U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: CRITERIA FOR APPROVAL OF CATEGORY III LANDING WEATHER MINIMA

Date: 3/9/84
Initiated by: AFO-210

AC No: 120-28C
Change:

1. PURPOSE. This advisory circular (AC) states an acceptable means, but not the only means, for obtaining approval of Category IIIa or Category IIIb landing weather minima and the installation approval of the associated airborne systems.

2. FOCUS. The criteria contained in this AC are applicable to operators using large turbojet aircraft holding Federal Aviation Administration (FAA) operating authority issued under Parts 121, 129, and 135 of the Federal Aviation Regulations (FAR). The FAA approves Category III minima for operators under these parts by amending the applicant's operations specifications.

3. CANCELLATION. AC 120-28B, dated December 1, 1977, is cancelled.

4. RELATED READING MATERIAL. Additional information on Category IIIa/b operations may be found in FAA Order 8400.8, Procedures for the Approval of Facilities for FAR Part 121 and Part 135 Category III Operations, dated September 10, 1980. Copies may be obtained (for a nominal fee) by writing to the:

Federal Aviation Administration
Document Inspection Facility
Public Inquiry Center, APA-420
800 Independence Avenue, S.W.
Washington, D.C. 20591

5. DEFINITIONS.

a. Category IIIa. A precision instrument approach and landing with no decision height (DH), or a DH below 100 feet (30 meters), and controlling runway visual range not less than 700 feet (200 meters).

b. Category IIIb. A precision instrument approach and landing with no DH, or with a DH below 50 feet (15 meters), and controlling runway visual range less than 700 feet (200 meters), but not less than 150 feet (50 meters).

c. Category IIIc. A precision instrument approach and landing with no DH and no runway visual range limitation.

d. Decision Height (DH). 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.

e. Alert Height (AH). A height defined for operational use by pilots (100 feet or less above the highest elevation in the touchdown zone), above which a Category III approach would be discontinued and a missed approach initiated if a failure occurred in one of the required redundant operational systems in the airplane or in the relevant ground equipment. Below this height, the approach, flare, touchdown, and, if applicable, rollout may be safely accomplished following any failure in the airplane or associated Category III systems not shown to be extremely improbable. This height is based on characteristics of an aircraft and its particular fail-operational airborne Category III system.

f. Fail-Operational Category III System. An airborne system which provides redundant operational capability down to touchdown and, if applicable, through rollout. Fail-operational capability may be provided by automatic systems, manually flown systems, or a combination of both. The redundant operational systems must have no common failure modes, and need not be the same. If one of the required Category III systems fails below the AH, the flare, touchdown, and rollout, if applicable, can be accomplished using the remaining operational system or systems. In manually flown systems, the remaining operational system or systems must be available to either pilot without pilot action.

g. Automatic Fail-Operational Category III System. A fail-operational system which provides redundant operational capability using automatic systems. If one of the automatic systems fails below the AH, the flare, touchdown, and rollout, if applicable, can be accomplished using the remaining automatic system(s).

h. 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 glidepath.

(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.

i. Approved Simulator. For the purposes of this AC, approved simulators are those simulators approved by the principal operations inspector for the specific Category III maneuvers required in paragraph 10.

j. Rollout Control System. A system which provides either automatic control or instrument guidance for manual control of lateral steering for rollout until manual control of the aircraft by visual reference is assured.

k. Proof of Concept Testing. "Proof of concept testing" is defined as a generic demonstration in a full operational environment of facilities, weather, crew complement, aircraft systems, environmental systems, and any other relevant parameters necessary to show concept validity in terms of performance, system reliability, repeatability, and typical pilot response to failures as well as to demonstrate that an equivalent level of safety is provided. "Proof of concept" may be established by a combination of analysis, simulation and/or flight demonstrations in an operational environment. In certain cases, operational

"proof of concept" may not be necessary if the validity of the concept was demonstrated during the type certification approval of the Category III airborne systems and the Director of Flight Operations determines, on a case-by-case basis, that "proof of concept" has been established.

6. DISCUSSION. To be acceptable for Category III operations, the automatic landing systems should meet the criteria in AC 20-57A, Automatic Landing Systems (ALS), and Appendix 1 of this AC; the rollout control system, if required, should meet the criteria in Appendix 2 or Appendix 3 of this AC, as appropriate. These systems should also enable Category III operations in accordance with the operational concepts discussed in this AC. The following criteria are issued to identify the airport and ground facilities, airborne systems, training requirements, and maintenance standards which, if met, will provide a basis for approval of Category III landing minima. The first principal change included in this revision permits certain aircraft with a fail-operational automatic landing system and a rollout control system to operate to Category IIIb weather minima on certain instrument landing system (ILS) facilities which previously were limited to use for Category IIIa approaches in the United States. The second change clarifies the systems' requirements and visual references necessary for various Category III operations. The effect of the changes will be to provide suitable credit for modern flight control and other aircraft systems and permit additional Category III approaches at U.S. and international facilities where such approaches may be safely conducted.

7. OPERATIONAL CONCEPTS. The weather conditions encountered in Category III operations range from an area where visual references are adequate for manual rollout in Category IIIa, to an area where visual references are inadequate even for taxi operations in Category IIIc. To maintain a high level of safety during approach and landing operations in very low visibilities, the airborne system and ground support system requirements established for Category III operations should be compatible with the limited visual references that are available.

