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ADVISORY CIRCULAR

CRITERIA FOR APPROVAL OF CATEGORY II LANDING WEATHER MINIMA

Reprinted to Include Change 1 and 2

Federal Aviation Agency

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ADVISORY CIRCULAR

SUBJECT: CRITERIA FOR APPROVAL OF CATEGORY II LANDING WEATHER MINIMA

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1. PURPOSE. This circular sets forth criteria, guidelines, and procedures which provide an acceptable basis for the approval of Category II ILS minima and the installation approval of the associated airborne systems.

2. CANCELLATION. Advisory Circulars 120-15 and 20-31 are hereby canceled.

3. HOW TO GET THIS PUBLICATION.

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      FAA Advisory Circular AC 120-20
      Criteria for Approval of Category II Landing Weather Minima
      Dated 6/6/66

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Flight Standards Service

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1. DEFINITIONS.

a. Category II Operations. Operations down to minima below 200' decision height and 2400 RVR and to as low as 100' decision height and 1200 RVR.

b. Touchdown Zone. The first 3000' of runway beginning at the threshold.

c. Decision Height. A specified height (above the highest elevation in the touchdown zone) at which a missed approach must be initiated if the required visual reference has not been established.

d. ILS Reference Datum. A point at a specified height located vertically above the intersection of the runway centerline (localizer centerline) and the threshold and through which the downward extended straight portion of the glide path passes.

2. DISCUSSION.

a. Criteria for approval of Category II landing weather minima were initially published in AC 120-15 on October 2, 1964. On December 4, 1964, AC 20-31, which described the requirements for Engineering approval of Category II airborne equipment, was published. As a result of further discussions and operational experience gained during the evaluation of several air carriers' airborne equipment, this material has been refined and updated. The following criteria identify the ground facilities, airborne equipment, maintenance standards and additional training requirements which must be met before Category II minimums can be approved.

b. The comments in response to the criteria for Category II weather minimums for general aviation airplanes, as published in Notice No. 65-35, are presently under study. It is anticipated that criteria and operating rules for use of Category II ILS minima within the framework of the Federal Aviation Regulations will be issued. Upon completion of that project the Agency will consider similar rulemaking for air carriers and commercial operators. In the meantime, the Agency will authorize Category II by the amendment of operations specifications on an individual basis, using the criteria set forth in this AC.

3. AIRPORTS.

a. U. S. Airports. Air carriers may be approved to use ILS minima as low as 1200 RVR at designated Category II airports which meet criteria contained in Appendix 3.

b. Foreign Airports. U. S. air carriers may be approved Category II minimums at Category II foreign airports whenever the visual and electronic ground aids are equivalent to those specified in Appendix 3. This will require that the Agency evaluate each such airport on an individual basis. The major considerations here are the approach

light systems, high-intensity runway lights, in-runway lights, runway marking and procedures for reporting runway visibility. Although it is recognized that the systems at foreign airports may not be exactly in accordance with U. S. standards, it is important that the facilities installed at foreign airports do provide the necessary information with respect to visual cues and visibility reporting. It is believed that an attempt to compare the several different systems with U. S. standards in this document would serve no useful purpose and would tend to limit the flexibility desired in this respect.

4. AIRBORNE EQUIPMENT. The following is the list of necessary equipment, in addition to the instruments and radio equipment required by the FARs:

a. Dual ILS Localizer and Glide Slope Receivers.

b. Flight Control Guidance Systems.

(1) All Aircraft (Except Twin-Engine Propeller Aircraft).

(a) An automatic approach coupler (may include split axis) and a flight director system with dual displays, or

(b) Two independent flight director systems.

(2) Twin-Engine Propeller Airplanes.

(a) An automatic approach coupler (may include split axis), or

(b) One flight director system with dual displays.

NOTE: Single-axis flight directors giving steering (roll) command are acceptable if basic glide slope information is displayed on the same instrument(s).

c. Equipment for Identification of the Decision Height.

(1) One radar (radio) altimeter approved in accordance with paragraph 9f of Appendix 1, or

(2) Improved dual barometric altimeter systems - approval for the use of barometric altimetry will be based on the ability of the air carrier to demonstrate the accuracy of its altimeters by a test program acceptable to the FAA.

(3) Inner markers, where installed, may be used to identify the 100' decision height in lieu of improved barometric altimeters or a radio altimeter, provided a marker beacon receiver having three lights, to indicate airway (inner) and a middle and outer marker respectively, is installed and operative.

NOTE: Instrument panel display(s) are to be located at such a place that height information is readily usable by both pilots.

d. Missed Approach Attitude Guidance.

(1) Attitude gyro indicators with calibrated pitch attitude markings, or

(2) Flight director pitch command, or

(3) Computed pitch command for turbojet aircraft if identification of the decision height (100') is based on the use of barometric altimetry.

e. An Auto Throttle Control System. If Category II minimums are predicated on a flight-control guidance system other than an automatic approach coupler (all axis), an auto throttle control system is necessary, unless the applicant can demonstrate that its LOW APPROACH system does not significantly increase pilot workload over that required with an automatic approach coupler (all axis). On all current four-engine turbojets, an auto throttle system is necessary if operations are predicated on flight director systems.

f. Instrument Failure Warning System. The failure warning system, together with flight-crew procedures and duty assignments, is to provide for the immediate detection of essential instrument and equipment failures. The adequacy of the system is determined by a review of the individual air carrier's aircraft instrument and equipment configuration. (See paragraph 9.)

g. Rain Removal Capability. A rain removal system is to be available and capable of providing cockpit visibility which will assure safe transition to visual touchdown and rollout.

5. PILOT TRAINING AND PROFICIENCY PROGRAM. The following items are to be included in each air carrier's approved training program:

a. Ground Training (Pilot in Command and Second in Command).

(1) Ground Facilities.

(a) The operational characteristics, capabilities and limitations as applied to Category II operations of:

1 The instrument landing system, and

2 The visual approach aids, i.e., approach lights, touchdown zone and centerline lighting, etc.

(2) The Airborne Low Approach System.

(a) The operational characteristics, capabilities and limitations appropriate to the airborne low approach system(s) to be utilized.

1 The flight director system,

2 The automatic approach coupler (including split axis),

3 The system used to identify the decision height,

4 The instrumentation and display systems,

5 Automatic throttle control systems,

6 Other systems and/or devices peculiar to the particular installation, i.e., computed go-around guidance equipment and failure warning system, etc.

(3) Operations. The following factors are to be covered on both initial and recurrent proficiency checks:

(a) Resolution of the decision height,

(b) Missed approach technique, using as appropriate computed or fixed attitude guidance display,

(c) Runway visual range; its use and limitations,

(d) The availability and/or limitations of visual cues with 1200 RVR using various glide slope angles, cockpit cutoff angles and the altitude at which these visual cues are normally discernible.

(e) Problems related to the transition from nonvisual to visual flight with 1200 RVR (and subsequent lower values, i.e., 1000 and 800) through the use of the following:

1 Approved simulators with visual capability, and/or

2 The use of films or other training aids.

(f) The effects of vertical and horizontal wind shear, and

(g) Review of operations specifications applicable to Category II operations.

b. Flight Training and Proficiency Program. The following are proficiency requirements for Category II:

(1) Initial Pilot-in-Command Proficiency Requirements. Each pilot in command is to satisfactorily demonstrate to either a company check pilot or an FAA inspector the following proficiency requirements in each type aircraft to be flown in Category II operations:

(a) One ILS approach under the hood to 100', using the flight director system.

(b) One ILS approach under the hood to 100', using the auto coupler.

(c) A landing from at least one of the approaches specified in subparagraphs (a) and (b) above.

(d) A missed approach from at least one of the approaches specified in subparagraphs (a) and (b) above, with one of the critical engines in the idle thrust position. Such engine is to be placed in idle prior to reaching the outer marker.

(e) Two ILS approaches under the hood, if the carrier proposes to use only the manual (flight director) airborne low-approach system. From one of the approaches a landing is to be accomplished and from the other a missed approach is to be executed in accordance with the provisions of subparagraph (d) above.

(f) Two auto coupler ILS approaches under the hood, in the case of a carrier operating twin-engine propeller aircraft equipped with only an automatic approach coupler. From one of the approaches a landing will be accomplished and from the other a missed approach will be executed in accordance with the provisions of subparagraph (d) above.

NOTE: 1. A pilot in command who is not qualified for turbojet landing minimums less than 300-3/4, in accordance with AC 120-4A, is to demonstrate initial pilot-in-command proficiency requirements for Category II to an FAA inspector.

2. During the instrument approaches and missed approaches the appropriate airborne equipment upon which Category II minima are predicated are to be used.

