for use in a return to the final approach course (inbound). Normally, a procedure turn involves an initial left turn through the outbound course, followed by a turn to the right for a return to the final approach course. Direction of the turn will be specified as north, south, east, or west side of final approach course. This type of turn will be standard whenever terrain, obstruction, and traffic will permit. The degree of turn and the point at which the turn will be made is left to the discretion of the pilot, but the maneuver will be completed within the maneuvering area at or above 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 facility and will normally provide terrain and obstruction clearance of 1,000 feet for ten miles from the centerline of the course on the maneuvering side and for five miles on the opposite side. Altitudes based on this criteria will also be established for procedure turns at distances of 15, 20, and 25 miles from the radio 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 radio facility, and ending at the point where missed approach commences. It is normally the course having a bearing which most nearly approximates the magnetic course from the radio facility to the airport. Specific courses, 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 radio facility 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 obstructions between the point where the procedure turn is completed and the radio facility, and normally will provide this clearance for an area of five miles on each side of the centerline of the course. The final approach, if commenced more than ten miles from the radio facility, will provide for at least 1,000 feet clearance above obstructions and will 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 as 500 feet, 511 feet will be indicated as 520 feet, etc.).

(f) *Radio facility to airport.* (a) For that part of the final approach which lies between the radio facility and the nearest usable portion of the airport, a minimum clearance of at least 300 feet above obstructions will be provided for an approach area two miles on each side of the centerline when the radio facility is located at/or within seven miles of the airport.

(b) Where the terrain features are ideal and flight from the radio facility 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:

(*1*) *Over seven to ten miles.* When

located from seven to ten miles, obstruction clearance of 400 feet will be provided for an area two miles on each side of the centerline of the proposed course.

(2) *Over ten to twelve miles.* When located from ten to twelve miles, obstruction clearance of 500 feet will be provided for an area two miles on each side of the centerline of the proposed course.

(3) *Over twelve miles.* When located more than twelve miles, 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 approach course and close enough to the radio facility that it may be reasonably considered as assisting the final approach in its true sense. The distance of this fan marker or other radio aid from the radio facility will not normally exceed ten miles. The final approach altitude will provide at least 1,000 feet clearance up to the fan marker or other radio aid, and at least 500 feet clearance from that point to the radio facility. This clearance will normally be provided for an area of five miles on either side of the centerline of the final approach course.

(3) *Magnetic course from radio facility to airport.* When plotting the magnetic course from the radio facility to the airport, two conditions will be considered. Where the bearing from the radio facility to the end of the runway to be used does not diverge more than 30° from the direction of that runway, and a reasonable rate of descent is possible, the magnetic course shown will correspond with the bearing from the radio facility to the approach end of the runway, and a straight-in approach may be authorized. Where this condition is not possible, the magnetic course from the radio facility toward the approximate center of the airport landing area will be shown. This bearing shall be that which bisects the angle formed by two straight lines extending from the radio facility to the outer ends of the airport runways.

(4) *Distance from radio facility to airport.* The distance from the radio facility to the airport is normally measured on a straight line along the magnetic course from the radio facility to the approach end of the runway. If, however, a straight-in approach cannot be authorized by application of subparagraph (3) of this paragraph, the distance will be measured along the magnetic course from the radio facility to the first point of intersection of the course with any runway on the airport. At airports where no runways exist, the distance will be measured along the magnetic course from the radio facility to the point of intersection with the nearest boundary of the landing area.

(f) *Missed approach procedure.* A 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 (i) at the point where the aircraft has descended to authorized landing minimums if visual contact is not established, or (ii) if the landing has not been accomplished, or (iii) when directed by Air Traffic Control. Time limitations will not be used due to the variations in the approach speed of different types of aircraft.

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

(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. When an alternate missed approach procedure is formulated, it will be approved by the local Aviation Safety Office, Civil Aeronautics Administration, and made known to the appropriate air traffic control personnel. An alternate missed approach procedure will be indicated under the missed approach item of the instrument approach procedure by the phrase "or as directed by air traffic control."

§ 609.10 *Instrument landing system procedures determination.*—(a) *General.* The policies set forth in this section will be used by the Civil Aeronautics Administration in formulating and approving all instrument landing system (ILS) procedures, including those prescribed in § 609.11.