The primary mode of Category III operations is automatic-to-touchdown using automatic landing systems which do not require pilot intervention. However, pilot intervention should be anticipated in the unlikely event that the pilot detects or strongly suspects inadequate aircraft performance as well as when he determines that an automatic touchdown cannot be safely accomplished within the touchdown zone.

To be approved for Category III operations, the airplane and its associated systems should be shown to provide sufficient information to the flightcrew to permit the safe completion of the approach, touchdown, and rollout or the safe completion of a go-around from any altitude to touchdown, following any failure conditions not shown to be extremely improbable. Additionally, the design of the cockpit instrumentation, system comparators, and warning systems should be adequate in combination to assure that the pilot can verify that the aircraft will safely touchdown within the touchdown zone and safely rollout if the controlling runway visual range (RVR) is reported at or above minima.

Although the primary mode is automatic-to-touchdown, these operational concepts do not preclude the use of systems to conduct Category III operations with the pilot-in-the-active-control-loop if "proof of concept testing" demonstrates that these systems provide an equivalent level of safety.

a. Safety of Go-Around From Any Point in the Approach. An aircraft approved for Category III operations should be capable of safely executing a go-around from any point in an approach prior to touchdown with the aircraft in a normal configuration. This is appropriate to provide for go-arounds due to air traffic control (ATC) contingencies, rejected landings, loss of visual reference, or missed approaches due to other reasons. The evaluation of this capability is based on normal Category III operations at the lowest controlling RVR authorized and should account for factors related to geometric limitations during the transition to go-around, the limited visual cues that are available, autopilot mode switching, and other pertinent factors. For aircraft in which a go-around from a very low altitude may result in an inadvertent touchdown, the safety of such a procedure should be established considering relevant factors such as operation of autospoilers, automatic braking systems, autopilot mode switching, autothrottles, and other pertinent systems associated with a low altitude go-around.

If the occurrence of any failure condition in the airplane or its associated systems, including critical engine failure, could preclude the flightcrew from executing a safe go-around from low altitude, Category III operations may be conducted with these airplanes only if the total airborne system has the capability to permit an approach, touchdown, and rollout to be safely continued and completed following any failure conditions not shown to be extremely improbable. Additionally, in the event of such a failure after passing 100 feet above ground level (AGL), the cockpit cues or indications should not cause the flightcrew to attempt a go-around.

If an automatic go-around capability is provided, it should be demonstrated that a go-around can be safely initiated and completed from any altitude to touchdown. If the automatic go-around mode can be engaged at or after touchdown, it should be shown to be nonhazardous. The ability to initiate an automatic go-around at or after touchdown is not required.

Information should be provided to the crew regarding appropriate procedures for go-around and expected altitude loss during a properly executed automatic or manual go-around. Expected height loss should be provided to the crew as a function of go-around initiation altitude for the region below 100 feet AGL. In the event that an aircraft has been demonstrated to be capable of Category III operations with an engine inoperative, height loss information should also be provided for the engine-out case.

b. Fail-Passive Category III Operations. Fail-passive Category III operations are conducted with a 50-foot DH and are limited to Category IIIa. Since a fail-passive Category III system does not necessarily provide sufficient redundancy to successfully continue the approach and landing to touchdown following any failure in the flight control system not shown to be extremely improbable, a DH of 50 feet is specified. A DH is established to ensure that, prior to passing 50 feet, the pilot determines that adequate visual reference is available to verify that the aircraft is in a position which will permit a successful landing in the touchdown zone. If this visual reference is not established prior to passing DH, a go-around will be executed. A missed approach will also be initiated if, after passing DH, visual cues are lost or a reduction in visual cues occurs which prevent the pilot from continuing to verify that the

aircraft is in a position which will permit a successful landing in the touchdown zone. In the event of a failure of the system at any point in the approach to touchdown, a missed approach will normally be required.

If the need to initiate a go-around below 100 feet AGL due to airplane failure conditions has been shown to be improbable, a fail-passive automatic landing system may be used for Category IIIa if the system is shown to provide the capability to safely touchdown in the touchdown zone or to safely complete a go-around from any altitude to touchdown following any failure conditions not shown to be extremely improbable.

Due to considerations of approach geometry related to factors such as "wheel to glide slope antenna height," "wheel to pilots eye height," and cockpit visibility, authorization for fail-passive Category IIIa operations may not be appropriate for all sizes or types of aircraft. Applicability of Category III to such fail-passive systems is limited to those aircraft for which the concept can be shown to apply by "proof of concept testing."

Typical arrangements which could be used to meet the requirements for operating to a 50-foot Category IIIa DH include the following:

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

(2) 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.

(3) A monitored fail-passive head up display (HUD) or head down display (HDD) designed for a pilot-in-the-active-control-loop flight guidance system with instrument displays suitable for monitoring, by the pilot-not-flying, of the overall performance of the Category III system and the performance of the pilot flying.

c. Fail-Operational Category III Operations. Fail-operational Category III operations are conducted with fail-operational flight control systems for use to touchdown in Category IIIa, and through rollout to safe taxi speeds in the lower limits of Category IIIb. The required redundancy may be provided by multiple automatic landing and rollout systems, by an approved manual backup capability to the primary automatic system, or by multiple advanced/sophisticated pilot-in-the-active-control-loop systems. If credit is taken for manual capability, it should be suitable for landing to touchdown by reference to instruments alone for Category IIIa or for landing and rollout by reference to instruments alone for Category IIIb.