(2) Second-in-Command Initial Flight-Training Requirements. The flight-training requirements for a second in command will depend on his assigned role during Category II approaches. Each second in command is to satisfactorily demonstrate, to a company check pilot or an FAA inspector, his ability to perform his assigned functions. If a second in command is not expressly prohibited by his company from executing Category II approaches, he is to satisfactorily accomplish the appropriate requirements of subparagraph b(1) above.

(3) Recurrent Pilot-in-Command and Second-in-Command Proficiency Requirements.

(a) Pilots in Command. During each required proficiency check the pilot in command is to demonstrate, in flight, to a company check pilot or an FAA inspector, his proficiency on the items listed in subparagraph b(1) above. If an air carrier has an approved aircraft simulator, configured with the appropriate low approach system, the alternate check may be accomplished in the simulator. However, in the case of a pilot in command who is dual aircraft qualified, the proficiency requirements are to be accomplished at least annually in each aircraft type.

(b) Second in Command. During each required proficiency check the second in command is to demonstrate, in flight, to a company check pilot or an FAA inspector, his proficiency on the requirements in paragraph b(2) above. If an air carrier has an approved aircraft simulator, configured with the appropriate low approach system, the alternate check may be accomplished in the simulator.

c. Ground and Flight Training - Aircraft Interchange. When equipment interchange is involved, the pilot in command and the second in command are to receive sufficient ground and flight training to ensure complete familiarity and competency with the particular airborne low approach system on the interchange aircraft. The amount of training required will depend on the differences in the low approach system and configuration.

6. OPERATIONAL PROCEDURES. Procedures and instructions to be used and adhered to by its flight crews are to be developed by each air carrier to include, as applicable, at least the following:

a. Approach monitoring. Crewmember duties during a Category II approach are to be clearly delineated in the operations manual.

b. Testing of the radar (radio) altimeter by either a functional test or an acceptable operational procedure.

c. Resolution of the decision height. If operation is predicated on the use of barometric altimeters, the errors determined to exist in the altimeter system, including correction for wheel height, are to be applied to the MSL indicated altitude.

d. Use of RVR information.

e. Decision region. The region between the middle marker and the 100' point where the pilot must decide to either continue his approach or execute a go-around. Instructions to pilots should include the maximum permissible excursions of the raw ILS deviation from which a landing can be made.

f. Missed approach procedure.

g. Use of airborne low approach equipment including cross-over system, if provided.

h. Instrument failure warning system.

7. AIRBORNE SYSTEM EVALUATION. Performance of the flight control guidance system may be demonstrated by showing compliance with either:

a. The criteria contained in Appendix 1, or

b. The provisions of paragraph 8 below.

8. OPERATIONAL DEMONSTRATION OF THE LOW APPROACH SYSTEM. The following provisions apply to an air carrier selecting this method of demonstrating its airborne system:

a. Conduct at least 300 approaches to 100' in each aircraft type, except that if additional aircraft types are configured with the same basic low approach system, the additional approaches may be reduced by one-half. These approaches may be accomplished in line operations or during training and demonstration flights or any combination thereof. Eighty-five (85%) percent of the total demonstrations conducted during line operations must be successful and 90 percent conducted during training or demonstration flights must be successful. (See paragraph 8c for a definition of a successful approach.) Approaches are to be accomplished in accordance with the following:

(1) A minimum of three ILS facilities are to be used during the demonstrations and at least 10 percent of the total approaches are to be conducted on each of at least three of the facilities selected. The number of approaches conducted on additional facilities can be at the air carrier's discretion.

(2) The low approaches should be accomplished on Category II ILS facilities. However, at the airline's option, demonstration may be made on Category I ILS facilities.

(3) No more than 15 approaches per day are to be conducted on a single facility.

(4) No more than 60 percent of the approaches are to be conducted in any single aircraft.

(5) Where a carrier has different models of aircraft within a given type which utilize the same basic flight-control guidance system, the carrier is to assure that the various models comply with the basic system performance criteria.

(6) A representative number of pilots assigned to an aircraft type are to be used in the conduct of these approaches. No single pilot in command shall perform more than 15 percent of these approaches except when the total number of crews located at a small domicile requires a greater percentage.

(7) At least 30 percent of the approaches will be observed by FAA Air Carrier Operations Inspectors.

b. Data Collection During Airborne System Evaluation. Each air carrier is to develop a form to be used by the flight crews to record data listed below. This form will be completed whenever an approach is attempted utilizing the airborne low approach system regardless of whether it is initiated, abandoned or concluded successfully. The completed forms will be made available to the assigned FAA Principal Operations Inspector for his evaluation.

(1) If unable to initiate approach due to a deficiency in the airborne equipment, state deficiency.

(2) If approach is abandoned, give reasons and altitude above runway at which approach was discontinued.

(3) Adequacy of speed control at the 100' point (if auto throttle used).

(4) Was airplane in trim at the 100' point for continuation to flare and landing?

(5) Compatibility of flight director with auto coupler.

(6) Diagram of cockpit raw ILS display and diagram of runway extended to middle marker. Flight crew to indicate position of airplane at middle marker, 100' point and estimated touchdown point.

(7) Quality of overall system performance.

NOTE: Unsuccessful approaches attributed to ATC instructions may be excluded from the statistical data; for example, flights vectored too close infor adequate localizer and glide slope capture and ATC requests to abandon approach. Also, unsuccessful approaches may be excluded from consideration when they are due to faulty ground station signals and where a pattern of such faulty performance can be established.

c. Definition of a Successful Approach. For the purpose of the airborne system evaluation, a successful approach is one in which, at the 100' point:

(1) The airplane is in trim so as to allow for continuation of normal approach and landing.

(2) The indicated airspeed and heading are satisfactory for a normal flare and landing. If an auto throttle control system is used, speed must be $\pm$ 5 knots of programmed airspeed but may not be less than computed threshold speed.

(3) The airplane is positioned so that the cockpit is within, and tracking so as to remain within, the lateral confines of the runway extended.

(4) Deviation from glide slope does not exceed $\pm$ 75 microamps as displayed on the ILS indicator.

(5) No unusual roughness or excessive attitude changes occur after leaving middle marker.

9. SYSTEM FAULT DETECTION. The air carrier is to submit a description of the proposed Category II system which outlines the methods of detecting and protecting against the consequences of single failures. Warning flags that are used must be easily discernible under all lighting conditions. The following, as appropriate, will be treated in the description:

a. Attitude (vertical gyro).

b. Heading.

c. Auto throttle system.

d. Altitude.

e. ILS instrument.

f. Flight director system.

g. Any other equipment essential to the system.

10. MAINTENANCE PROGRAM. Each air carrier is to establish a maintenance program, acceptable to the FAA, to assure that the airborne electronic equipment will continue at the level of performance and reliability demonstrated during the evaluation program. The following are the minimum requirements:

a. Reliability Reporting. For a period of one year after an air carrier has been advised that its low approach system meets Category II requirements, and reduced minima are authorized, the carrier is to provide a monthly summary to the FAA of the following information:

(1) The total number of approaches where the equipment constituting the airborne portion of the Category II system was utilized to make satisfactory actual or simulated approaches to Category II minima (by aircraft type).

(2) The total number of unsatisfactory approaches and the reasons therefore (broken down into appropriate categories - airborne equipment faults, ground facility difficulties, aborts of approaches because of ATC instructions) by airport and aircraft registration number.

b. Maintenance Personnel Training. The initial and recurrent training program for personnel performing maintenance work on Category II airborne systems and equipment is to be submitted to the FAA. Training records for such personnel are to be kept current and made available to FAA for inspection.

c. Test Equipment and Standards. The air carrier program for maintenance of test equipment and primary and secondary standards which relate to Category II operations are to be submitted to the FAA. Emphasis will be placed on standards associated with ILS receivers, flight directors, autopilot/couplers and altimeter systems.

d. Maintenance Procedures. Any changes to maintenance procedures, practices or limitations which were established in qualification for Category II operations are to be submitted to the FAA for acceptance before any such changes are adopted.

e. Engineering Modifications. Titles and numbers of all modifications, additions and changes which were made to qualify aircraft systems for Category II performance are to be provided to FAA.

11. APPROVAL OF CATEGORY II WEATHER MINIMA.

a. U. S. Air Carriers. When an air carrier has complied with the appropriate provisions of these criteria, operations specifications authorizing 1600 RVR with a 150' decision height will be issued. During the six-month period following the issuance of these specifications the air carrier, when practicable, should use the Category II

airborne system regardless of weather minimums, to ensure continued performance and reliability of the system. If there is a significant deterioration in the performance and reliability of the airborne equipment, approval of 1200 RVR will be withheld and authorization for 1600 RVR may be suspended unless positive corrective action is taken. When the carrier exercises its airborne systems at airports where the ILS is not of Category II quality, or when other conditions not normal for Category II approaches are encountered, the performance standards specified for normal Category II conditions need not be met. When the first six months of operations have been analyzed and found acceptable, the air carrier will be authorized to operate at 1200 RVR with a decision height of 100'. Sample operations specifications pages are included in Appendix 2.

b. Foreign Air Carriers. Foreign flag air carrier operations specifications may be amended to authorize Category II landing minimums in accordance with paragraph "a" above, provided the air carrier:

(1) Is authorized for these minima by the State of Registry, and

(2) Certifies that its Category II program is equivalent to that required for U. S. air carriers by this advisory circular.

