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ADVISORY CIRCULAR

CRITERIA FOR APPROVAL OF CATEGORY IIIa LANDING WEATHER MINIMA

DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

Initiated by: AFS-203

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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. AC 120-28A, dated December 14, 1971, is 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. P. SKULLY
Director, Flight Standards Service

Initiated by: AFS-203

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1. DISCUSSION. The criteria initially established by the FAA for Category IIIa operations were based on a conservative approach to reduction of landing minimums below Category II. As a result of considerable experience and further review, it has been determined that in some respects the previous criteria were too stringent. Accordingly, the following amended criteria are issued to identify the airport and ground facilities, airborne systems, training requirements, and maintenance standards which must be met for approval of Category IIIa landing minima. The first principal change included in this revision permits certain aircraft with fail-operational automatic landing systems to operate to Category IIIa minima on ILS facilities which previously were limited to use for Category II approaches in the U. S. The second change permits Category IIIa approaches with a 50-foot decision height for aircraft up to and including the B-727, DC-9, or B-737 size when equipped with a fail-passive automatic landing system. The effect of these changes will be to permit Category IIIa operations at an increased number of facilities.

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.

NOTE: In the U. S., any operations which are conducted with runway visual range between 1200 feet and 700 feet, and with a decision height below 100 feet HAT or no decision height are considered to be Category IIIa operations.

b. Alert Height. A height (100 feet or less above the highest elevation in the touchdown zone), established, based on the characteristics of an aircraft and its particular fail-operational 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 single failure, should not:

(1) Cause significant displacement of the aircraft from its approach path or altitude loss below the nominal glide path.

(2) Upon system disconnection, involve any out of trim condition not easily controlled by the pilot.

(3) Cause any action of the flight control system that is not readily apparent to the pilot, either by control movement or advisory display.

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 systems 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 fails below the alert height, the flare and touchdown may be accomplished using the remaining automatic system.

f. Decision Height.

(1) U. S. Definition. With respect to the operation of aircraft, means the height at which a decision must be made during an ILS or PAR instrument approach to either continue the approach or to execute a missed approach.

(2) ICAO Definition. A specified height at which a missed approach must be initiated if the required visual reference to continue the approach to land has not been established.

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 combination of failures not shown to be extremely improbable. 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.

a. Operations Without a Decision Height. For operations without a decision height, 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. 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 hardover 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 3a(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.

b. Operations with a 50-foot Decision Height.

(1) For operations with a 50-foot decision height, a fail-passive automatic landing system may be used if the system is shown to provide the capability to safely touchdown in the touchdown zone or go around from any point on the approach. When a fail-passive automatic landing system is used, a decision height is specified to ensure that adequate external visual reference is available to verify that the aircraft is in a position which will permit a successful landing in the touchdown zone. If after decision height visual cues are lost or a reduction of visual cues occurs which prevents the pilot from verifying the performance of the automatic landing system, a missed approach will be executed. In the event of a failure of the system on approach either before or after decision height, a missed approach will be executed, unless the pilot determines that adequate visual cues are available to manually complete the landing and that continuation of the landing would be a safe course of action.

NOTE #1 Due to considerations of approach geometry related to "wheel to glide slope antenna height," "wheel to pilots eye height," and such factors as landing gear width, the authorization for the Category IIIa 50-foot decision height based on use of a fail-passive autoland is currently limited to aircraft of the B-727, DC-9, B-737 size or smaller.

NOTE #2 Performance criteria for aircraft with fail-passive systems are outlined in AC 20-57A or AC 20-57 as appropriate to the original approval of the automatic landing system.

NOTE #3 The requirement for a missed approach in the event of an automatic flight control system failure does not preclude continuation of an approach to Category I or Category II minima if the failure relates only to the system elements needed for the Category IIIa minima.

(2) Typical arrangements which could be used to meet the requirements for operating to a 50-foot Category IIIa decision height include the following.

(a) A single monitored fail-passive flight control system with automatic landing.

(b) A fail-operational automatic landing system which has reverted to fail-passive due to the occurrence of a failure during flight, or has been dispatched in a fail-passive configuration.

4. AIRPORTS AND GROUND FACILITIES.

a. U. S. Airports.

(1) An applicant may be authorized to use minima as low as 700 RVR at designated airports which meet criteria described below.

(2) 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:

(a) Ground ILS systems designated for U. S. Category II or Category IIIa approaches.

NOTE: Unless it is shown that automatic landing performance as specified in AC 20-57A can also be met at facilities designated for Category II approaches, Category IIIa operations with no decision height will be restricted to ILS facilities meeting the requirements specified in AC 20-57A, paragraph 5a.