The reliability and performance of the required redundant operational systems should be such that continued safe operation to landing in Category IIIa or landing and rollout in Category IIIb can be achieved following any failure conditions, not shown to be extremely improbable, which could occur below 100 feet AGL.

An AH should be specified in all fail-operational Category III operations and operations with fail-operational Category III systems are normally conducted in accordance with the AH concept. This is consistent with the system design philosophy which requires the airborne system to be capable of successfully completing a touchdown and, if applicable, a rollout following a failure which occurs after passing 100 feet AGL. As specified in Appendix 1, it must be shown that an unsafe landing is extremely improbable based on various exposure times which are established for different types of operations. These exposure times are based on the time necessary to complete various phases of the approach, landing, and rollout beginning from a point at least 100 feet AGL.

In the event that an aircraft design provides for inhibiting certain noncritical warning system functions after passing this point, such inhibiting features should not occur at height above 500 feet AGL. Conversely, even though certain alerts or warnings are inhibited, such a feature does not preclude an aircraft operator from setting an AH at a value lower than the height at which they are inhibited because touchdown would occur within the prescribed touchdown area even though a noncritical system failure occurs below this height and the warning is inhibited.

If a DH is used by an airline for fail-operational Category III, it should be compatible with the flight control and display systems installed in the airplane and with the AH to be used operationally. A DH limitation is only applied to fail-operational systems in special cases: where a unique design feature in the airborne system or ground support system requires a DH limitation, or where a foreign country requires the use of a DH to conduct operations in that particular country. Additionally, an airline may apply a DH limitation to fail-operational systems even though the use of a DH is not specifically required by these special cases.

The following are typical arrangements by which the requirement for fail-operational systems may be met:

(1) Two or more monitored autopilots or integrated autopilot/flight director systems each with dual channels making up an automatic, fail-operational system designed so that at least one system remains operative after a failure.

(2) Three autopilots or integrated autopilot/flight director systems designed so that at least two remain operative after a failure to permit comparison and provide necessary hardover protection.

(3) A monitored fail-passive automatic flight control system with automatic landing capability to touchdown and rollout, if applicable, plus an independent and adequately failure-protected flight guidance system with dual displays.

(4) If "proof of concept" has been acceptably demonstrated for manually flown systems, two or more independent and adequately failure-protected pilot-in-the-active-control-loop flight guidance systems with independent displays may be used.

For the flight guidance systems described in subparagraphs c(3) and c(4), the displays should include flare or flare and rollout commands, as applicable, displayed to each pilot. The raw data and flight guidance command displays, HDD or HUD, must provide sufficient guidance so that a pilot of average skill can demonstrate a touchdown dispersion which meets the criteria of AC 20-57A and, if applicable, the rollout control system criteria of Appendix 2 or Appendix 3 of this AC, as applicable. This demonstration is required over any portion of the approach and landing for which manual control or manual takeover is considered a part of the Category III system.

d. Category III Operations Conducted with an Alert Height. The AH is specified by an operator of an aircraft and approved by the FAA. This height must be compatible with aircraft system configuration, training, ground facilities, and other factors pertinent to the air carrier's operation. Although AH will be less than or equal to 100 feet AGL, it should generally be set at 100 feet AGL. By setting the AH at 100 feet AGL the aircraft may continue, in the event that a failure occurs in an element of the Category III system prior to beginning the final approach segment, to Category I or Category II minima as appropriate to the weather conditions and the equipment which remains operational on the aircraft. This is desirable to permit and encourage the use of Category III approaches and procedures by allowing continuation of an approach to Category I or Category II minima, as appropriate, without the need to reinitiate an approach.

Additionally, for those aircraft equipped with Category III systems which have the capability to continue Category IIIa operations in the fail-passive configuration following a failure which precludes a fail-operational approach and landing, the approach may be continued, to the 50-foot DH, using the operative fail-passive system if the controlling RVR is reported at or above Category IIIa minima and the landing may be completed if the necessary visual references are established prior to passing the DH.

e. Category IIIa Operational Concepts. Category IIIa operations can be conducted with either fail-operational or fail-passive automatic landing systems with minima no lower than 700 RVR (200 meters). If the system's reliability is such that the need for a go-around below 100 feet AGL due to airplane failure conditions is shown to be improbable, Category IIIa operations may be conducted with systems which permit either the safe completion of the landing or the safe completion of the go-around following any failure condition not shown to be extremely improbable.

As discussed in paragraph 7b, fail-passive Category IIIa operations are conducted with a 50-foot DH. The DH is established to ensure that, prior to passing 50 feet, the pilot determines that adequate visual reference is available to verify that the aircraft is in a position which will permit a successful landing in the touchdown zone.

For Category IIIa fail-operational approach and landing (as discussed in paragraph 7c) without a rollout control system, visual reference with the touchdown zone is required and should be verified prior to the minimum height specified by the operator for that particular aircraft type. These visual cues combined with controlling transmissometer RVR reports of visibility at or above minima are necessary to verify that the initial landing rollout can be accomplished visually.

Lacking visual reference prior to the specified minimum height or in the event of receiving a report of controlling RVR below minima prior to this height, a go-around should be accomplished.