(1) *Deviations.* The criteria outlined in this section will normally be adhered to in formulating and approving all ILS procedures; however, if any deviation is necessary, a note will be included on the procedure stating that a deviation has been authorized.

(2) *Number of procedures established.* More than one ILS procedure may be established for a particular airport when a different direction of approach is involved. Where more than one procedure is established Procedure No. 1 will be that which is based on the utilization of the front course of the ILS, and Procedure No. 2 will be that which utilizes the back course of the ILS.

(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 the specified points (radio range, reliable intersections—including bearings, localizer courses, fan markers, or compass locators) on predetermined established courses 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 LF radio range station or VOR facility thence to the ILS localizer course to start the approach.

(1) *Altitudes.* The minimum altitude for transition to the ILS from specified fixes will not be less than the minimum published en route altitude. These published altitudes will be based solely on clearance above obstructions. Where there is no published en route altitude, the transition altitude will be established by providing at least 1,000 feet clearance above all obstructions for an area five miles on each side of the transition course. In those areas designated as mountainous areas, a clearance of at least 2,000 feet above obstructions will normally be provided. All altitudes will be computed to the nearest 100 feet (i. e. 1,150 feet will be indicated as 1,100 feet, 1,151 feet will be indicated as 1,200 feet, etc.).

(c) *Shuttle.* Where necessary, a shuttle will be prescribed within a specified distance of the outer marker or outer marker compass locator after initial approach and prior to commencement of the final approach. Vertical and lateral clearance will be provided as in the case of the initial approach.

(d) *Procedure turn.* Procedure turns will be established and specified in ILS procedures for use in a return to the final approach course (inbound). Normally, a procedure turn involves an initial left turn through the outbound localizer course within five miles of the outer marker, followed by a turn to the right for a return to the final approach course. Direction of the turn will be specified as north, south, east, or west side of the final approach course. This type of turn will be standard whenever terrain, obstructions, and traffic will permit. The degree of turn and the point at which the turn will be made is left to the discretion of the pilot, but the maneuver will be completed within the maneuvering area at or above the altitude established to provide the required obstruction clearance. A specified procedure turn need not be made 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° and within five miles of the outer marker from an established radio fix on a course specified in the ILS procedure, or (ii) when final approach can be accomplished from an established holding pattern.

(1) *Altitudes.* (i) A minimum altitude will be established for a procedure turn within a distance of five miles from the outer marker and will not be less than the altitude of the glide path at the outer marker. The established altitude will normally provide obstruction clearance of at least 1,000 feet for five miles on each side of the center-line of the localizer course. Where necessary, an upward adjustment of the minimum altitude will be made to insure safe clearance of any prominent obstruction immediately beyond the specified area.

(ii) A procedure turn may be made between five and ten miles from the outer marker when necessary to effect proper interception with the glide path. In such instances, the minimum procedure turn altitude 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. Altitudes of procedure turns authorized at distances greater than five miles from the outer marker will be included in the procedure as an advisory item. Where procedure turns at distances greater than five miles are not desirable, the term "not authorized" (NA) will be used.

(2) *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.

(e) *Final approach.* The term "final approach" as used in the ILS procedures 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.

(1) *Altitudes.* 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."

(f) *Obstruction clearance for final approach.* The approach zone to instrument runways, together with the minimum obstruction clearances required for glide path, is defined as:

(i) *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 centerline of the runway.

(ii) *Slope.* The slope of the approach surface along the runway centerline 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 centerline, 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.* (i) 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 centerline or the runway centerline extended.

(ii) 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 centerline.

(iii) 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 centerline at the approach end of the runway, and are parallel to and 500 feet from the runway centerline extended.

(iv) Transitional surfaces more than 200 feet outward from the approach end of the runway extended 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 intersection 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 12 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.* (i) The minimum clearance in feet is a function of the distance D outward from the glide path unit as follows:

(a) For D less than 10,950 feet, minimum clearance $0.02366D+20$ feet.

(b) For D between 10,950 feet and five miles, minimum clearance $0.01866D+75$ 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 $= (10{,}250' \times 0.02366) + 20 = 243' + 20 = 263'$.