(b) Approach light system which meets U. S. requirements for an ALSF-I or ALSF-II configuration as specified in FAA Order 6850.2.

(c) Standard touchdown zone lights in accordance with AC 150/5340-4C.

(d) Standard centerline lights as specified in AC 150/5340-4C.

(e) Precision instrument runway marking in accordance with AC 150/5340-1D.

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

(g) Arrangements to permit immediate voice communications to the pilot of sudden RVR changes are required, but automatic transmission of RVR data to the pilot is not required.

(h) Standard obstacle clearance requirements in accordance with AC 120-29, Appendix 2.

(i) An established system and/or procedures acceptable to FAA which provides for positive control over aircraft and vehicles on the airport to assure that the active runway is clear and that ILS critical areas are protected as necessary for Category IIIa operations.

b. Foreign Airports. An applicant having U. S. Category IIIa approval may be authorized to use Category IIIa minimums at foreign airports whenever all of the following conditions are met: (1) The airport is approved for Category IIIa operations by the appropriate airport authority, (2) the visual aids are equivalent to those used for U. S. Category IIIa approaches, and (3) electronic ground aids are at least equivalent to those designated for U. S. Category IIIa approaches. The major factors to be considered when approving such operations will be the equivalence with U. S. standards of the approach light systems, high intensity runway lights, in-runway lights, quality and integrity of the electronic approach and landing guidance systems, runway marking, 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 or functions consistent with the intent of the U. S. standards.

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 localizer and glide slope receivers which meet the performance requirements outlined in Appendix 1, paragraphs 7a and 7b.

(2) Two approved radio (radar) altimeter systems which meet the performance requirements outlined in Appendix 1, paragraph 7f.

(3) Redundant flight control systems which meet the requirements of Appendix 1, paragraph 7c.

(4) Missed approach attitude guidance as follows:

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

(b) Fixed or computed pitch command display.

NOTE: An automatic go-around system may be used with either (a) or (b) above.

(5) Autothrottle control system which meets the requirements of Appendix 1 for operations approved without a decision height. For operations with a 50-foot decision height, the need for autothrottle installation is the same as for Category II approval. Performance requirements are listed in Appendix 1 if an autothrottle is required.

(6) Failure detection and warning capability as described in Appendix 1, paragraph 7h.

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 training program must 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, if installed.

3 The flight director system.

4 Instrumentation and display systems.

5 System and aircraft characteristics which determine the alert height, if applicable.

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) Resolution of the decision height if a decision height applies.

(b) Recognition of and reaction to significant failures encountered prior to and after reaching the alert height or decision height as applicable.

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

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

(e) The availability and limitations of visual cues encountered on approach (both before and after decision height, if applicable), including unexpected deterioration of conditions less than 700 RVR encountered during flare and rollout.

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

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

(h) Pilot recognition of acceptable aircraft position and flightpath tracking during approach and flare.

(i) Pilot recognition of and reaction to airborne or ground system faults or abnormalities, particularly after passing alert or decision height.

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

NOTE: The above listed items with the exception of (j) 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 very low altitudes which, for some aircraft, may be after touchdown or result in a touchdown during the go-around maneuver.

(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 starting from a very low altitude which, for some aircraft, may be after touchdown or may result in a touchdown during the go-around maneuver.

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 6b(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 paragraph 6b above and also recurrent requirement of paragraph 6b(4)(b).

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

(a) Pilot-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 paragraph 6b(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 6b(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 flightcrews are to be developed by each air carrier to include, as applicable, at least the following:

a. Approach Monitoring and Control Task Allocation. Crewmember duties during a Category IIIa approach, flare, rollout, or missed approach are to be clearly delineated in the operations manual. Particular emphasis should be placed on aircrew responsibilities when transitioning from nonvisual conditions to visual conditions and procedures to be used in deteriorating visibility or when failures occur.

b. Resolution of the alert height or decision height.

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.

f. Autoland System Periodic Checks. Periodic autoland system checks shall be conducted in accordance with procedures recommended by the airframe or avionics manufacturer, or by an alternate procedure approved by the FAA.

9. APPROVAL OF CATEGORY IIIa WEATHER MINIMA. When an applicant has complied with the appropriate provisions of these criteria, operations specifications authorizing Category IIIa minima with or without a decision height as applicable and automatic landings under visibility conditions of 1000 RVR may be issued. During the period (minimum of 6 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 flightcrews 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 Flight Standards office for evaluation. The form should, as a minimum, include the following information:

(1) Inability to Initiate an Approach. Identify deficiencies related to airborne equipment which preclude initiation of a Category IIIa approach.