APPENDIX 1. AIRWORTHINESS APPROVAL FOR CATEGORY II INSTALLATION OF AIRBORNE NAVIGATION, INSTRUMENT, AND FLIGHT CONTROL SYSTEMS IN TRANSPORT CATEGORY AIRCRAFT.

1. PURPOSE. This Appendix contains criteria for the approval of airborne equipment and their installations when the applicant desires to have a statement in approved flight manuals that his equipment meets Category II performance.

2. GENERAL CRITERIA. The type certification approval for the equipment, system installations and test methods should be based on a consideration of factors such as the intended function of the installed system, its accuracy, reliability and failsafe features. In addition, approval should be based on demonstrated compatibility with Category II ground facilities. The guidelines and procedures contained herein are considered acceptable methods of determining transport category airplane airworthiness for use in Category II IFR operations. Type certification based on other criteria may also be considered acceptable when found to be equivalent and approved by the FAA.

3. EQUIPMENT APPROVAL CRITERIA. Airborne navigation instrument and/or flight control equipment may be eligible for installation approval as part of an installed system when it is:

   a. Found to comply with the requirements of an applicable technical standard order or type certificate, or

   b. Found to comply with applicable Civil Air Regulations and approved as part of an airplane under a type certificate or supplemental type certificate, or

   c. Found to comply with other pertinent specifications adopted by the Administrator; e.g., military standards or a foreign government's validation which has been found to be compatible with the intent of the appropriate Civil Air Regulations.

4. INSPECTION AND TEST PROGRAM. Agreement should be reached with the applicant on his proposed flight test program, which should be conducted to determine compliance with the requirements of this document of the pertinent systems installed. Upon completion of Federal Aviation Agency engineering design and ground testing program evaluations on the combination of systems proposed as a basis for a Category II installation indicating that the system will meet the prescribed criteria, a Type Inspection Authorization, or similar document should be issued. This document will specify the necessary conformity inspections and tests to be conducted, both on the ground and in flight. It should include determination of satisfactory installation practices, freedom from interferences, compatibility with ground navigation facilities and the Air Traffic Control System, and performance of intended functions. Performance testing in flight should cover representative and critical phases of operation including malfunction simulation.

5. FUNCTION AND RELIABILITY TESTING. In addition to the inspection and test program, a program of function and reliability flight testing may be required for the purpose of supplementing analytical and test data, such as fault analysis and reliability studies, with accelerated service experience (such testing if practicable may be done, by arrangement, during normal airline operations not predicated on use of the system undergoing test). The extent of the additional tests depends upon the complexity, number, nature of (or novel) design features incorporated in the system and the record of previous tests and experience.

6. APPROVED AIRPLANE FLIGHT MANUAL. The Federal Aviation Agency approved airplane flight manual or supplement thereto should include pertinent material as required to define the normal and emergency operating procedures and applicable operating limitations associated with system performance in Category II operation.

7. SYSTEMS PERFORMANCE REQUIREMENTS. For the combination of systems to provide the level of accuracy, reliability, and compatibility needed to assure an approach capability which is considered acceptable to the Administrator, each individual system should be found to perform its intended function in accordance with the following:

   a. Control Functions. All systems which furnish signals directly to the airplane flight control system or the propulsion thrust control system should be so designed that if malfunction occurs, such malfunction does not result in an unsafe configuration. Means for quick disengaging or overriding of each automatic control function should be immediately available to the flight crew without requiring the application of excessive forces and the assuming of any unusual position.

   b. Malfunction of Monitoring Functions. A reasonable probable malfunction in any monitoring sub-system should be incapable of causing a malfunction of any **ESSENTIAL** system unless such essential system malfunction is indicated to the flight crew.

8. COMBINED SYSTEMS CRITERIA.

   a. Eligibility for Category II operations includes compliance with applicable sections of Federal Aviation Regulations, Part 25.

   b. A combination of airborne navigation, instrument, and flight control systems, having individual system installation approvals, may be eligible for Category II installations approval when:

      (1) Found to provide information to the flight crew with sufficient accuracy and reliability to permit the manual control of the airplane along the flight path within prescribed limits.

(2) Or found to provide signals to the airplane flight control systems with sufficient accuracy, and reliability to maintain the aircraft along the approach flight path within prescribed limits.

(3) Or found to provide a combination of automatic flight, propulsion control, and other information to the flight crew to permit manual control of the aircraft, supplemented by automatic control, along the approach flight path within prescribed limits.

9. INDIVIDUAL SYSTEM CRITERIA. Individual Category II airborne systems should comply with the pertinent sections of this Appendix and the following performance criteria:

a. Localizer. The localizer system installation should comply with the following:

(1) The localizer equipment should meet or exceed the minimum performance standards set forth in Federal Aviation Agency Technical Standard Orders C36, C36a, C36b, or RTCA Paper **DO-131 dated December 15, 1965, "Minimum Performance** Standards - ILS Localizer Receiving Equipment."

(2) The localizer system installation should meet or exceed the minimum performance standards set forth in RTCA Paper 69-60/DO-102, dated April 12, 1960, "Minimum In-Flight Performance Standards - ILS Localizer Receiving Equipment."

(3) Display to the pilot positive visual indication to show degradation of localizer system performance under the following conditions:

(a) The absence of either or both modulation signals.

(b) The reduction of both modulation signals to one-half the normal 20 percent.

(c) When a difference of depth of modulation equal to 0.093$\pm$ 0.002 produces an output of less than one-half normal response to this standard localizer deviation signal.

(4) The localizer receiving centering error should be within 5 ua on a 95 percent probability basis under the following conditions, using a standard test signal:

(a) Variation of R.F. signal level from 50 to 1,000 uv.
NOTE: This represents the variation of R.F. signal level expected during the final phase of an ILS approach.

(b) Variation of DC power over the range of 24 to 28 volts or AC power over the range of 105 to 120 volts.

(c) Variation of ambient temperature over the limited range expected during a normal ILS approach. The nominal ambient temperature range is defined as +10°C. to +40°C. Operation over a different temperature range in a particular airplane will require special coordination.

(5) The localizer receiving equipment should be adjusted in accordance with RTCA Paper 23-63/DO-117, dated March 14, 1963, "Standard Adjustment Criteria for Airborne Localizer and Glide Slope Receivers."

b. Glide Slope. The glide slope system installation should comply with the following:

(1) The glide slope equipment should meet or exceed the minimum performance standards set forth in Federal Aviation Agency Technical Standard Orders C34, C34a, C34b, or RTCA Paper **DO-132 dated March 15, 1966, "Minimum Performance** Standards - ILS Glide Slope Receiving Equipment."

(2) The glide slope system installation should meet or exceed the minimum performance standards set forth in RTCA Paper 233-59/ DO-101, dated December 9, 1959, "Minimum In-Flight Performance Standards - ILS Glide Slope Receiving Equipment."

(3) Display to the pilot positive visual indication to show degradation of glide slope system performance under the following conditions:

(a) The absence of either or both modulation signals.

(b) The reduction of both modulation signals to one-half of their normal 40 percent.

(c) When a difference of depth of modulation equal to 0.091± .002 produces an output of less than one-half normal response to this standard glide slope deviation signal.

(4) Centering Error: - The glide slope centering requirements outlined in RTCA Paper 222-58/DO-89 are applicable for Category II installation approval.

(5) The glide slope receiving equipment should be adjusted in accordance with RTCA Paper 23-63/DO-117, dated March 14, 1963, "Standard Adjustment Criteria for Airborne Localizer and Glide Slope Receivers."

c. Automatic Pilot/Coupler. When an automatic pilot/coupler system is used as part of a Category II installation, it should, in addition to complying with applicable TSO and CAR/CAM material, provide the following performance under the test condition stated:

(1) Airplane Speed - Maximum and minimum design approach speeds.

(2) Wind Conditions (The effects may be shown analytically) - Surface downwind component of 10 knots. Wind shear of 4 knots per 100 feet altitude applied along the runway or across the runway individually, commencing at an altitude of 500 feet.

(3) Localizer Performance -

(a) The airplane should be stabilized on the localizer for the purpose of demonstration before the outer marker is intercepted on a normal inbound approach.

(b) From the outer marker to an altitude of 300 feet above runway elevation on the approach path, the automatic pilot/coupler should cause the airplane to track automatically to within $\pm$ 35 microamperes (95 percent probability) of the indicated localizer course. The performance should be free of sustained oscillations.