(ii) 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.

(g) *Glide path setting.* (1) 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.

(2) 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.

(3) Where 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.

(h) *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.* (i) Extend a line horizontally outward from the top of each obstruction and parallel with the runway centerline 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.

(ii) 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.

(i) *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.

(j) *Missed approach procedure.* A 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 (i) at the point where the aircraft has descended to authorized landing minimums if visual contact is not established, or (ii) if the landing has not been accomplished, or (iii) when directed by Air Traffic Control. Time limitations will not be used due to the variations in the approach speed of different types of aircraft.

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

(2) *Alternate missed approach procedure.* 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. When an alternate missed approach procedure is formulated, it will be approved by the local Aviation Safety Office, Civil Aeronautics Administration, and made known to the appropriate air traffic control personnel. An alternate missed approach procedure will be indicated under the missed approach item of the instrument approach procedure by the phrase "or as directed by air traffic control."

(k) *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 ILS localizer, a 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 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 is located on the localizer back course within seven miles of the airport, a straight-in approach may be formulated

[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 12 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.

and approved using the minimums equivalent to straight-in range minimums.

§ 609.12 *Ground controlled approach procedures determination*—(a) *General.* The policies set forth in this section will be used by the Civil Aeronautics Administration in formulating and approving all ground controlled approach (GCA) procedures, including those prescribed in § 609.13. However, the safe completion of a ground controlled approach procedure involves a dual responsibility. This responsibility includes (1) the interpretation of the information received by the controller on the radar scope and the relaying of this information to the pilot of the aircraft, and (2) the acceptance and compliance by the pilot with the advice received from the controller.

(1) *Number of procedures established.* More than one GCA procedure may be established for a particular airport when a different direction of approach is involved. Where the approach is to be made to the designated instrument runway, PAR (Precision Approach Radar) procedure will be established and so designated. Where approaches to other than the designated instrument approach runway are feasible they will be established and termed ASR (Airport Surveillance Radar) type instrument approach procedures. Where PAR or ASR instrument approaches are established, it will be necessary to specify the particular runway which may be utilized, and the types of approaches authorized for those runways.

(b) *Initial approach procedure.* The initial approach to the GCA will normally be made on the associated primary navigation facility, radio range or radio beacon, or from an intersection therebf.

(1) *Altitudes.* All altitudes pertaining to initial approach to a GCA facility will not be less than the minimum initial approach altitude established for the associated radio facility. Where it is necessary to establish an initial approach altitude from directions other than those for which an altitude has been prescribed, consideration will be given to providing at least 1,000 feet clearance above all obstructions within five miles on each side of the initial approach course. Normally, in designated mountainous areas this clearance will be at least 2,000 feet for five miles on each side of the initial approach course. All altitudes will be computed to the nearest 100 feet (i. e., 1,150 feet will be indicated as 1,100 feet; 1,151 feet will be indicated as 1,200 feet, etc.).

(c) *Transition to GCA.* During the approach on the associated primary facility, the pilot will notify approach control of his intention to use the GCA system. The ground controller will normally take over when the aircraft is within approximately 25 miles of the airport. When necessary to insure positive identification, and on being so advised by the ground controller, the pilot will execute turns as directed by the ground controller.

(d) *Pattern.* (1) Patterns will be established and approved by the Civil Aeronautics Administration for the completion of a GCA procedure and the guidance of the ground controllers. A pattern will normally provide for a final turn and/or interception of the final approach course at a distance of not less than five miles from the approach end of the runway to be used and whenever possible, a pattern will be designed to accommodate both right- and left-hand turns into the final approach course. The ground controller will advise the pilot of the headings and altitudes to be flown and will also issue instructions to be followed in the event radio communications with the aircraft cannot be maintained.

(2) To provide the flexibility required for air traffic control purposes, the ground controller may deviate from the pattern courses as required to provide separation from other aircraft and to make allowances for wind conditions, speed of aircraft, direction from which aircraft are approaching, or other reasons which may require deviations therefrom, provided that the minimum obstruction clearances are strictly adhered to.

