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**AC NO:** 120-28A

**DATE:** 14 Dec 71

# ADVISORY CIRCULAR

CRITERIA FOR APPROVAL OF CATEGORY IIIa LANDING WEATHER MINIMA

**DEPARTMENT OF TRANSPORTATION**

**FEDERAL AVIATION ADMINISTRATION**

Initiated by: FS-403

**AC NO:** 120-28A

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# ADVISORY CIRCULAR

## DEPARTMENT OF TRANSPORTATION
## FEDERAL AVIATION ADMINISTRATION

**SUBJECT:** CRITERIA FOR APPROVAL OF CATEGORY IIIa LANDING WEATHER MINIMA

1. PURPOSE. This circular states an acceptable means, not the only means, for obtaining approval of Category IIIa minima and the installation approval of the associated airborne systems.

2. CANCELLATION. Advisory Circular 120-28 is hereby cancelled.

3. APPLICABILITY. These criteria are applicable to operators holding operating certificates issued pursuant to Parts 121, 123 and 135 (large aircraft only). FAA grants approvals of these minima by amending the applicant's operations specifications.

R. S. Slift

Acting Director, Flight Standards Service

Initiated by: FS-403

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1. DISCUSSION. The aviation industry and the FAA have been working for many years towards the ultimate goal of all weather landings. Efforts to achieve this goal have resulted in a gradual, conservative reduction in landing minimums down to 1200 RVR with a 100-foot decision height at designated Category II airports. Category IIIa is the next logical step in reducing landing minimums. Accordingly, the following criteria identify the airport and ground facilities, airborne systems, training requirements and maintenance standards which must be met before Category IIIa minimums can be approved.

2. DEFINITIONS.

   a. Category IIIa Operations (ICAO definition). Operations with no decision height limitation, to and along the surface of the runway with external visual reference during the final phase of the landing and with runway visual range not less than a value on the order of 700 feet.

   b. Alert Height. A height (100' or less above the highest elevation in the touchdown zone), established, based on the characteristics of the aircraft and the particular airborne Category IIIa system, above which a Category IIIa approach would be discontinued and a missed approach executed if a failure occurred in one of the required redundant operational systems in the aircraft or in the ground equipment.

   c. Fail-Passive Automatic Flight Control System. An automatic flight control system which, upon occurrence of any failure or combinations of failures not shown to be extremely improbable, is protected against hardovers, does not involve any out of trim not easily controlled by the pilot, causes a warning signal and does not interfere with the pilot's normal control of the aircraft.

   d. Fail-Operational Category IIIa System. An airborne system which provides redundant operational capability down to touchdown. The redundant operational systems must have no common failure modes, and need not be the same (e.g., one system may be automatic-to-touchdown, and the other manually flown, using computed displays). If one of the two required operational system fails below the alert height, the flare and touchdown may be accomplished using the remaining operational system.

   e. Automatic Fail-Operational Category IIIa System. A system which provides redundant operational capability using automatic systems. If one of the automatic systems fail below the alert height, the flare and touchdown may be accomplished using the remaining automatic system.

3. OPERATIONAL CONCEPTS. The total airborne system must be designed and must provide sufficient information to the pilot so that the landing may be safely continued and completed or a go-around safely executed from any altitude following any single failure or combinations of failures not shown to be extremely improbable.

a. The primary mode of Category IIIa operations will be automatic to touchdown. The automatic landing system should provide a high degree of reliability in assuring safe landings on the runway. Pilot intervention other than decrab and power adjustment shall not normally be required.

b. A redundant operational flight control capability will be required at least down to the touchdown. The redundancy may be provided by multiple automatic landing systems or by a manual backup capability for landing by reference to instruments. The reliability and performance of each of the required redundant operational systems must be such that below the alert height continued safe operation to a successful landing can be effected with a high level of confidence after a failure occurs in one of the redundant operational systems.

c. The following are typical arrangements by which this requirement may be met:

(1) Two (or possibly more) monitored autopilots, (making up an automatic, fail-operational system) one remaining operative after a failure.

(2) Two monitored systems, each consisting of an integrated autopilot and flight director system with common flare computation, with one monitored system remaining operational after a failure.

(3) Three autopilots, two remaining operative (to permit comparison and provide necessary hard-over protection) after a failure.