(c) From an altitude 300 feet above runway elevation on the approach path to the decision altitude (100 feet), the automatic pilot/coupler should cause the airplane to track automatically to within $\pm$ 25 microamperes (95 percent probability) of the indicated course. The performance should be free of sustained oscillations.

(4) Glide Slope Performance -

(a) For the purposes of the demonstration, the airplane should be stabilized on the glide slope before an altitude of 700 feet above the field level is reached.

(b) From 700 feet altitude to the decision altitude the autopilot/coupler should cause the airplane to track the center of the indicated glide slope to within $\pm$ 35 microamperes or $\pm$ 12 feet, whichever is the larger, without sustained oscillations.

d. Flight Director Systems. When a flight director system is used as part of a Category II installation it should provide for the following performance under the test condition stated:

(1) Airplane Speed - Maximum and minimum design approach speeds.

(2) Wind Conditions (The effects may be shown analytically) - Surface crosswind component of 15 knots. Surface downward component of 10 knots. Wind shear of 4 knots per 100 feet altitude applied along the runway or across the runway individually, commencing at an altitude of 500 feet.

(3) Mode selection and Indication.

(a) Manual selection should be positive, and the selection should be clearly identified.

(b) When the mode of operation is not shown by the manual mode selector and by the command display behavior, means should be employed to clearly annunciate the existing mode.

(4) Localizer Performance -

(a) The airplane should be stabilized on the localizer for the purpose of demonstration before the outer marker is intercepted on a normal inbound approach.

(b) From the outer marker to an altitude of 300 feet above runway elevation on the approach path, the flight director should cause the airplane to track within $\pm$ 35 microamperes (95 percent probability) of the indicated localizer course. The performance should be free of sustained oscillations.

(c) From an altitude 300 feet above runway elevation on the approach path to the decision altitude (100 feet), the flight director should cause the airplane to track to within $\pm$ 25 microamperes (95 percent probability) of the indicated course. The performance should be free of sustained oscillations.

(5) Glide Slope Performance -

(a) For the purpose of the demonstration, the airplane should be stabilized on the glide slope before an altitude of 700 feet above the field level is reached.

(b) From 700 feet altitude to the decision altitude (100 feet), the flight director should cause the airplane to track the center of the indicated glide slope to within $\pm$ 35 microamperes or $\pm$ 12 feet, whichever is the larger, without sustained oscillations.

e. Automatic Throttle System.

(1) An automatic throttle system, if used, should provide safe operation under conditions which can reasonably be expected

in normal service including wind shear, gusts, and sideslips. The system should:

(a) Automatically adjust throttles to maintain airplane speed to within ± 5 knots of stabilized programmed airspeed, but not less than computed threshold airspeed under all intended flight conditions. Proper operating points such as reference speed or angle-of-attack may be set manually or automatically.

(b) Provide throttle application at a rate consistent with the recommendations of the appropriate engine and airframe manufacturers.

(c) Maintain stable short period and phugoid airplane modes for all intended flight situations during manual and automatic flight control.

(2) Malfunction of any part of the system should not restrict either pilot from maintaining safe control of the airplanes or engines.

(a) Disconnect switch(es) readily accessible to both pilot and copilot should be provided.

(b) The throttle drive mechanism should be designed to permit manual over-riding without application of excessive throttle forces.

(c) The maximum servo velocity attainable should be positively limited by design to that required for adequate performance.

(d) Appropriate indication of system engagement and disengagement should be provided.

f. Radio Altimeter. The radio altimeter system should provide the following performance under the test conditions stated:

(1) Display to the flight crew clearly and positively the altitude information in flight which indicates the airplane main landing gear wheel height above terrain.

(2) Under the measurement conditions described, the flight crew presentation should:

(a) Display altitude to an accuracy of ± 5 feet or ± 5 percent of altitude, whichever is greater, under the following conditions:

(1) Pitch angle zero ± 5° about the mean approach attitude

(2) Roll angle zero to ± 20°

(3) Forward velocity from minimum approach speed up to 200 knots.

(4) At altitudes from 100 to 200 feet with sink rates of zero to 15 feet/second.

(b) Over level ground the altimeter should track the actual altitude of the airplane without significant lag or oscillation.

(c) With the airplane at an altitude of 200 feet or less, any abrupt change in terrain representing no more than 10 percent of the airplane's altitude should not cause the altimeter to unlock, and indicator response to such changes should not exceed 0.1 seconds. If the system unlocks, it should reacquire the signal in less than one second.

(d) Systems which contain a push-to-test feature should test the entire system (with or without antenna) at a simulated altitude of less than 500 feet.

(e) Failure Warning - The system should provide to the flight crew a positive failure warning display any time there is a loss of power or absence of ground return signal within the specified range of operating altitudes.

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SAMPLE

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34. Category II Operations

a. Landing Minimums - The air carrier is authorized to use the following ILS straight-in landing minimums:

(1) RVR 1600.

(2) Decision height not less than 150 feet.

b. Pilot Qualifications - The minimums prescribed in paragraph a above are authorized only for those pilots-in-command who have completed the approved Category II training program and who have been certified by an FAA inspector or a company check pilot as being qualified for Category II operations. No pilot-in-command shall be authorized to conduct Category II operations in turbojet aircraft unless he has had at least 300 hours as pilot-in-command in turbojet aircraft.

c. Required Airborne Equipment - In addition to the flight instruments and radio navigation equipment required by Part 121 of the FARs, the following equipment is required for Category II operations (specify by type aircraft authorized):

d. Operating Limitations - An ILS approach shall not be started when the RVR for the touchdown area of the landing runway is reported to be less than RVR 2000 for four-engine turbojet aircraft or RVR 1800 for all other aircraft unless:

(1) The airborne equipment required by paragraph c of this section is operating satisfactorily..

(2) The following elements of the ground navigation system are in normal operation:

(a) All components of the ILS.

(b) HIRL.

(c) Standard approach light system (3000') and sequenced flashing lights.

(d) Touchdown zone lights and runway centerline lights.

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(3) The crosswind component on the landing runway is 10 knots or less.

(4) Fifteen per cent additional runway length is available over the landing field length specified in FAR 121.195(b).

e. Missed Approach - A missed approach shall be initiated when:

(1) The pilot, upon reaching the authorized decision height, has not established adequate visual reference, or

(2) A touchdown cannot be accomplished within the touchdown zone.

(3) Any of the required airborne equipment specified in paragraph c of this section becomes inoperative during a Category II approach, except that an approach may be continued using a flight director system if the automatic approach coupler malfunctions and is disengaged below 400' above the elevation of the touchdown zone.

(4) Any of the elements of the ground navigation system specified in subparagraph d(2) of this section become inoperative during a Category II approach.

f. Authorized Airports - The air carrier is authorized Category II operations at the following airports and runways:

AIRPORT	RUNWAY	T/D Zone ELEVATION	*RADIO ALTIMETER SETTING	
			150' D/H	100' D/H

*If determination of the decision height is predicated on dual barometric altimeters, the pilot-in-command must assure that corrections for altimeter system errors are properly applied.

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APPENDIX 3. GROUND SYSTEM AND OBSTRUCTION CLEARANCE CRITERIA FOR CATEGORY II OPERATIONS

*1. PURPOSE. This Appendix outlines ground system and obstruction clearance criteria for Category II ILS operations. Other FAA Selection Orders, Notices, and Advisory Circulars define system performance and equipment characteristics and are available at any Airport District Office or by writing to the address on the title page of this Advisory Circular. *

2. GENERAL. A Category II ILS approach system consists of both electronic and visual guidance systems. The electronic system must be capable of guiding an aircraft to the ILS reference datum with a high degree of accuracy. The visual guidance system must provide the correct visual cues to the pilot from the decision height down to and including the touchdown, and along the runway for rollout, under the appropriate RVR conditions. Airports which do not meet the criteria established in this Appendix, but where an operational or other evaluation identifies that an equivalent level of safety exists, may be authorized appropriate ILS Category II minimums. Such an evaluation shall be conducted by Flight Standards or other Service as appropriate.

* Foreign airports served by United States carriers or commercial operators may be approved in accordance with the provisions of ICAO Annex 3 on a basis of a comparable level of safety.

3. SECTION I - CATEGORY II GROUND SYSTEM

a. Electronic Guidance System. An instrument landing system which meets Category II performance standards and provides continuous electronic guidance to the ILS reference datum and consists of the elements described below:

(1) Localizer. The localizer provides azimuth guidance from the specified coverage limit down to the ILS reference datum as indicated in the U.S. Flight Inspection Manual.

(2) Glide Slope. The glide slope provides guidance in the vertical plane from the specified coverage limit down to the ILS reference datum as indicated in the U.S. Flight Inspection Manual.