(3) *Altitudes.* (i) Except as provided below, all altitudes pertaining to the GCA pattern prior to interception of the final approach course will be at least 1,000 feet above all obstructions to flight within at least three miles on each side of the pattern track, and will provide at least 500 feet above all obstructions located within an additional two miles on each side of the pattern track. When an aircraft is observed to have definitely passed an altitude limiting feature or obstruction, the ground controller may descend the aircraft to a lower altitude, provided that the lower altitude affords the minimum obstruction clearance set forth above with respect to other obstructions farther along the course to be flown.

(ii) The interception of the final approach course will normally be made at a distance not less than five miles from the approach end of the runway to be utilized, and the minimum altitude will not be less than 1,000 feet above airport elevation and not less than 500 feet above all obstructions, provided the reduction in clearance is made within five miles of the point of interception. If, due to obstructions, it is necessary to intercept the final approach course at an altitude higher than 1,000 feet above airport elevation, sufficient distance must be available along the course line to allow descent to the ceiling minimums authorized.

(2) *Partial execution of pattern.* Where the foregoing obstruction clearance can be maintained and at the discretion of the ground controller, a GCA pattern may be executed in part only, provided the final approach course can normally be intercepted not less than five miles from the approach end of the runway.

(e) *Final approach.* The term "final approach" is defined as that portion of the approach procedure where the ground controller signifies that the aircraft in-bound has intercepted the final approach course, and descent to final approach altitude is commenced.

(1) *Altitudes.* 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."[1]

(f) *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 centerline of the runway.

(ii) *Slope.* The slope of the approach surface along the runway centerline 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 centerline, 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.* (i) 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 centerline or the runway centerline extended.

(ii) 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 centerline.

(iii) 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 centerline at the approach end of the runway, and are parallel to and 500 feet from the runway centerline extended.

(iv) 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 ground controller's glide path by the aircraft, the minimum terrain and obstruction clearance is that obtained between a two and one-half degree glide path passing through a point 12 feet above and 500 feet inward from the approach end of the runway, and fifty to one (50 : 1) and forty to one (40 : 1) approach surface as previously defined.[2]

(5) *Criteria.* (i) The minimum clearance in feet is a function of the distance D outward from the point at which the glide path intercepts the runway at zero altitude as follows:

(a) For D less than 10,950 feet, minimum clearance $0.02366D + 20$ feet.

(b) For D between 10,950 feet and 5 miles, minimum clearance $0.01866D + 75$ feet.

Example. If an obstruction is 10,250 feet from the glide path intersection with the runway, formula (i) would apply, and the minimum clearance above the obstruction = $(10{,}250' \times 0.02366) + 20 = 243' + 20 = 263'$.

[2] This is the condition when the glide path extended inward and downward from the point 12 feet above and 500 feet inward from the approach end of the runway intersects the runway at zero altitude 750 feet inward from the approach end of the runway.

(ii) It should be noted that the criteria provides a minimum clearance of approximately 500 feet at five miles from the runway intersection point 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.

(g) *Glide path setting.* (1) Where the minimum obstruction clearance can be obtained in the approach area and adjacent transitional surfaces inward from the point of interception with the controller's 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 at a point approximately 200 feet above and 4,250 feet outward from the runway intersection point.

(2) 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.

(3) 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 path angle and the length of the runway permits, consideration may be given to locating the point at which the glide path intercepts the runway inward from the standard location at a distance necessary to obtain the specified minimum clearance.

(h) *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.* (i) 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.

(ii) Where minimum obstruction clearance 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.

(i) *Surveillance (ASR) approach.* A ground controlled approach utilizing the surveillance scope may be authorized when the position of the aircraft can be definitely determined and the flight path controlled by means of the surveillance scope under the following conditions:

(1) The ground electronics equipment is sufficiently accurate, and free from ground clutter, to assure positive aircraft identification and azimuth course guidance.

(2) Obstruction clearance between the end of the runway to be used and a point five miles out is provided which meets the criteria presently required for standard radio ranges (300 feet clearance above all obstructions two miles each side of the center-line of the runway extended.)

(3) Satisfactory patterns are provided which will insure that the aircraft on final approach will be at or above the altitudes specified in paragraph (d) of this section at a point five miles from the approach end of the runway to be used.

(4) Weather minimums are prescribed which are equal to or better, than the regular (i. e., circling) minimums approved for that particular airport.