(4) A single, monitored fail-passive automatic flight control system with flare computation and automatic flare and landing, plus an adequately failure-protected flight director system with dual displays (or dual flight director system) with flare computation, (independent of that used for the autopilot) supplied to the command bars.

NOTE: The flight director displays (head-down and/or head-up) required in paragraph 3 c. (4) above must provide sufficient guidance so that a pilot of average skill can demonstrate the same degree of repeatable performance as required by AC 20-57A. This demonstration is required over the portion of the approach and landing during which the manual takeover is a part of the operational Category IIIa system, i.e., from the alert height to touchdown.

4. AIRPORTS AND GROUND FACILITIES.

a. U. S. Airports. An applicant may be authorized to use minima as low as 700 feet RVR at designated Category IIIa airports which meet criteria described below.

The ground based system must have failure-survival capabilities such that total loss of guidance will be extremely improbable. Precautions must be taken to control traffic in critical areas over and on the airport to avoid ILS overflight and reflection interference. The basic ground facility requirements are as follows:

(1) Ground ILS meeting ICAO Category IIIa requirements (as developed by 1966 ICAO COM/OPS Division Meeting, ICAO Annex 10 Second Edition, April 1968).

(2) Standard approach light system, requirements are the same for Category II. (Reference FAA Advisory Circular 120-29).

NOTE: While uniform implementation of an internationally standardized approach light system is desirable, as a goal, the present Configuration A system is satisfactory to support Category II and Category IIIa operations.

(3) Standard touchdown zone lights. (FAA Advisory Circular 150/5340)

(4) Standard centerline lights, as required for Category II operations. (FAA Advisory Circular 150/5340, also FAA Advisory Circular 120-29) with appropriate distance-to-go coding.

(5) Precision instrument runway marking in accordance with current directives (Advisory Circular 150/5340-1C).

(6) Three RVR transmissometers required, unless it can be shown that two RVR transmissometers can meet the operational needs for a particular airport.

NOTE: Arrangements to permit positive and immediate voice communications to the pilot of sudden RVR changes are required, but automatic transmission of RVR data to the pilot is not required.

(7) Obstacle clearance requirements are the same as for Category II.

(8) An established system and/or procedures acceptable to FAA which provides positive control over aircraft and vehicles on the airport to assure the runway and ILS critical areas are kept suitable for Category IIIa operations.

b. Foreign Airports. An applicant may be authorized to use Category IIIa minimums at foreign airports which are approved for Category IIIa operations by appropriate airport authority whenever the visual and electronic ground aids are equivalent to those specified in 4 a. The major considerations here are the approach light systems, high intensity runway lights, in-runway lights, quality and integrity of the electronic approach and landing guidance systems, runway marking and procedures for reporting runway visibility and airport surface traffic control. 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 provide the necessary information with respect to electronic signals, visual cues, visibility reporting and surface traffic control.

5. AIRBORNE SYSTEMS.

a. Equipment. The following equipment in addition to the instrument and radio equipment required by the Federal Aviation Regulations is the minimum airborne equipment considered necessary for Category IIIa operations.

(1) Two ILS Localizers and Glide Slope Receivers, which meet the performance requirements outlined in Appendix 1.

(2) Two Approved Radio (Radar) Altimeter Systems Which Meet The Performance Requirements for Category II, except that performance requirements should be met from zero to 200' with sink rates of zero to 15 feet/second.

(3) Redundant Flight Control Systems Meeting The Requirements Of Appendix 1.

(4) Missed Approach Attitude Guidance.

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

(b) Fixed or computed pitch command display, or

(c) An automatic go-around system with either (a. or b.) above.

(5) Auto Throttle Control System (Single). An auto throttle system meeting the requirements of Appendix 1.

(6) Failure Detection and Warning Capability, as described in Appendix 1.

NOTE: It is acceptable to inhibit certain indications of failure occuring below the alert height in the required operational systems to avoid cockpit confusion following a type of failure for which no specific action by the flight crew is required and the approach to landing may be continued.

b. Airborne System Evaluation and Approval. Category IIIa airborne systems will be evaluated in accordance with the applicable airworthiness rules and engineering criteria contained in Appendix 1 to determine compliance with applicable airworthiness and performance requirements.