(3) VHF Marker Beacons. In addition to the outer and middle marker beacons, a 75 mc inner marker beacon is provided at each Category II ILS installation as a system requirement and is one method of identifying the decision height. *

* b. Visual Guidance System. The Category II lighting system provides continuous visual guidance from the point where transition from Category II instrument flight to visual reference is initiated. The visual system provides guidance for the approach, flare, landing, and rollout. The system will consist of the following components:

(1) Approach Lighting System. Pending retrofit to Category II lighting standards outlined in Selection Order 1010.39, ILS Category II operations will be authorized on the present ILS Category I, Configuration "A", 3000-foot approach lighting system (ALS). When retrofitted, these and all subsequent Category II ALS will conform to Selection Order 1010.39 except that no negative gradient will be permitted in the inner 1500 feet. Where required, and when fixtures are available, approved flush approach lighting systems may be installed, i.e., displaced landing threshold.

(2) Touchdown Zone Lighting System. A touchdown zone lighting system will be provided for each Category II ILS runway defining the runway touchdown zone and conforming to AC 150/5340-4A.

(3) Centerline Lighting System. A centerline lighting system will be provided for each Category II ILS runway defining the runway centerline and conforming to AC 150/5340-4A. Existing L-842 300 candlepower centerline lights on 25-foot spacing may be approved for 1600 RVR day, and 1200 RVR night. 1200 RVR day and night may be approved for existing L-843 runway centerline lighting systems.

(4) High Intensity Runway Edge Lighting. A high intensity runway edge lighting system will be provided for each Category II ILS runway defining the lateral and longitudinal limits of the runway and conforming to AC 150/5340-13A. The operating limit of existing L-818 or L-820 runway edge light systems will be determined by the FAA on an individual basis.

(5) Taxiway Turnoff Lighting Systems. Taxiway turnoff lighting systems are not required for Category II operations. The FAA policy on these systems is contained in FAA Selection Order 1010.40.

(6) All-Weather Runway Markings. Category II runways will be marked with all-weather runway markings as specified in AC 150/5340-1A.

c. Other Requirements. The following additional systems are required as part of the Category II ILS system. *

* (1) Runway Visual Range (RVR). For operations below 1600 RVR, two transmissometers are required to provide visibility information at the approach and rollout ends of the Category II runway. Where an initial transmissometer installation is being made on a Category II runway, both transmissometers will be installed on a 250-foot baseline. Where a Category I runway is updated to Category II status, the touchdown zone transmissometer may be on a 500 or 250-foot baseline. On the rollout end of the Category II runway, the transmissometer will be installed on a 250-foot baseline.

Transmissometers serving other runways may be used to provide the RVR information in the rollout area of the Category II runway. Where transmissometers from other runways are used for this purpose, the transmissometer will be located within a radius of 2000 feet of the rollout threshold of the Category II runway and will provide a minimum of 2000 feet coverage of the Category II rollout area as measured from the rollout threshold of the Category II runway.

RVR readout for transmissometers on 250-foot baseline is as follows:

600' - 3000' in 200-foot increments.
3000' - 6000' in 500-foot increments.

RVR readout for transmissometers on a 500-foot baseline is as follows:

1000' - 4000' in 200-foot increments.
4000' - 6000' in 500-foot increments.

FAA Standard 008 prescribes installation criteria for RVR equipment.

(2) Radar (Radio) Altimeter Setting Height. Radar (radio) altimeter setting heights will be provided on the FAA Form 8260-7, indi- * cating the vertical distance at the 100/150-foot decision heights between the glide slope and the terrain beneath these points, on the runway centerline extended.

(3) Remote Monitoring. Remote monitoring shall be provided for the following elements of the Category II ILS system:

(a) Glide slope, localizer, and marker beacons.

(b) Approach lighting system.

* (4) Manual Inspection. The following systems are not remotely monitored and will require frequent inspection by airport management or FAA personnel or frequent pilot reports to determine if they are operated and maintained in accordance with the criteria.

(a) Touchdown zone and centerline lights.
(b) Runway edge lights.
(c) Runway markings.

d. Critical Areas. Category II ILS glide slope, localizer, and obstacle critical areas will be marked and lighted to insure that ground traffic does not violate these areas during Category II operations. These areas are shown in Figure 1 and defined as follows:

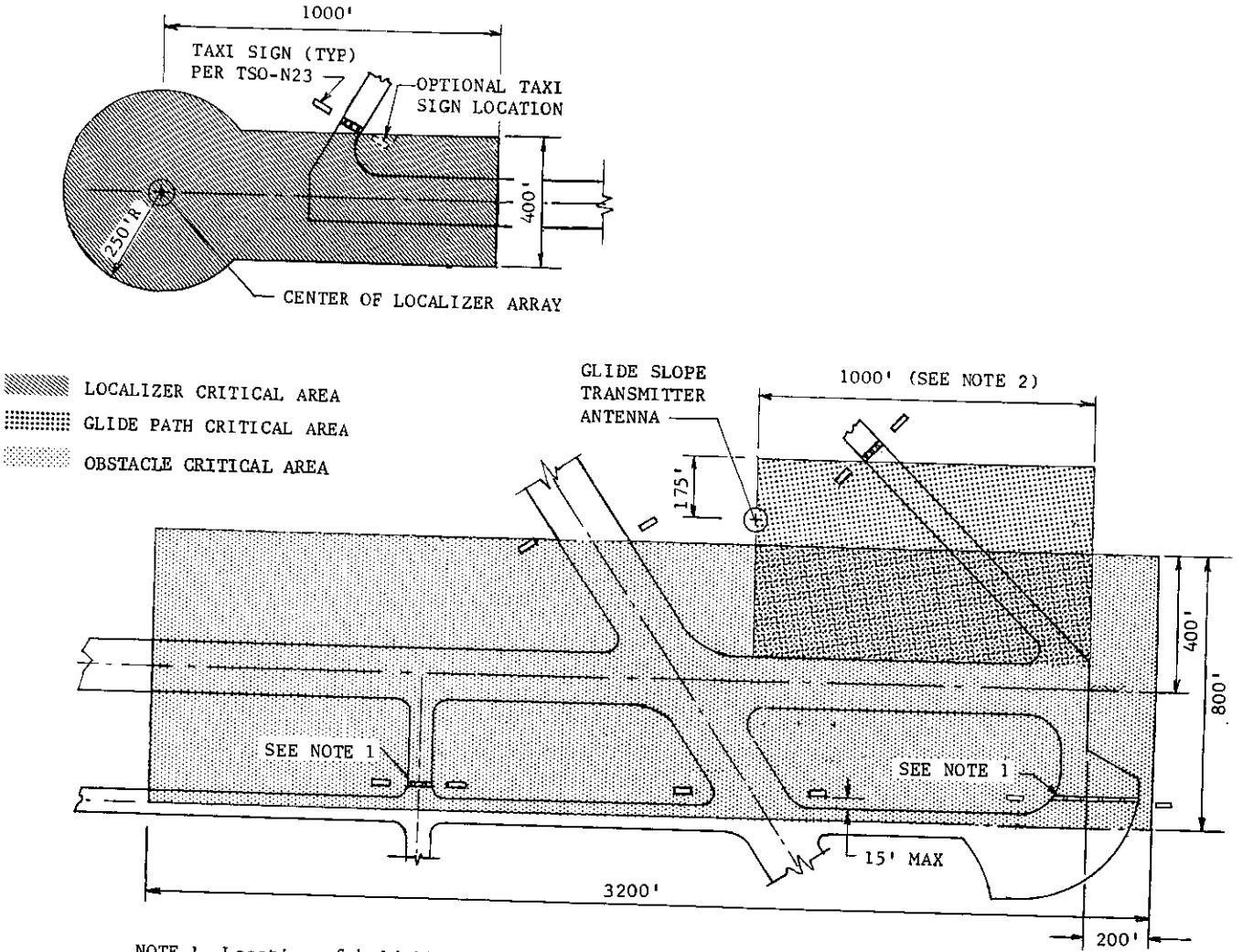
(1) Glide Path Critical Area. The glide path critical area is a rectangular area extending from the glide slope transmitting antenna to:

(a) 1000 feet in the direction of the approach end of the runway, or to the end of the runway, whichever is greater.
(b) "0" feet in the opposite direction.
(c) To the near edge of the runway which the ILS serves.
(d) 175 feet in the direction away from the runway.

(2) Localizer Critical Area. The localizer critical area is a rectangular area extending from the localizer transmitting antenna 1000 feet in the direction of the approach end of the runway and 200 feet on either side of the runway centerline. An additional area is described as a circular area with a radius of 250 feet from the center of the localizer and connecting to the parallel lines on either side of the runway.

(3) Obstacle Critical Area. The obstacle critical area is a rectangular area longitudinally centered on the runway centerline, extending from a point 200 feet outward from the Category II landing threshold (normal or displaced) and extending 3200 feet in the direction of landing and having a total width of 800 feet.