For Category IIIa fail-operational approach and landing (as discussed in paragraph 7c) with a rollout control system, the availability of visual reference is not a specific requirement for continuation of an approach to touchdown. The design of the cockpit instrumentation, system comparators, and warning systems should be adequate in combination to assure that the pilot can verify that the aircraft will safely touchdown within the touchdown zone and safely rollout if the controlling RVR is reported at or above approved minima.

f. Category IIIb Operational Concepts. Category IIIb operations are conducted with fail-operational landing systems which include a rollout control system for lateral steering control for rollout until manual control of the aircraft by visual reference is assured. These operations are conducted with systems which, after passing 100 feet AGL, permit the safe completion of the approach, touchdown, and rollout following any failure conditions not shown to be extremely improbable. The rollout control system should meet the criteria in Appendix 2 or Appendix 3, as appropriate.

For Category IIIb operations, the availability of visual reference is not a specific requirement for continuation of an approach to touchdown. The design of the cockpit instrumentation, system comparators, and warning systems should be adequate in combination to assure that the pilot can verify that the aircraft will safely touchdown within the touchdown zone and safely rollout if the controlling RVR is reported at or above minima.

To be approved for Category IIIb operations with fail-passive rollout control systems, it should be demonstrated under the most critical conditions expected in service that the airplane and its associated systems provide sufficient capability for the pilot to control the airplane so as to remain on the runway and stop within the runway length available following any airplane failure conditions not shown to be extremely improbable.

To be approved for Category IIIb operations with fail-operational rollout control systems, aircraft system failures not shown to be extremely improbable (after touchdown and until the point where the pilot's ability to manually control the aircraft by visual reference is assured) should not preclude the ability of the rollout control system to control the airplane so as to remain on the runway or present cues or indications to the pilot that would cause him/her to attempt a manual rollout using visual references. These capabilities should be demonstrated under the most critical condition expected in service.

Category IIIb operations may be conducted to minima as low as 300 RVR (100 meters) with fail-operational Category IIIb landing systems which incorporate a rollout control system which meets the criteria of Appendix 2.

Category IIIb operations may be conducted to minima as low as 150 RVR (50 meters) with fail-operational Category IIIb landing systems which incorporate a rollout control system which meets the criteria of Appendix 3.

If "proof of concept" has been acceptably demonstrated, Category IIIb operations may be conducted to minima as low as 600 RVR (175 meters) with fail-operational Category IIIb landing systems which incorporate rollout control systems deemed to be "non-hazardous" which comply with the tracking performance requirements of Appendix 2 or Appendix 3.

g. Runway Field Length Requirements. As in other operations, the runway field length requirements for Category III operations are based on the provisions of Section 121.195(b) of the FAR. If an automatic braking system is used and the airplane flight manual contains landing performance data, based on this system, for runways which are clear and dry as well as grooved or porous friction coarse (PFC) runways which are clear but not dry, the required field length can be based on this data.

However, to ensure that a high level of safety is maintained if other deceleration means are used, the runway available for landing in Category III conditions should be the distance obtained by multiplying the required field length specified in Section 121.195(b) by the following factors:

(1) Category IIIa. The factor to be applied to determine the required field length is 1.15.

(2) Category IIIb.

(i) Minima: 600 RVR (175 meters). The factor to be applied to determine the required field length is 1.15.

(ii) Minima: 300 RVR (100 meters).

(A) For grooved or PFC runways reported clear and dry as well as clear and not dry, the factor to be applied to determine the required field length is 1.3. However, this factor may be reduced to 1.15 if antiskid and reverse thrust systems are both installed and these systems are fully operational.

(B) Operations are not appropriate on ungrooved/non-porous friction coarse runways.

(iii) Minima: 150 RVR (50 meters).

(A) For grooved or PFC runways reported clear and dry as well as clear but not dry, the factor to be applied to determine the required field length is 1.3. Factors as low as 1.15 may be authorized in the future if operational experience indicates that the runway surface treatments (i.e., grooving, PFC) and runway maintenance practices (i.e., friction measurement and cleaning) are compatible with these lower factors. To use factors as low as 1.15, antiskid and reverse thrust systems should be installed and should be fully operational.

(B) Operations are not appropriate on ungrooved/non-porous friction coarse runways.

(C) A procedural means is not appropriate to meet the provisions for deceleration in paragraph 9c.

8. AIRPORTS AND GROUND FACILITIES.

a. U.S. Airports.

(1) An applicant may be authorized to use minima as low as 700 RVR (200 meters) for Category IIIa or 300 RVR (100 meters) for Category IIIb at designated airports which meet the criteria described in subparagraph a(2). Category IIIb minima as low as 150 RVR (50 meters) may be authorized in the future if operational experience indicates that the airborne and ground support equipment are compatible with the lower minima. Due to limitations of transmissometers and lighting systems, however, the interim limits for U.S. Category IIIb operations are 600 RVR (175 meters) on U.S. facilities until suitable facility upgrading is completed. Additionally, unless the runways are grooved or have PFC surfaces, Category III operations are limited to minima no lower than 600 RVR (175 meters).

(2) The ground-based system will have failure-survival capabilities such that total loss of localizer and/or glidepath guidance when the airplane is below 100 feet AGL will be extremely improbable. However, transient loss of guidance which occurs during the detection of a ground system failure and reversion to the backup transmitter is probable. Therefore, the airborne equipment should be able to accommodate these transient conditions. Precautions will 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:

(i) For Category IIIa minima - ILS systems of U.S. Type II or Type III (or foreign equivalent). However, for Category IIIa operations, aircraft which have not been shown to have satisfactory autoland performance using U.S. Type II facilities will be restricted for Category IIIa to runways having U.S. Type III facilities.