(j) *Missed approach procedure.* A 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 the altitude of the authorized ceiling minimums for the type of approach being made (PAR or ASR), if (i) visual contact is not established, (ii) a landing has not been accomplished, or (iii) unless previously directed by the ground controller. In the case of a precision approach (PAR), the ground controller will not permit the aircraft to deviate below the centerline of the glide path to a distance greater than that afforded by a line of one-half degree from the beginning of the glide path. Should the aircraft continue below this line, the ground controller will advise the pilot to initiate a missed approach procedure.

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

(2) *Alternate missed approach procedure.* 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. When an alternate missed approach procedure is formulated, it will be approved by the local Aviation Safety Office, Civil Aeronautics Administration, and made known to the appropriate air traffic control personnel. An alternate missed approach procedure will be indicated under the missed approach item of the instrument approach procedure by the phrase "or as directed by air traffic control."

(k) *Operation personnel for GCA equipment.* Normally, ground controlled approach procedures will be established at those installations operated by Civil Aeronautics Administration personnel. Before establishing a ground controlled approach procedure at an installation which is not operated by CAA the operating agent will be required to furnish a list of all personnel responsible for operating the GCA equipment, and to certify that the personnel are competent in their respective duties. The operating agency will also be required to establish a training program for the training of the personnel concerned in standardized GCA phraseology.

§ 609.14 *Very high frequency omnidirectional range procedures determination*—(a) *General.* The policies set forth herein will be used by the Civil Aeronautics Administration in formulating and approving all VHF omnirange procedures, including those prescribed in § 609.15.

(1) *Deviations.* Adherence to criteria outlined herein will normally be required in all procedures; however, if any deviation is necessary, a note will be included on the procedure outlining such deviations.

(2) *Number of procedures established.* More than one VOR 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 other suitable fix is situated within seven miles of the airport and located on a course which passes over or is adjacent to the airport. The additional procedures will be established in the same manner as a procedure from over the VOR facility and will be complete in all details including procedure turn, direction and approach altitudes.

Where more than one procedure is established, procedure No. 1 will be that which is based on an approach from over the VOR facility and procedure No. 2 will be that which utilizes a fan marker, compass locator or suitable fix.

(b) *Initial approach to VOR facility.* The initial approach to a VOR facility will normally be made over specified routes. This information will not be carried on the procedure itself, since this is considered as en route operation and the information is available from other sources. The only initial approaches which will be shown in the procedure will be those approaches from fixes located not more than 25 miles from the VOR station which will afford a reduction in altitude from those published as the en route minimum and provide a transition to the facility. These fixes may be either radio range stations, "H" facilities, VOR stations, reliable intersections afforded by either of these two fixes or available radio bearings.

(1) *Altitudes.* The altitudes to the VOR facility will correspond with those established for minimum en route operations in the particular area. Since initial approaches will not be specified in the procedures for distances greater than 25 miles, it will be the pilot's responsibility to make the initial approach in accordance with existing regulations. For those altitudes specified in the procedure used for transition, there will be provided at least 1,000-foot clearance above all obstructions within five miles on each side of the center-line of a course between the departed fix and the VOR station. All altitudes will be computed to the nearest 100 feet (i. e., 1,150 feet will be indicated as 1,100 feet; 1,151 feet will be indicated as 1,200 feet, etc.).

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

(d) *Procedure turn.* Procedure turns will be established and specified in VOR

procedures for use in the return to the final approach course (inbound). Normally, a procedure turn involves an initial left turn through the outbound course, followed by a turn to the right for a return to the final approach course. Direction of the turn will be specified as north, south, east, or west side of final approach course. This type of turn will be standard whenever terrain, obstructions, and traffic will permit. The degree of turn and the point at which the turn will be made is left to the discretion of the pilot but the maneuver will be completed within the maneuvering area and at or above the altitude established to provide the required obstruction clearance. A specified procedure turn need not be made when the final approach course can be established from a suitable fix or from an established holding pattern.