4. OBSTACLE CLEARANCE CRITERIA. This Section prescribes the obstacle clearance criteria for the final and missed approach areas for use in the formulation of ILS Category II procedures. *



NOTE 1. Location of hold lines when operations are permitted on a 400' parallel taxiway.

2. Or to the end of the runway, whichever is greater.

FIGURE 1. CATEGORY II CRITICAL AREAS

a. Final Approach. The final approach begins at the Final Approach Fix (FAF) and ends at the runway or missed approach point (DH). The FAF in ILS procedures is the point where the glide slope is intercepted and descent to the authorized decision height has begun. The FAF may be identified by an outer marker, compass locator, DME, radar, or other fix.

b. Final Approach Area. The final approach area has the following dimensions:

(1) Length. The basic final approach area is 50,000 feet long, measured outward along the final approach course from a point 200 feet outward from the runway threshold. The final approach area used in a procedure shall be that portion of the basic area which is between the FAF and the 200-foot point outward from the runway threshold.

(2) Width. The final approach is centered on the extended runway centerline. It has a total width of 1,000 feet at the inner end and expands uniformly to a total width of 16,000 feet at the outer end which is 50,000 feet from the point of beginning.

c. Final Approach Surface. The final approach surface is an inclined plane which originates at the runway threshold elevation, 200 feet outward from the threshold, and which overlies the final approach area. The surface is divided into two sections; an inner 10,000-foot section and an outer 40,000-foot section. The slope of the surface changes at the 10,000-foot point. The exact gradient may differ according to the angle at which the glide slope is established. The 50:1 and 40:1 slopes which are applicable to the 2-1/2 degree glide slope shall be established unless other slopes must be used to assure required clearance over existing obstructions. The table below specifies slopes which provide minimum required obstruction clearance for several glide slope angles.

GS Angle	Slope of Inner Section	Slope of Outer Section
2 degrees	94:1	60:1
2-1/4 degrees	65:1	48:1
2-1/2 degrees	50:1	40:1
2-3/4 degrees	40:1	34:1
3 degrees	34:1	29.5:1

d. Final Approach Area Transitional Surfaces. Transitional surfaces are inclined planes with slopes of 7:1, which extend outward and upward from the edge of the final approach area, starting at the height of the approach surface and extending for a lateral distance of 5,000 feet at right angles to the runway centerline.

e. Obstruction Clearance. No obstruction shall penetrate the applicable final approach surface specified in paragraph 4.c. When obstructions penetrate the final approach area transitional surfaces, and when deemed necessary, consideration will be given to an adjustment in the Decision Height (DH) commensurate with the degree of interference presented by the particular obstruction or obstructions.

5. SPECIAL OBSTRUCTION CLEARANCE AREAS. Because of the lower flight altitudes which occur in the immediate vicinity of the runway during ILS Category II approach and missed approach, it is necessary to specify certain areas in which obstructions must be eliminated or controlled. These special areas are the Approach Light Area, the Touchdown Area, the Transitional Surfaces, and the Missed Approach Area.

6. APPROACH LIGHT AREA. (See Figure 2)

a. Definition. An area longitudinally centered on the extended centerline of the ILS Category II runway, and extending outward from the end of the Touchdown Area (See Paragraph 7) to a point 200 feet beyond the last approach light fixture, and having a total width of 400 feet.

b. Obstruction Clearance. No obstruction shall penetrate the approach light plane. Further, no obstruction, including the approach light structure or fixtures, shall penetrate a 50:1 surface which originates at the same point as the final approach area (See Paragraph 4.b(1) at the elevation of the runway threshold. The 50:1 surface over the Approach Light Area remains a constant requirement even when other portions of the final approach surface are adjusted for glide slope angles greater than 2-1/2 degrees. However, where glide slope angles of less than 2-1/2 degrees are established, no obstruction in the Approach Light Area shall penetrate the associated approach surface.

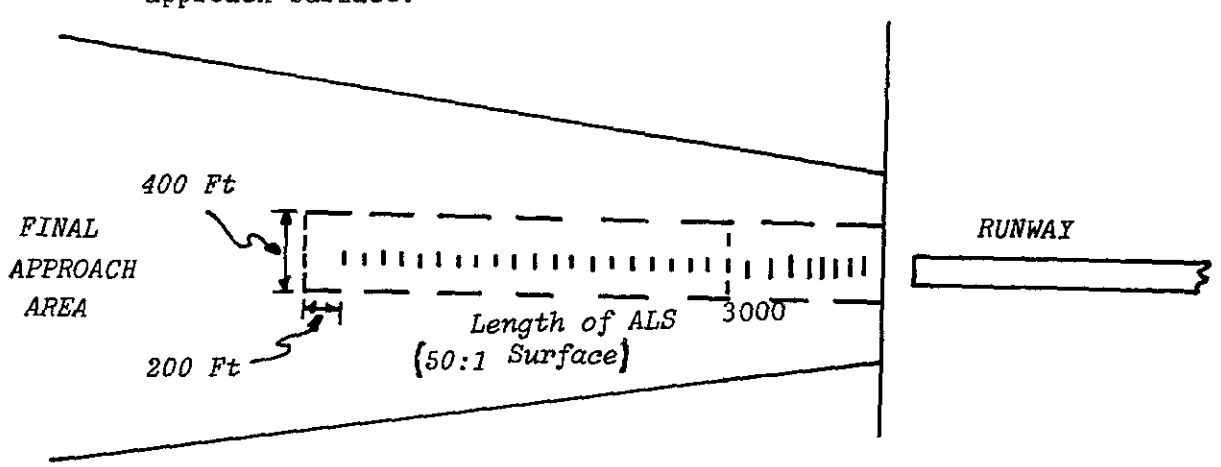


FIGURE 2. Approach Light Area

7. TOUCHDOWN AREA. See Figure 3.

a. Definition. An area longitudinally centered on the runway centerline, extending from a point 200 feet outward from the runway threshold (normal or displaced) for a distance of 3200 feet in the direction of landing, and having a total width of 1000 feet.

b. Obstruction Clearance. The only obstructions permitted in the Touchdown Area are those objects which are fixed by their functional purpose or which are required for precision approaches to the Category II ILS runways. All objects except visual aids and frangible functional objects shall be appropriately marked and lighted unless shielded by a properly lighted and marked functional object. The identity and height limits of acceptable objects are as follows:

(1) Visual Aids. Unless flush-mounted, all visual aids shall be installed on frangible mounts. Maximum height is 14 inches above the surface where the fixture is located. Except that taxiway guidance signs may be installed in accordance with TSO N-23.

(2) Glide Slope Antenna. The mast or monitor mast shall be no closer than 400 feet to the ILS Category II runway centerline, and should not exceed 55 feet in height above the elevation of the runway centerline nearest it. A mast of over 55 feet may be permitted if the minimum distance from the runway centerline is increased by 10 feet for each foot the mast exceeds 55 feet in height.

(3) Structures. Those structures which are elements of the Glide Slope, PAR, or RVR systems (except GS antenna or monitor masts) should not exceed 15 feet in height above the elevation of the runway centerline nearest them, and in addition may be no closer to the runway centerline than 400 feet. When such structures are more than 15 feet high, they may be permitted if the minimum distance from the runway centerline is increased 10 feet for each foot the structure exceeds 15 feet. Frangible PAR reflectors are not considered to be obstructions.

8. TOUCHDOWN AREA TRANSITIONAL SURFACES (See Figure 3)

a. Definition. Transitional Surfaces sloped at 7:1 extend outward and upward from the edges of the Touchdown Area and Section 1 of the Missed Approach Area (See Paragraph 9) to a height of 150 feet above the elevation of the runway centerline at the end of the touchdown area.