(ii) For Category IIIb minima - U.S. Type II, Type III, or foreign equivalent facilities may be used to 600 RVR (175 meters). However, until suitable facility upgrading is completed, only U.S. Type III or equivalent foreign facilities may be used for operations below 600 RVR (175 meters).

(iii) An approach light system which meets U.S. requirements for an ALSF-I or ALSF-II configuration or International Civil Aviation Organization (ICAO) equivalent in foreign countries. However, Category III approaches and landings may be continued if sequence flashers are inoperative.

(iv) Standard touchdown zone lights in accordance with AC 150/5340-4C, Installation Details for Runway Centerline and Touchdown Zone Lighting Systems, or ICAO equivalent in foreign countries.

(v) Standard centerline lights as specified in AC 150/5340-4C, or ICAO equivalent in foreign countries.

(vi) Precision instrument runway marking in accordance with AC 150/5340-1E, Marking of Paved Areas on Airports, or ICAO equivalent in foreign countries.

(vii) For Category IIIa, 3 RVR transmissometers are required, unless it can be shown that 2 RVR transmissometers can meet the operational needs for a particular runway. For Category IIIb, 3 transmissometers are required and they should read in 100-foot (25 meter) increments or less for landing minima below 600 RVR (175 meters).

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

(ix) Obstacle clearance and ILS critical area protection requirements for precision approaches will be provided in accordance with TERPS Chapter 9, and Order 7110.65C, Air Traffic Control, paragraph 974. This includes use of appropriate signs, markings, stop bars, lights, or other means to provide protection from inadvertent intrusion of aircraft or ground vehicles on runways, taxiways, or obstacle-free areas and to provide protection of ILS signals in reduced visibility conditions.

(x) An established system and/or procedure 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 obstacle free zones and ILS critical areas are protected as necessary for low visibility operations.

(xi) Prior to approval of Category III minima for a particular aircraft type on any facility not formerly approved for Category III use for that type of aircraft, acceptable autoland, or autoland and rollout performance if applicable, should be verified. This verification may be made by airline and/or FAA observation of automatic landings during line operations or training flights in weather conditions at or above Category II minima to determine adequacy of the facility for that type aircraft. In certain special cases, as designated by the FAA, where U.S. Type II facilities are used at locations where the characteristics of the prethreshold terrain may induce abnormal performance in certain automatic flight control systems, additional analysis or flight demonstrations in line service may be required for each aircraft type prior to approval of Category III minima.

b. Foreign Airports. An applicant having U.S. Category III approval may be authorized to use Category III minima at foreign airports on the FAA-approved list. Airports are approved and listed when the following conditions are met:

(1) The airport is approved for Category III operations by the appropriate foreign airport authority.

(2) The visual aids are equivalent to those used for U.S. Category III approaches.

(3) Electronic ground aids are at least equivalent to those designated for U.S. Category III approaches.

(4) The FAA office having responsibility for the area in which the foreign facility is located has reviewed and verified the conditions in subparagraphs b(1), b(2), and b(3).

The major factors to be considered when approving such airports 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 any foreign facilities used for Category III provide the necessary information or functions consistent with the intent of the U.S. standards. Carriers desiring Category III approvals at foreign airports or runways not on the FAA-approved list should submit such requests through their FAA principal operations inspector to the Air Transportation Division, AFO-200, FAA Headquarters, Washington, D.C.

9. AIRBORNE SYSTEMS.

a. Equipment for Category IIIa. The following equipment, in addition to the instrument and radio equipment required by the FAR, is the minimum airborne equipment considered necessary:

(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 7e.

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

(4) Missed approach guidance appropriate for Category III operations as follows:

(i) Attitude gyro (or equivalent) indicators with calibrated pitch attitude markings or preestablished computed pitch command display, or

(ii) Approved flightpath angle display.

NOTE: An automatic go-around system may be used with either of the above.

(5) Autothrottle control system which meets the requirements of Appendix 1 for operations approved without a DH. For operations with a 50-foot DH, autothrottles are required unless it has been demonstrated by "proof of concept testing" that operations can be safely conducted without their use. Performance requirements are listed in Appendix 1 if an autothrottle system is required.

(6) Failure detection and warning capability as described in Appendix 1, paragraphs 7c and 7g.

b. Equipment for Category IIIb. Additional equipment, over and above that specified in paragraphs 7c and 9a, is required for Category IIIb operations.

(1) All Category IIIb operations are conducted with an automatic or manual rollout control system. The accuracy and reliability of the rollout control system when considered in combination with the available visual cues and the characteristics of the ground support system will determine the lowest minima authorized for a particular operation. Additional criteria for approval of rollout control systems are contained in Appendix 2 and Appendix 3.

(2) Fail-passive rollout control systems which meet the criteria of Appendix 2 are necessary to conduct operations below 600 RVR (175 meters).

(3) Fail-operational rollout control systems which meet the criteria contained in Appendix 3 are necessary to conduct operations below 300 RVR (100 meters).

(4) Unless a fail-operational rollout control system is used, operations are not appropriate on runways with the runway centerline lights obscured by precipitation (i.e., snow or ice).