(1) *Altitudes.* A minimum altitude will be established for a procedure turn and will normally provide obstruction clearance of 1,000 feet for ten miles on the maneuvering side of the course and five miles on the opposite side within a distance of ten miles from the facility. Altitudes based on this 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 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 VOR procedures is defined as beginning at the point where the procedure turn is completed and the aircraft is headed back toward the station and ending at the point where the landing is completed or the missed approach commences. Where possible, after considering terrain and course accuracy, the final approach course will coincide with the magnetic track from the station to the airport. A specific course, both outbound and inbound, in degrees magnetic will be indicated to avoid any confusion. There will be only one final approach in any one procedure.

At some locations, due to terrain or other features, it may be advantageous for the final approach course and the direction from the VOR station to the airport to differ. This difference will not normally exceed 30° and sufficient distance should be available to allow proper bracketing. Example: When the final approach course is 350° inbound for a certain field, the final approach from the facility to the airport will be between courses of 320° and 20°.

(1) *Altitudes.* The altitude over the station on final approach will be based on the 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 obstructions between the point where the procedure turn is completed and the station, and normally will provide this clearance for an area five miles on each side of the final approach course and will extend for a distance of ten miles outbound from the station. These altitudes will be shown to the nearest 20-foot interval (i. e., 510 feet will be indicated as 500 feet; 511 feet will be indicated as 520 feet, etc.).

(2) *Range station to airport.* For that part of the final approach which lies between the station and the nearest usable portion of the airport, a minimum clearance of at least 300 feet above obstructions will be provided for an approach area two miles on each side of the center-line of the course when the range station is located at or within seven miles of the airport. In cases where the airport is located less than three miles from the station, care must be used in ascertaining that a signal indication is present to afford a flyable track from the station to the airport when a straight-in approach is contemplated.

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 may be established and approved for an airport located 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.

(i) *Over seven to ten miles.* When located from seven to ten miles, obstruction clearance of 400 feet will be provided for an area two miles on each side of the center-line of the proposed course.

(ii) *Over ten to twelve miles.* When located from ten to twelve miles, obstruction clearance of 500 feet will be provided for an area two miles on each side of the center-line of the proposed course.

(iii) *Over twelve miles.* When located more than 12 miles, operations will be conducted in accordance with visual flight rules from the range station to the airport.

(3) *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 course and close enough to the station that it may be reasonably considered as assisting the final approach in its true sense. The distance of this fan marker or other radio aid from the range station will not normally exceed ten miles. The final approach altitude will provide at least 1,000 feet clearance up to the fan marker or other radio aid, and at least 500 feet of clearance from that point to the range station. This clearance will normally be provided for an area of five miles on each side of the center-line of the approach course.

(4) *Magnetic course from range station to airport.* The magnetic courses used for VOR approaches will always be computed at the respective VOR station site using the variation value of the isogonic line nearest the station. When plotting the magnetic course from the station to the airport, two conditions will be considered. Where the bearing from the range station to the end of a runway to be used does not diverge more than 30° from the direction of that runway, and a reasonable rate of descent is possible, the magnetic course shown will correspond with the bearing from the range station to the approach end of the runway, and a straight-in approach may be authorized. Where this condition is not possible, the magnetic course from the range station toward the approximate center of the airport landing area will be shown. This bearing shall be that which bisects the angle formed by two straight lines extending from the VOR to the outer ends of the airport runways.

(5) *Distance from facility to airport.* The distance from the range station to the airport is normally measured on a straight line along the magnetic course from the range station to the approach end of the runway. If, however, a straight-in approach cannot be authorized by application of subparagraph (4) of this paragraph, the distance will be measured along the magnetic course from the range station to the first point of intersection of the course with any runway on the airport. At airports where no runways exist, the distance will be measured along the magnetic course of the range station to the point of intersection with the nearest boundary of the landing area.

(f) *Missed approach procedure.* A 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 (1) at the point where the aircraft has descended to authorized landing minimums if visual contact is not established, or (2) if the landing has not been accomplished, or (3) when directed by Air Traffic Control. Time limitations will not be used due to the variations in the approach speed of different types of aircraft.

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

(2) *Alternate missed approach procedure.* 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. An alternate missed approach procedure will be made known to the appropriate air traffic control personnel, and will be indicated under the missed approach item of the instrument approach procedure by the phrase "or as directed by air traffic control."