6. PILOT TRAINING AND PROFICIENCY PROGRAM.

a. Category III Ground Training (All Aircraft). The applicant's approved training program must be amended to provide training for pilots in command and seconds in command in the following subjects:

(1) Ground Facilities.

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

1. The instrument landing system,

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

3. Transmissometer systems.

(2) The Airborne Category IIIa System.

(a) The operational characteristics, capabilities and limitations appropriate to the Category IIIa system(s) utilized such as:

1. The automatic landing system.

2. Automatic throttle system.

3. The flight director system.

4. Instrumentation and display systems.

5. System and aircraft characteristics which determine the alert height.

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

(3) Operations. The following items are to be covered on both initial training and proficiency checks.

(a) Recognition of significant failures prior to and after reaching the alert height.

(b) Missed approach technique, using appropriate computed go-around guidance or fixed attitude display.

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

(d) The availability and/or limitations of visual cues with 700 RVR.

(e) The effects of vertical and horizontal windshear.

(f) Procedures for transitioning from nonvisual to visual flight and procedures to be used in deteriorating visibility conditions.

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

The above listed items with the exception of (g) must be accomplished in an approved visual simulator, unless the applicant can show that equivalent training is provided by the use of other training aids and/or devices.

b. Flight Training and Proficiency Program. The following are initial and recurrent flight training requirements for Category IIIa:

(1) Each pilot-in-command shall have received training in flight in executing automatic landings and missed approaches from a very low altitude which may be after touchdown for some systems.

(2) Initial Pilot-In-Command Training and 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 a visual simulator configured with the appropriate Category IIIa system and approved for these maneuvers:

(a) Two ILS approaches using the automatic landing system.

(b) An automatic landing from one of the approaches.

(c) A missed approach from one of the approaches starting from a very low altitude which may be after touchdown for some systems.

NOTE #1 During the instrument approaches and missed approaches the appropriate airborne equipment upon which Category IIIa minima are predicated must be operative and used.

NOTE #2 If an approved visual simulator is not available, this demonstration may be accomplished in flight using a suitable device to simulate appropriate restricted visibility during approach and landing. If conducted in flight the demonstration may be concurrent with the training required by paragraph b. (1) above.

(3) Second-In-Command Initial Flight-Training Requirements. The flight-training requirements for a second-in-command will depend on his assigned role during Category IIIa 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 IIIa approaches, he is to satisfactorily accomplish the requirements of subparagraph b. above and also recurrent requirement of subparagraph b. (4)(b.).

(4) Recurrent Pilot-In-Command and Second-In-Command Proficiency Requirements.

(a) Pilots-in-Command. At least annually the pilot-in-command is to demonstrate to a company check pilot or an FAA inspector, his proficiency on the items listed in subparagraph b. (2). However, if one of the required redundant operational systems is manually flown, using computed displays, the pilot will be required at least annually to demonstrate proficiency, in flight, in the use of such system. In the case of a pilot-in-command who is dual aircraft qualified, the proficiency requirements are to be accomplished at least annually for each aircraft type.

(b) Second-in-Command. During each required proficiency check the second-in-command is to demonstrate to a company check pilot or an FAA inspector his proficiency on the requirements in paragraph b. (3) above in an approved simulator or in flight.

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 Category IIIa system on the interchange aircraft. The amount of training required will depend on the differences in the low approach system and configuration.

7. OPERATIONS 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 IIIa approach are to be clearly delineated in the operations manual.

b. Resolution Of The Alert Height.

c. Use of RVR Information.

d. Missed Approach Procedures.

e. Instrument Failure Warning System.

8. MAINTENANCE PROGRAM. Each applicant is to establish a maintenace program, acceptable to FAA, to assure that the airborne electronic equipment will continue at the level of performance and reliability demonstrated during the evaluation program. Applicants having existing FAA approved maintenance/reliability programs for Category II equipment may extend their programs to include Category IIIa equipment.

The following are the minimum requirements:

a. Maintenance Personnel Training. The initial and recurrent training program for personnel performing maintenance work on Category IIIa 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.

b. Test Equipment and Standards. The applicant's program for maintenance of test equipment and primary and secondary standards which relate to Category IIIa operations are to be submitted to the FAA. Emphasis will be placed on standards associated with ILS receivers, flight directors, autopilot/couplers, auto throttles and altimeter systems and maintenance techniques and procedures associated with redundant systems.

c. Maintenance Procedures. Maintenance procedures, practices, or limitations established in qualification for Category IIIa operations are to be incorporated in the operator's normal maintenance practices.