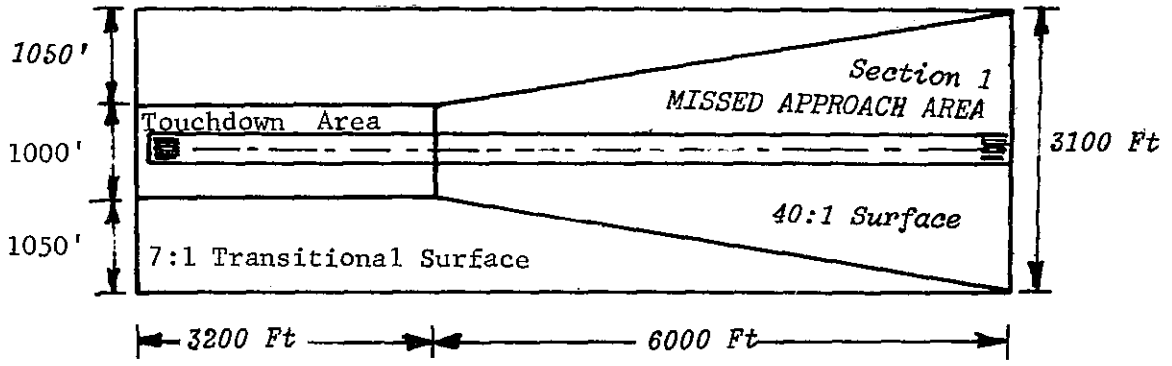


FIGURE 3. OBSTRUCTION CLEARANCE AREAS. ILS Category II.

b. Obstruction Clearance. When an obstruction penetrates the 7:1 transitional surfaces and when deemed necessary, adjustment in the RVR * minimum will be made commensurate with the degree of interference presented by the obstruction. Such adjustment will be approved by Flight Standards Service. A caution note will be added to the approach procedure to identify obstacles which penetrate the 7:1 surfaces. *

9. MISSED APPROACH AREA. A missed approach will be specified to commence at the DH if the required visual reference has not been established. However, it is possible that aircraft will continue to descend through the decision height while initiating the missed approach, or that a decision to land may be altered by circumstances and the approach aborted at a lower altitude. In either case the missed approach obstruction clearance criteria must consider aircraft which have progressed into the touchdown area to heights below the decision height, perhaps even to a momentary touchdown. There are two Sections to the Missed Approach Area, and a special treatment for the turning missed approach is also necessary.

a. Missed Approach Section 1. This portion of the area begins at the end of the Touchdown Area at the height of the runway, and is longitudinally centered on the runway centerline. It has the same width as the touchdown area at the point of beginning (1,000 feet) and the width increases uniformly to 3,100 feet at 6,000 feet from the point of beginning. (See Figure 3)

b. Missed Approach Section 2. This portion of the area starts at the end of Missed Approach Section 1 and is centered on a continuation of the Section 1 course. The width increases uniformly from 3100 feet at the beginning to 8 miles at a point 15 miles from the runway threshold. When positive course guidance is NOT provided for the missed approach procedure, secondary areas which are zero miles wide at the point of beginning and increase uniformly to 2 miles wide at the end of Missed Approach Section 2, must be added to the edges of Section 2. (See Figure 4)

c. Turning Missed Approach Area. (Applies to turns of over 15 degrees). The design of the turning missed approach area assumes that aircraft missing an approach will climb straight ahead until reaching a height of at least 300 feet above the elevation of the runway centerline at the end of the Touchdown Area. The procedure will identify the obstruction if a turn toward a significant obstruction has to be made. The turning flight track radius shall be 1.75 miles, and it shall be plotted to begin at the end of Missed Approach Section 1. The outer boundary of Missed Approach Section 2 shall be drawn with a 3.5 mile radius. The inner boundary line shall commence at the outer edge of the transitional surface opposite the end of the Touchdown Area. The outer and inner boundary line shall terminate at points 4 miles each side of the assumed flight track 15 miles from the runway threshold. (See Figures 5 and 6). Where secondary areas are required, they shall commence after completion of the turn. Turns in the missed approach area are normally specified to commence after reaching a height of 300 feet. Where an operational requirement exists to continue the climb of the aircraft to a height of more than 300 feet prior to commencing a turn, Missed Approach Section 1 will continue to increase uniformly in width, and will be extended longitudinally 4000 feet for each 100 feet of height over 300 feet. In addition, the 7:1 Transitional Surface (Paragraph 8.a.) is also extended laterally on the inside of the turn to a height equal to the elevation attained by the extension of Missed Approach Section 1.

NOTE: Where a positive course guidance is provided in Section 2 consideration may be given to reducing the width of this Section.

d. Obstruction Clearance.

(1) Straight Missed Approach. No obstruction in Sections 1 or 2 may penetrate a 40:1 surface. This surface originates at the beginning of Section 1 at the elevation of the runway centerline at the end of the touchdown area, and overlies the entire Missed Approach Area.

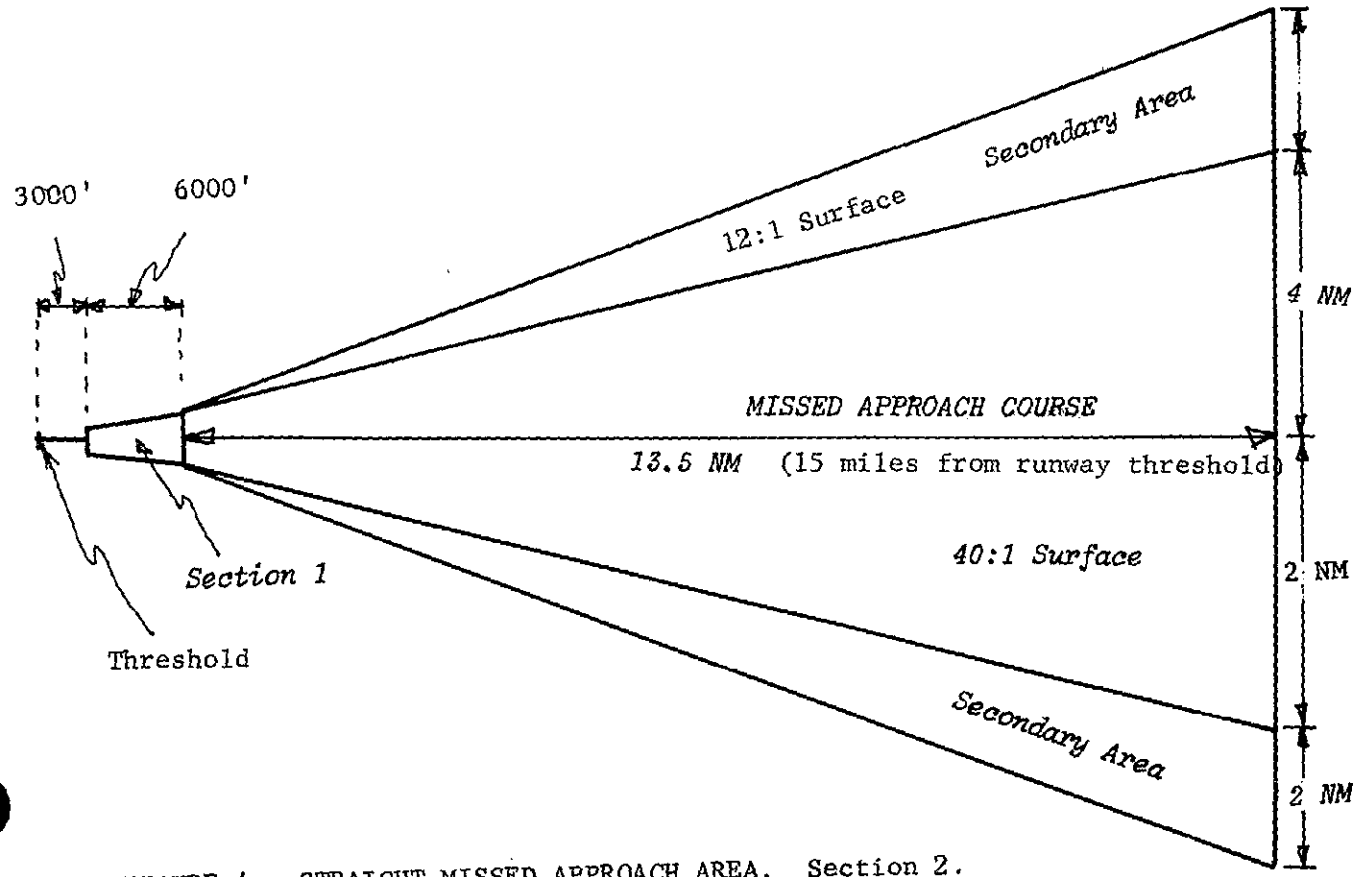


FIGURE 4. STRAIGHT MISSED APPROACH AREA. Section 2.