(2) Abandoned Approaches. Give the reasons and altitude above runway at which approach was discontinued.

(3) Touchdown Performance. Describe whether or not the aircraft landed within the desired touchdown dispersion area with lateral velocity or crosstrack error which could be corrected by the pilot so as to remain within the lateral confines of the runway without a requirement for unusual skills 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 Factors. ATC factors which result in unsuccessful approaches should be reported. Examples include situations in which a flight is vectored too close in for adequate localizer and glide slope capture, or ATC requests the flight to abandon the approach.

(2) Faulty Ground Station Signals. 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 should be reported.

(3) Other Factors. Any other specific factors affecting the success of Category IIIa operations that are clearly discernible to the flightcrew should be reported.

NOTE: An evaluation of reports discussed in paragraph 9c(1), c(2), c(3) will be made to determine system suitability for further Category IIIa operations.

d. Approval of 700 RVR. When the data from the operational demonstration has been analyzed and found acceptable, the applicant may be authorized to operate to minimums of 700 RVR.

e. Foreign Air Carriers. 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 installations required for Category IIIa operations.

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 fail-safe features. In addition, approval should be based on demonstrated compatibility with ground facilities designated for Category III operations, or U. S. facilities currently designated for Category II until such time as revised approach procedures authorizing Category III at these facilities are published. The guidelines and procedures contained herein are considered acceptable methods of determining transport category airplane airworthiness for use in Category IIIa 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 FAA 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 both normal operations and malfunction simulation, including failure detection and warning. Verification should be made of safety of go-arounds from any point in the approach or landing prior to touchdown. For aircraft in which a go-around from very low altitude results in a touchdown, the safety of such a procedure must be established. Clearly defined go-around procedures should be incorporated in the Airplane Flight Manual for minimum altitude loss.

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 FAA 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± 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 at +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 FAA 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 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 March 14, 1963, "Standard Adjustment Criteria for Airborne Localizer and Glide Slope Receivers."

c. Flight Control System.

(1) For operations conducted without a decision height, a fail-operational flight control system should be used. For operations conducted with a 50-foot decision height, a fail-passive flight control system may be used if the system is shown to provide the capability to safely touchdown within the touchdown zone or go around from any point on the approach.

(2) Automatic flight control systems with automatic landing capability used as part of a Category IIIa installation should in addition to complying with applicable Federal Aviation Regulations and Advisory Circular 20-57A (Automatic Landing Systems), provide the following performance under the test conditions stated.

(a) Airplane Speed. Maximum and minimum design approach speeds.

(b) Localizer Performance.

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

2 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 (two sigma) of the indicated localizer course. The performance should be free of sustained oscillations.

3 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 Advisory Circular 20-57A.

NOTE: The references to Advisory Circular 20-57A in Appendix 1, paragraph 7c, are considered to mean Advisory Circular 20-57 for those aircraft and flight control systems which previously received approval for automatic landing under the provisions of Advisory Circular 20-57.

(3) 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 automatic flight control system should cause the airplane to track the center of the indicated glide slope to within ± 35 microamperes (two sigma) 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 systems for fail-operational Category IIIa approach and landing, 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 should be shown to meet the criteria of Advisory Circular 20-57A.

(3) Mode Selection and Indication.

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

(b) 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 ± 35 microamperes (two sigma) 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 Advisory Circular 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 100 feet altitude, the flight director should cause the airplane to track the center of the indicated glide slope to within ± 35 microamperes or ± 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 Advisory Circular 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 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. 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) 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 flightcrew 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 flightcrew information should:

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

1 Pitch angle $\pm$ 5° about the mean approach attitude.

2 Roll angle zero to $\pm$ 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 1 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) The system should provide to the flightcrew 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 dispersions within criteria of Advisory Circular 20-57A.

NOTE: The above reference to Advisory Circular 20-57A is considered to mean Advisory Circular 20-57 for those aircraft and flight control systems which were previously approved under the provisions of Advisory Circular 20-57.

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

h. Failure Detection and Warning Capability.

(1) Failure detection and warning capability should be provided in accordance with criteria listed in paragraph 7a through g above.

(2) For aircraft which use a fail-passive automatic flight control system, an immediate aural disconnect warning and disconnect warning light shall be provided.

(3) Notwithstanding paragraph 7h(1), for fail-operational systems, failure warning may be inhibited below alert height if:

(a) The failure does not preclude continuation of an automatic approach and landing, and

(b) The failure requires no specific action of the flightcrew.