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

9. APPROVAL OF CATEGORY IIIa WEATHER MINIMA. When an applicant has complied with the appropriate provisions of these criteria, operations specifications authorizing automatic landings under visibility conditions of 1000 RVR may be issued. During the period (minimum of six months) following the issuance of these specifications, the operator must successfully complete an operations demonstration and data collection program as part of the approval process to ensure continued performance and reliability of the system before operations down to 700' RVR are authorized.

a. Airborne Systems Operational Demonstration. One hundred (100) successful landings are to be accomplished in line operations using the Category IIIa system installed in each aircraft type. If failures occur during the program a determination will be made of the need for additional demonstration landings.

(1) The demonstration should be accomplished on Category IIIa ILS facilities. However, at the operator's option, some demonstration may be made on other ILS facilities of his choice. If this option is exercised sufficient data must be recorded to determine the cause of any difficulties which arise.

(2) If an operator has different models of aircraft utilizing the same basic flight control guidance systems, the operator is to assure that the various models comply with the basic system performance criteria, but need not necessarily conduct a full operational demonstration for each model.

b. Data Collection During Airborne System Demonstration. Each applicant is to develop a form used by flight crews to record the approach and landing performance. This form will be utilized whenever an approach and landing is attempted utilizing the Category IIIa system, regardless of whether initiated, abandoned or concluded successfully. The completed forms will be made available to the assigned FAA principal operations inspector for his evaluation. The form should include, but not be limited to, the following information:

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

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

(3) Whether or not the aircraft landed within the desired touchdown dispersion area with lateral velocity or cross track error which could be corrected by the pilot so as to remain within the lateral confines of the runway without a requirement for unusual skill or techniques.

c. Data Analysis. Approaches which, for the following reasons, do not result in a successful landing are to be fully documented.

(1) ATC instructions, for example where a flight is vectored too close in for adequate localizer and glide slope capture, and also ATC requests to abandon approach.

(2) Faulty ground station signals or ILS beam irregularities, such as caused by other aircraft taxiing, over-flying the antenna, or where a pattern of such faulty performance can be established.

(3) Any effect which would be clearly discernable to the flight crew prior to reaching the alert height under Category IIIa conditions.

NOTE: An evaluation of the above incidents will be made to determine suitability of the airborne system for Category IIIa operations.

d. Approval of 700 RVR.

(1) U. S. Air Carriers. When the data from the operational demonstration has been analyzed and found acceptable, the applicant may be authorized to operate at 700' RVR.

(2) Foreign Air Carriers. Foreign flag air carrier operations specifications may be amended to authorize Category IIIa landing minimums provided the air carrier:

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

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

APPENDIX 1. AIRWORTHINESS APPROVAL FOR CATEGORY IIIa AIRBORNE SYSTEMS.

1. PURPOSE. This Appendix contains criteria for the approval of airborne equipment and their installations when the applicant desires to have a statement in the approved flight manuals that his equipment meets Category IIIa 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 III ground facilities. The guidelines and procedures contained herein are considered acceptable methods of determining transport category airplane airworthiness for use in Category IIIa IFR operations.

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 Federal Aviation 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 Federal Aviation Regulations.

4. SYSTEM EVALUATION. 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 Administration engineering design and ground testing program evaluations on the combination of systems proposed as a basis for Category IIIa installation indicating that the system will meet the prescribed criteria, a Type Inspection Authorization should be issued. This TIA 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.

NOTE: Coordination with the Engineering and Manufacturing Division of Flight Standards Service should precede initiation of the FAA flight test program and the final airworthiness approval.

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. RELIABILITY CRITERIA. The Category IIIa system and associated components, considered separately and in relation to other systems, must be designed to comply with FAR Section 25.1309, amendment 25-23.

7. INDIVIDUAL SYSTEM CRITERIA. Individual Category IIIa 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 Administration Technical Standard Orders C36, C36a, C36b, or RTCA Paper DO-131 dated 15 December 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 12 April 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± 0.002 produces an output of less than one-half normal response to this standard localizer deviation signal.