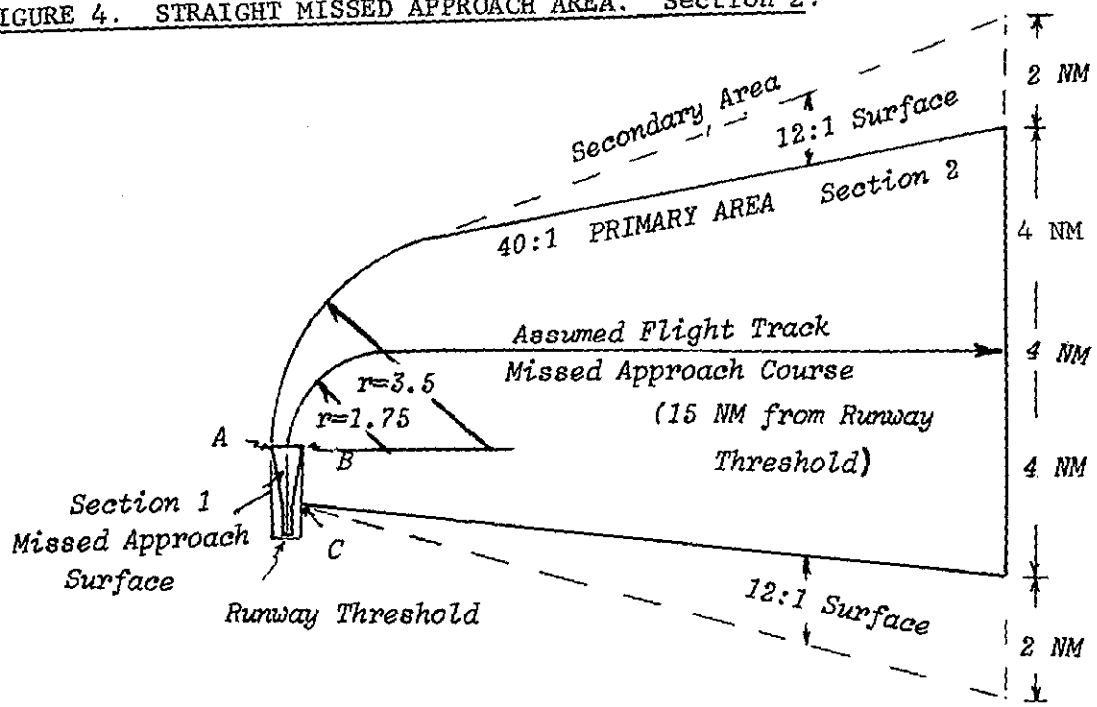


FIGURE 5. TURNING MISSED APPROACH AREA Section 2

(2) Turning Missed Approach. Section 1 obstruction clearance is the same as that for straight missed approach. To determine the obstruction clearance requirements in Section 2, the lines A-B and B-C are identified in Figures 5 and 6. The height of the missed approach surface over any obstruction in Section 2 is determined by measuring the distance from the obstruction to the nearest point on the line A-B or B-C and computing the height according to the 40:1 ratio starting at the elevation of line A-B or B-C. Note that lines A-B and B-C are always at the same elevation as the end of Section 1. (See Figure 6).

(3) Secondary Areas. Where secondary areas are considered, no obstruction may penetrate a 12:1 surface which slopes outward and upward from the missed approach surface.

10. GLIDE SLOPE ANGLE. The optimum glide slope angle is 2.5 degrees. The maximum angle is 3.0 degrees. An angle less than 2.5 degrees or more than 2.75 degrees will be established only to satisfy a unique operational requirement, and must be justified by special study for consideration of approval by Flight Standards Service, Washington, D.C.

*11. GLIDE SLOPE THRESHOLD CROSSING HEIGHT. The optimum glide slope threshold crossing height is 50 feet. The maximum is 60 feet. A height as low as 47 feet may be used at locations where special consideration of the glide path angle and antenna location are required, provided that for those aircraft which can reasonably be expected to use the procedure, the vertical distance between the aircraft's glide slope antenna and lowest part of main landing gear wheels does not exceed 19 feet with the aircraft in approach attitude. Heights are measured at the landing threshold. See TERPs' Appendix 1, paragraph 10 for method of computing this height. *

12. ADJUSTMENT TO CATEGORY II ILS MINIMUMS. The decision height is measured from the highest elevation of the runway in the touchdown area. The lowest minimums permitted by the Category II system are a decision height of 100 feet and RVR 1200. Application of Category II obstruction clearance criteria may identify objects which exceed the allowable height in the touchdown area or penetrate the approach light surface. In such cases, adjustment to the decision height shall be made as follows:

Final Approach Surface -	Requires a special study of local features and conditions before Category II operation can be authorized by Flight Standards Service, FAA, Washington, D.C.
Approach Light Surface and Touchdown Area -	Adjust the DH upward one foot for each one foot an object exceeds the allowable height. The RVR value will then be adjusted as indicated in the table:

Adjusted Decision Height	RVR
101-140 feet	1200
141-180 feet	1600
181-199 feet	1800

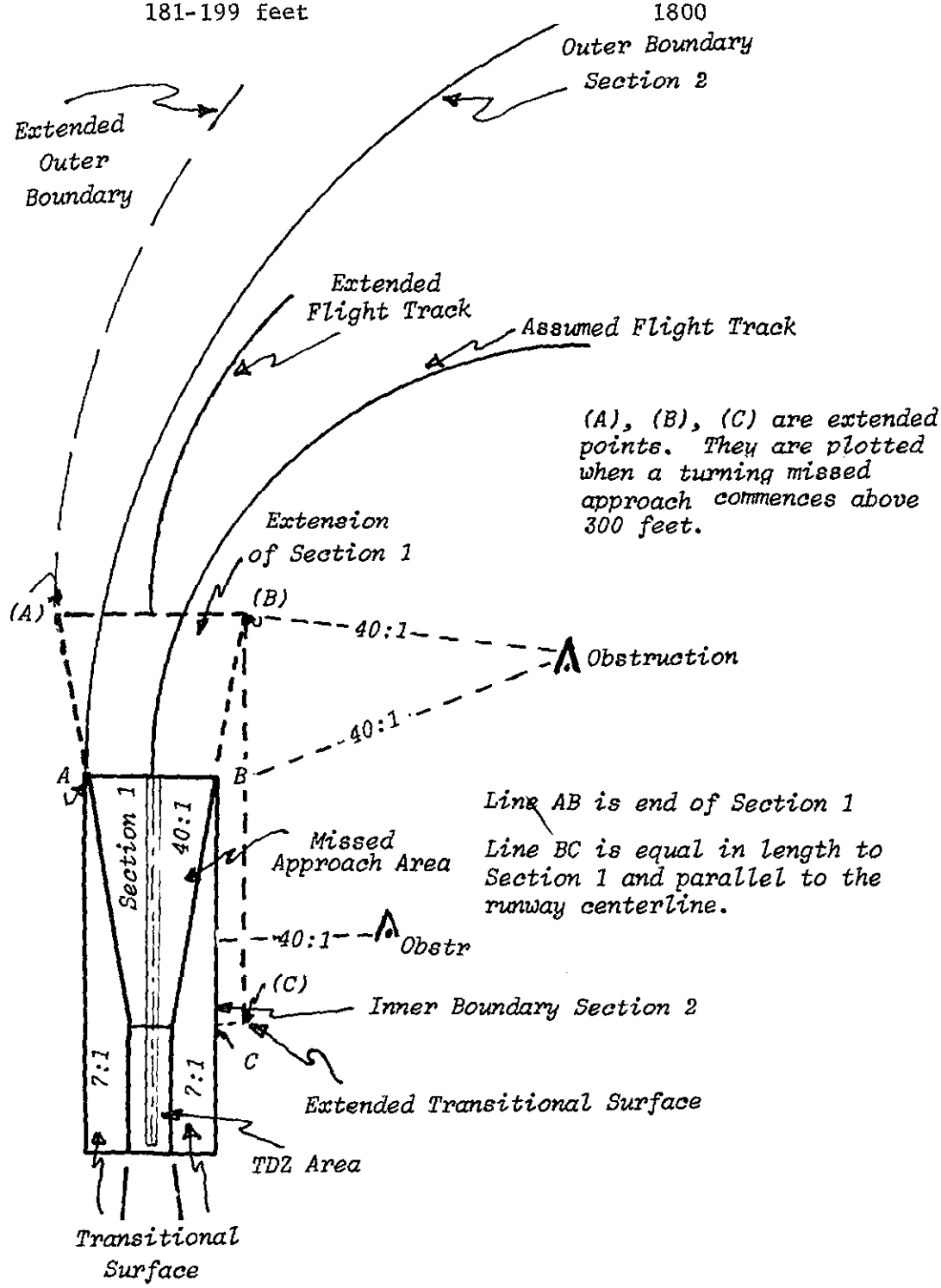


FIGURE 6. TURNING MISSED APPROACH AREA CONSTRUCTION DETAIL. ILS Category II.

13. OBSTRUCTIONS IN THE MISSED APPROACH AREA. The 40:1 missed approach surface is established to identify objects which may be a hazard in the missed approach area. Objects which do not penetrate the 40:1 surface are not considered a hazard. When an object penetrates the 40:1 surface the missed approach procedure will contain a caution note which specifies a rate of climb in feet per minute which is required to clear the controlling obstruction by 50 feet. For example: An obstruction is 30,000 feet from the point where the missed approach surface starts and 900 feet above this point. A climb gradient of approximately 190 feet per mile is required to clear this 900-foot obstruction by 50 feet. Expressed in feet-per-minute for a range of ground speeds this becomes:

100K - 315	Feet Per Minute
150K - 470	" " "
200K - 630	" " "

The caution note should read as follows: "Obstructions in the missed approach area require a rate of climb of at least 315 fpm/100K, 470 fpm/150K, 630 fpm/200K, no wind conditions."