(5) An instrument, annunciator, or crew procedures to reliably detect and alert the pilot to abnormal lateral or vertical deviations during an approach or flare or an extended flare beyond the touchdown zone, or excessive lateral deviations during rollout.

c. Deceleration System(s)/Procedures for Category IIIb. A means to determine that a landing can be reliably completed within the available length of the runway is necessary to conduct Category IIIb operations (see Appendix 4). This means will be demonstrated to the FAA and, if acceptable, may be used to satisfy this requirement. At least one of the following means to assess stopping performance should be used:

(1) A "runway-remaining" indicator display showing length of remaining runway after touchdown.

(2) A deceleration display which can advise the pilot of the adequacy of aircraft deceleration to stop within the confines of the available runway.

(3) A groundspeed indicating system (i.e., inertial).

(4) An automatic braking system.

(5) A procedural means to assure a safe stop (not appropriate for minima less than 300 RVR (100 meters).

d. Airborne System Evaluation and Approval. Category IIIa or Category IIIb airborne systems may be evaluated in accordance with the applicable airworthiness criteria contained in Appendices 1 and 2 or Appendix 3 during type certification, or they may be evaluated in conjunction with an FAA-approved program with an air carrier for aircraft in service with approved automatic landing systems.

10. PILOT TRAINING AND PROFICIENCY PROGRAM.

a. Category III Ground Training (All Aircraft). The applicant's training program should provide training for the pilot in command and second in command in the following subjects:

(1) Ground Facilities.

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

(A) The instrument landing system and critical area protection.

(B) The visual approach aids; i.e., approach lights, touchdown zone and centerline lighting, signs, and markings.

(C) Transmissometer systems.

(D) Facility status, NOTAMS, or outage reports pertinent to use of Category III minima.

(2) The Airborne Category III System.

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

(A) The automatic landing system.

(B) Automatic throttle system, if installed.

(C) The flight director system, if installed.

(D) Instrumentation and display systems.

(E) System and aircraft characteristics which determine the AH or DH, as applicable.

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

(G) Description of the limits to which acceptable system performance has been demonstrated for wind and wind shear.

(3) Other.

(i) Review of operations specifications applicable to Category III operations.

(ii) Policies and procedures concerning the conduct of Category III operations on icy or snow-covered runways, as well as those runways with braking action reported less than good.

(iii) Pilot reporting of ILS anomalies, approach lights, runway lights, touchdown zone, or centerline light outages, or other discrepancies which may be pertinent to subsequent Category III approaches.

b. Flight Training Program.

(1) The following items are to be covered on both initial training and at least annually during recurrent training/proficiency checks for both pilot in command and second in command:

(i) Determination of the DH, if a DH applies, including use of radar altimeter.

(ii) Recognition of and proper reaction to significant failures encountered prior to and after reaching the AH or DH as applicable.

(iii) Missed approach technique and expected height loss as it relates to manual or automatic go-around and initiation altitude.

(iv) Runway visual range - its use and limitations, including the determination of controlling RVR and required transmissometers.

(v) The availability and limitations of visual cues encountered on approach both before and after DH, if applicable. This includes procedures for unexpected deterioration of conditions to less than minimum RVR encountered during approach, flare and rollout, demonstration of expected visual references with weather at minimum conditions, and the expected sequence of visual cues during an approach in which visibility is at or above landing minima.

(vi) The effects of vertical and horizontal wind shear (not required for recurrent training/proficiency checks).

(vii) Procedures for transitioning from nonvisual to visual flight.

(viii) Pilot recognition of the limits of acceptable aircraft position and flightpath tracking during approach, flare, and, if applicable, rollout.

(ix) Pilot recognition of and reaction to airborne or ground system faults or abnormalities, particularly after passing AH or DH.

Subparagraphs b(1)(i) through (ix) should be incorporated into the training program in sufficient detail to show how each item will be accomplished during initial and recurrent training. For instance, it could be stated that subparagraph b(1)(viii) will be accomplished by freezing the simulator at or below 50 feet with varying visibilities, wind components, runway lighting configurations, and offsets from centerline to demonstrate conditions that may be encountered on the line. The above listed items should be accomplished in an approved simulator unless the applicant can show that equivalent training is provided by the use of other training aids and/or devices.

(2) Initial Category III Flight Training Requirements For a Pilot in Command.

(i) Each pilot in command initially should receive training in flight or in an approved simulator in conducting automatic landings (manual landings, if appropriate) and missed approaches from very low altitudes which, for some aircraft, may result in an inadvertent touchdown during the go-around maneuver. If a simulator is used, the automatic flight control system, instruments, and annunciator system should be able to realistically represent the Category III airborne system performance and failure modes. Also, if training is done in an approved simulator, at least two actual automatic landings should be conducted in the aircraft prior to conducting Category III approaches with weather conditions below Category II minima. This can be accomplished during normal line operations.

(ii) Each pilot in command should satisfactorily demonstrate to either a company check pilot or an FAA inspector the following requirements in an approved simulator or in flight with a suitable view limiting device (e.g., variable density see-through training hood) in an aircraft configured with the appropriate Category III 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 may result in a touchdown during the go-around maneuver.

(D) For those Category IIIb operations predicated on the use of a fail-passive rollout control system, a manual rollout using visual reference or a combination of visual and instrument references. This maneuver should be initiated by a fail-passive disconnect of the rollout control system, after main gear touchdown and prior to nose gear touchdown, in conditions representative of the most adverse lateral touchdown displacement and weather conditions anticipated in normal Category IIIb operations with a fail-passive rollout control system.