(4) The localizer receiver 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 14 March 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 Administration Technical Standard Orders C34, C34a, C34b, or RTCA Paper DO-132, dated 15 March 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 9 December 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 DO-132 are applicable for Category IIIa installation approval.

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

c. Automatic Flight Control System. Automatic flight control systems used as part of a Category IIIa installation should in addition to complying with applicable TSO, FAR material and Advisory Circular 20-57A (Automatic Landing Systems) 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 to the criteria of AC 20-57A).

(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 flight control system should cause the airplane to track automatically to within ±35 microamperes 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 touchdown, the automatic flight control system should cause the airplane to track automatically so as to meet the lateral dispersion requirements set forth in AC 20-57A.

(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 flare engage height the automatic flight control system should cause the airplane to track the center of the indicated glide slope to within ± 35 microamperes or ± 12 feet, whichever is the larger, without sustained oscillations.

d. Flight Director Systems. When a flight director system is used as one of the required redundant operational systems in a Category IIIa 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 to the criteria of AC 20-57A).

(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 code 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 touchdown, the flight director must provide sufficient guidance so that a pilot of average skill can demonstrate the same degree of repeatable touchdown dispersions as required by AC 20-57A.

(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 flare engage height 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 larger and must provide sufficient guidance so that a pilot can demonstrate the same degree of repeatable touchdown dispersions as required by AC 20-57A.

e. Automatic Throttle System.

(1) An automatic throttle system should provide safe operation under conditions which may be expected in normal service including windshear, 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. Rapid airspeed fluctuations associated with turbulence may be disregarded.

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

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

(a) Disconnect switch(es) readily accessible to both pilot and copilot should be provided in a location which may be actuated without moving his hands from the control wheel or throttle.

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

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

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

f. Radio Altimeter. Each 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 altimeters used to present flight crew information 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 ± 5° about the mean approach attitude.

(2) Roll angle zero to ± 20°.

(3) Forward velocity from minimum approach speed up to 200 knots, in appropriate configurations.

(4) At altitudes from 0 to 200 feet with sink rates of zero to 15 feet/second, in landing, approach and go-around configurations.

(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 failure of the altimeter to function properly.

g. Flare Computer. Each flare computer system should provide the following performance in conjunction with other components of the automatic landing system.

(1) Provide signals to the flight control system to achieve landing touchdown disperions within criteria of AC 20-57A.

(2) Provide display to the flight crew clear indication that the flare has (or alternatively has not) been initiated at the minimum normal flare engage height.

8. APPROVED AIRPLANE FLIGHT MANUAL. Upon satisfactory completion of an engineering inspection and test program, the FAA airplane flight manual or supplement thereto, or markings or placards should reflect the following:

   a. The limitations, if any.

   b. Revision to the performance section, if appropriate.

   c. The airborne equipment and installations related to the Category IIIa system.

   d. A statement to the effect that, "the airborne systems associated with automatic approach and landing of the airplane to touchdown, have been found to meet the airworthiness and performance criteria required for Category IIIa operations."

      NOTE: Compliance with the performance standards referenced above, does not constitute approval to conduct Category IIIa operations.

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FEDERAL AVIATION ADMINISTRATION
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# ADVISORY CIRCULAR

## DEPARTMENT OF TRANSPORTATION
## FEDERAL AVIATION ADMINISTRATION

**SUBJECT:** CRITERIA FOR APPROVAL OF CATEGORY IIIa LANDING WEATHER MINIMA

PURPOSE. This change revises the CAT IIIa Landing Weather Minima maintenance requirements of paragraph 8 to make them consistent with the requirements for CAT IIa. It also adds a requirement for reliability reporting of components listed in aircraft manufacturers' CAT IIIa failure faults and analysis.

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C. R. Melugin Jr.

C. R. MELUGIN, JR.
Acting Director, Flight Standards Service

Initiated by: AFS-350

c. Use of RVR Information.

d. Missed Approach Procedures.

e. Instrument Failure Warning System.