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

a. Appropriate limitations.

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 by AC 120-28B, Appendix 1."

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

APPENDIX 2. SAMPLE OPERATIONS SPECIFICATIONS FOR AUTHORIZATION TO CONDUCT CATEGORY IIIa OPERATIONS

EXAMPLES:

1. LANDING MINIMUMS. The air carrier is authorized to use the following ILS straight-in landing minimums:

a. B-727 Aircraft.

(1) RVR 1000.

(2) Decision height 50 feet.

b. L-1011 Aircraft.

(1) RVR 700.

(2) Alert height 100 feet.

2. PILOT QUALIFICATIONS. The minima prescribed in paragraph 1 above are authorized only for those pilots in command who have completed the approved Category IIIa training program and who have been certified by a company check pilot or an FAA inspector (for Foreign Flag Air Carriers - certified by the air carrier) as being qualified for Category IIIa operations. No pilot in command shall be authorized to conduct Category IIIa operations in turbojet aircraft unless he has had at least 300 hours as pilot in command in turbojet aircraft, including 100 hours in the Category IIIa type aircraft.

3. REQUIRED AIRBORNE EQUIPMENT. In addition to the flight instruments and radio navigation equipment required by applicable FARs, the following equipment is required and must be used for Category IIIa operations (specify by type aircraft authorized):

a. For the B-727 aircraft, in addition to the flight instruments and radio navigation equipment required for Category II operation:

(1) Automatic approach coupler with fail-passive automatic landing system and dual radio altimeters.

(2) An immediate aural disconnect warning shall be provided in addition to the flashing red light.

b. For the L-1011 aircraft (itemized list).

4. OPERATING LIMITATIONS. An ILS approach shall not be started when either the touchdown or mid-RVR of the landing runway is reported to be less than RVR 1200, unless:

NOTE: Touchdown and rollout RVR's should be used for runways approved with two transmissometers.

a. The airborne equipment required by paragraph 3 of this Appendix is operating satisfactorily.

b. All required elements of the Category IIIa ground system are in normal operation.

c. The crosswind component on the landing runway is 10 knots or less.

d. 1000 feet or 15 percent, whichever is greater, is available over the required field length specified in FAR 121.195(b) (for Foreign Flag Air Carriers - 1000 feet or 15 percent, whichever is greater, is available over the landing field length for a dry runway as specified in the operator's manual).

5. MISSED APPROACH. A missed approach will be initiated:

a. If at or below the decision height (if applicable), the pilot has not established adequate visual reference with the TDZ lights.

b. If the pilot cannot determine that an automatic landing can be safely accomplished within the touchdown zone.

c. When any of the elements of the Category IIIa ground system referred to in paragraph 4b of this operations specification become inoperative.

d. For the L-1011, when a failure occurs prior to the alert height in one of the required redundant systems in the aircraft.

e. For the B-727, when a failure in the automatic landing system occurs prior to touchdown.

NOTE #1 Paragraphs 5d and 5e do not preclude continuation to Category I or Category II minima in instrument conditions if the failure does not affect systems required for those operations.

NOTE #2 Notwithstanding paragraphs 5c through 5e, if the failure occurs in conditions such that the pilot has sufficient visual cues to land the aircraft manually, and if the pilot determines that continuing a landing would be a safe course of action, the pilot may:

1 Following partial failure of a fail-operational system, land automatically using the remaining fail-passive channel or land manually,

2 Following failure of a fail-passive automatic system or ground ILS guidance system component, land manually, or

3 Following failure of a visual aid, land the aircraft either automatically or manually.

For example, for a fail-passive system, if the failure occurs at a height considerably below the decision height such that touchdown is inevitable, and the pilot has adequate visual cues, the pilot may elect to complete the landing rather than initiate a missed approach. As another example, if the failure occurs at a higher altitude, but the actual visibility is much greater than that reported - such that a manual landing is obviously safe - then a missed approach would not be mandatory.

6. AUTHORIZED AIRPORTS. The air carrier is authorized Category IIIa operations at airports and runways approved for Category IIIa operations in FAR Part 97. Category IIIa operations are also authorized for the runways listed at the following foreign and military airports.

NOTE: Until such time as U. S. approach procedures are updated to reflect the approval for Category IIIa operations at runways formerly approved only for Category II, this list may contain runways which have only a Category II approach procedure published. Specific approvals at these locations will be made by the Flight Standards District Office responsible for the applicant's operation. Initial approvals at each facility of this type will be done in conjunction with the FAA headquarters Flight Standards office.

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