(3) Second In Command Initial Flight Training Requirements. The flight training requirements for a second in command will depend on his/her assigned role during Category III approaches. Each second in command should satisfactorily demonstrate, to a company check pilot or an FAA inspector, his/her ability to perform his/her assigned duties. If a second in command is not expressly prohibited by his/her company from performing the duties of the pilot in command while under the supervision of the pilot in command during Category III approaches, he/she is to satisfactorily accomplish the additional requirements of subparagraph b(2).

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

(i) Pilot In Command. At least annually, the pilot in command is to satisfactorily demonstrate to a company check pilot or an FAA inspector the following requirements in an approved simulator or in flight with a view limiting

device (e.g., variable density see-through training hood) suitable for Category III in an aircraft configured with the appropriate Category III systems 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 result in an inadvertent touchdown during the go-around maneuver.

(D) For those Category IIIb operations predicated on the use of a fail-passive rollout control system, a manual rollout using visual reference or a combination of visual and instrument references. This maneuver should be initiated by a fail-passive disconnect of the rollout control system, after main gear touchdown and prior to nose gear touchdown, in condition representative of the most adverse lateral touchdown displacement and weather conditions anticipated in normal Category IIIb operations with a fail-passive rollout control system.

However, if one of the required redundant operational systems is a manual system based on instrument displays, the pilot will be required at least annually to demonstrate proficiency, in flight or in an approved simulator, in the use of such a 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.

(ii) Second In Command. The proficiency requirements for a second in command will depend on his/her assigned role during Category III approaches. During each required proficiency check, the second in command is to satisfactorily demonstrate to a company check pilot or an FAA inspector his/her ability to perform his/her assigned duties. If a second in command is not expressly prohibited from performing the duties of pilot in command during Category III approaches, he/she is to satisfactorily complete the additional requirements of paragraph 10(b)(4)(i).

(iii) 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 III system on the interchange aircraft. The amount of training required will depend on the differences in the flight control and display systems, and cockpit configuration.

(iv) Ground and Flight Training - Foreign Category III Airports. If the operator has authorization for Category III operations at an airport in a foreign country which imposes procedures or limitations different from those in the United States, both the pilot in command and the second in command should receive sufficient ground and/or flight training to ensure familiarity and competence with these different conditions and requirements.

(v) Category IIIa/b Evaluation on Line Checks. Operators should give consideration to requiring an approach utilizing Category III equipment and

procedures appropriate to crew qualification and aircraft capability whenever Category IIIa/b aircraft are utilized for line evaluations.

11. OPERATIONS MANUAL AND PROCEDURES. Procedures, instructions, and information to be used by flightcrews are to be developed by each air carrier to include, as applicable, at least the following:

a. Crewmember Duties. Crewmember duties during a Category III approach, flare, rollout, or missed approach are to be described in the operations manual. These duties should at least contain a description of the responsibilities and tasks of the pilot flying the aircraft and the pilot not flying the aircraft during all stages of the approach, landing, and missed approach. The duties of the third crewmember, if required, should also be explicitly defined.

b. Training Information. Suitable information and company policies on subjects specified in paragraph 10 should be provided in the operator's manual or available to crews in an equivalent form for reference use.

12. 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 established by the manufacturer or the FAA. Applicants having existing FAA-approved maintenance/reliability programs for Category II equipment may extend their program to include Category III equipment. The following are minimum requirements:

a. 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 III airborne systems and equipment. 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 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 III operation are to be submitted to the FAA for determination of adequacy. Emphasis will be placed on standards associated with ILS receivers, flight directors, automatic flight control systems, autothrottles, altimeter systems, hydraulic or electrical systems applicable, and maintenance techniques and procedures of associated redundant systems.

c. Maintenance Procedures. Any changes to maintenance procedures, practices, or limitations established in the qualification for Category III operations are to be submitted to the FAA for acceptance before such changes are adopted.

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

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

be established to show when and where the autoland system was used and if performance was satisfactory. Use of the automatic landing system should be encouraged to assist in maintaining its availability and reliability.

13. APPROVAL OF CATEGORY III WEATHER MINIMA. Prior to approval of Category III weather minima, the applicant should submit documentation to the FAA Air Carrier District Office (ACDO) or Flight Standards District Office (FSDO) responsible for its operating certificate which demonstrates compliance with the appropriate provisions of these criteria in paragraphs 7 through 12. This documentation will be evaluated by the ACDO/FSDO and forwarded, with the recommended actions, to the Air Transportation Division, AFO-200, FAA Headquarters, Washington, D.C., for review and concurrence prior to approval of Category III minima. When an applicant has satisfactorily shown compliance with the appropriate provisions of these criteria, operations specifications authorizing Category IIIa or Category IIIb minima with or without a DH, as applicable, may be issued (see Appendix 5). During the period (minimum of 6 months) following the issuance of these specifications, the operator will successfully complete the following operations demonstrations and data collection program in line service as part of the approval process to ensure continued performance and reliability of the system before operations down to the next succeeding lower minima are authorized. In unique situations involving newly manufactured airplanes where the air carrier's Category III maintenance program is approved for the proposed operation, this operations demonstration and data collection program may be initiated prior to the issuance of Category III operations specifications provided approval on a case-by-case basis is obtained from the Office of Flight Operations.

a. Airborne Systems Operational Demonstration. One-hundred (100) successful landings are to be accomplished in line operations, including training flights, using the Category IIIa or Category IIIb system installed in each aircraft type. If failures occur during the program, a determination will be made of the need for additional demonstration landings. The system should demonstrate reliability and performance in line operations consistent with the operational concepts specified in paragraph 7. In unique situations where the completion of 100 successful landings could take an unreasonably long period of time due to factors such as a small number of aircraft in the fleet, where ATC considerations significantly restrict the number of opportunities to utilize Type II/III ILS facilities, or to obtain ILS critical area protection during good weather conditions, reductions in the required number of landings will be considered on a case-by-case basis and requires approval from the Office of Flight Operations.