* 8. MAINTENANCE PROGRAM. Each applicant is to establish a maintenance program, acceptable to FAA, to assure that the airborne equipment will continue at a level of performance and reliability demonstrated during the evaluation program. Applicants having existing FAA approved maintenance/reliability programs for Category II equipment may extend their program to include Category IIIa equipment. The following are minimum requirements:

a. Reliability Reporting. For a period of one year after an applicant has been advised that its low approach system meets Category IIIa requirements, and reduced minima are authorized, the operator 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 IIIa system was utilized to make satisfactory actual or simulated approaches to Category IIIa minima (by aircraft type).

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

(3) A semi-annual summary report for all components listed in the aircraft manufacturer's Category IIIa failure or fault analysis that had a failure rate design consideration. This summary report is to show comparison of actual failure rates with the failure rates used as a basic for Category IIIa system design. The certificate holding office will notify the type design holding region when the reliability data indicates the Category IIIa system requires a design review, and whenever a component exceeds the design failure rate value of the failure analysis.

b. Maintenance Personnel Training. Each applicant is to establish an initial and recurrent training program acceptable to the FAA for personnel performing maintenance work on Category IIIa airborne systems and equipment. Training records for such personnel are to be kept current and made available to FAA for inspection.

c. Test Equipment and Standards. The applicant's program for maintenance of line (ramp) test equipment, shop (bench) test equipment and a listing of all primary and secondary standards utilized during maintenance of test equipment which relates to Category IIIa operation

are to be submitted to the FAA for determination of adequacy. Emphasis will be placed on standards associated with ILS receivers, flight directors, autopilot couplers, autothrottles and altimeter systems and maintenance techniques and procedures of associated redundant systems.

d. Maintenance Procedures. Any changes to maintenance procedures, practices, or limitations established in the qualification for Category IIIa operations are to be submitted to the FAA for acceptance before 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 IIIa performance are to be provided to FAA. *

9. APPROVAL OF CATEGORY IIIa WEATHER MINIMA. When an applicant has complied with the appropriate provisions of these criteria, operations specifications authorizing automatic landings under visibility conditions of 1000 RVR may be issued. During the period (minimum of six months) following the issuance of these specifications, the operator must successfully complete an operations demonstration and data collection program as part of the approval process to ensure continued performance and reliability of the system before operations down to 700' RVR are authorized.

a. Airborne Systems Operational Demonstration. One hundred (100) successful landings are to be accomplished in line operations using the Category IIIa system installed in each aircraft type. If failures occur during the program, a determination will be made of the need for additional demonstration landings.

(1) The demonstration should be accomplished on Category IIIa ILS facilities. However, at the operator's option, some demonstration may be made on other ILS facilities of his choice. If this option is exercised, sufficient data must be recorded to determine the cause of any difficulties which arise.

(2) If an operator has different models of aircraft utilizing the same basic flight control guidance systems, the operator is to assure that the various models comply with the basic system performance criteria, but need not necessarily conduct a full operational demonstration for each model.

b. Data Collection During Airborne System Demonstration. Each applicant is to develop a form used by flight crews to record the approach and landing performance. This form will be utilized whenever an approach and landing is attempted utilizing the Category IIIa system, regardless of whether initiated, abandoned or concluded

sucessfully. The completed forms will be made available to the assigned FAA principal operations inspector for his evaluation. The form should include, but not be limited to, the following information:

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

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

(3) Whether or not the aircraft landed within the desired touchdown dispersion area with lateral velocity or cross track error which could be corrected by the pilot so as to remain within the lateral confines of the runway without a requirement for unusual skill or techniques.

c. Data Analysis. Approaches which, for the following reasons, do not result in a successful landing are to be fully documented.

(1) ATC instructions, for example where a flight is vectored too close in for adequate localizer and glide slope capture, and also ATC requests to abandon approach.

(2) Faulty ground station signals or ILS beam irregularities, such as caused by other aircraft taxiing, over-flying the antenna, or where a pattern of such faulty performance can be established.

(3) Any effect which would be clearly discernable to the flight crew prior to reaching the alert height under Category IIIa conditions.

NOTE: An evaluation of the above incidents will be made to determine suitability of the airborne system for Category IIIa operations.

d. Approval of 700 RVR.

(1) U.S. Air Carriers. When the data from the operational demonstration has been analyzed and found acceptable, the applicant may be authorized to operate at 700' RVR.

(2) Foreign Air Carriers. Foreign flag air carrier operations specifications may be amended to authorize Category IIIa landing minimums provided the air carrier:

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

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


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