(1) The demonstration should be accomplished on U.S. Type II or Type III ILS facilities. However, at the operator's option, demonstrations may be made on other ILS facilities if sufficient data is recorded to determine the cause of unsatisfactory performance. However, no more than 50 percent of the demonstrations may be made on such facilities.

(2) If an operator has different models of the same type of aircraft utilizing the same basic flight control and display systems, or different basic flight control and display systems on the same type of aircraft, the operator should show that the various models comply with the basic system performance criteria, but the operator need not conduct a full operational demonstration for each model.

b. Data Collection During Airborne System Demonstration. Each applicant is to develop a form to be 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 III system, regardless of whether the approach is abandoned or concluded successfully. The completed forms and a summary of the demonstration results will be made available to the assigned FAA ACDO or FSDO 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 III approach.

(2) Abandoned Approaches. Give the reasons and altitude above the runway at which approach was discontinued or the automatic landing system was disengaged.

(3) Touchdown or Touchdown and Rollout 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 or automatic system so as to remain within the lateral confines of the runway without a requirement for unusual skills or techniques. The approximate lateral and longitudinal position of the actual touchdown point in relation to the runway centerline and the runway threshold, respectively, should be indicated in the report. This report should also include any Category III system abnormalities which required manual intervention by the pilot to ensure a safe touchdown or touchdown and rollout, as appropriate.

c. Data Analysis. Approaches on Type II or Type III ILS facilities where the pilot was assured that critical area protection was provided which do not result in a successful automatic 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, lack of protection of ILS critical areas, or ATC requests the flight abandon the approach.

(2) Faulty Ground Station Signals. ILS beam irregularities, such as those 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 effecting the success of Category III operations that are clearly discernible to the flightcrew should be reported. An evaluation of reports discussed in subparagraphs b(1), b(2), and b(3) will be made to determine system suitability for further Category III operations.

d. Approval of RVR Minima. When the data from the operational demonstration has been analyzed and found acceptable, an applicant for Category IIIa initially authorized 1,000 RVR (300 meters) may be authorized to operate to minima of 700 RVR (200 meters). If the Category III rollout control system has been shown to meet the appropriate provisions of Appendix 2 or Appendix 3, an applicant for Category IIIb initially authorized 600 RVR (175 meters) may be authorized 300 RVR (100 meters) at airports having suitable ground facilities. Additional approvals

for operations below 300 RVR (100 meters) may be authorized in the future if the airplane is suitably equipped and operational experience indicates that the airborne and ground support equipment are compatible with the lower minima.

e. Foreign Air Carriers. Operations specifications may be amended to authorize Category III landing minima provided the air carrier:

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

(2) Certifies that its Category IIIa or Category IIIb program is equivalent to that required by this AC for U.S. air carriers.

Foreign carriers having at least 6 months experience with Category IIIa or Category IIIb with the specific type of aircraft and at least 6 months satisfactory experience at an appropriate U.S. facility in conducting automatic landings may be authorized the respective Category IIIa minima as low as 700 RVR (200 meters) or Category IIIb minima as low as 300 RVR (100 meters). Foreign carriers not having the Category III or U.S. facility experience should complete the 6-month demonstration program with intermediate minima of 1,000 RVR (300 meters) for Category IIIa or 600 RVR (175 meters) for Category IIIb, but these carriers need not submit the documentation specified in this AC if the State of the Operator confirms to the FAA the authorization for the carrier to use Category III minima at U.S. facilities. However, until suitable facility upgrading is completed, foreign carriers desiring approval to conduct Category III operations on U.S. Type II ILS systems should submit documentation from the State of the Operator which confirms that the airborne equipment is compatible with operations on Type II facilities and the operator is specifically authorized Category III minima using these facilities. Following the 6-month demonstration program, the minima of 700 RVR (200 meters) for Category IIIa or 300 RVR (100 meters) for Category IIIb may be authorized if the program has been satisfactory.

14. OPERATIONAL REPORTING.

a. For a period of 1 year after an applicant has been advised that its aircraft system meets Category III 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 III system was utilized to make satisfactory (actual or simulated) approaches to the applicable Category III minima (by aircraft type).

(2) The total number of unsatisfactory approaches by airport and aircraft registration number with explanations in the following categories - airborne equipment faults, ground facility difficulties, aborts of approaches because of ATC instructions, or other reasons.

(3) Notify the certificate-holding office as soon as possible of any system failures or abnormalities which require flightcrew intervention after passing 100 feet during operations in weather conditions below Category I minima. The certificate-holding office will forward this information to the Office of Flight Operations as expeditiously as possible.

b. For an Extended Period.

(1) For FAA facility review, the operator is encouraged to provide to the certificate-holding office an annual summary of the total number of approaches in weather conditions below Category II minima on which Category IIIa or Category IIIb procedures were used, listed by airport and aircraft type and the number of aborted approaches due to equipment failures or ATC.

(2) The operator is to notify the certificate-holding office as soon as possible of any system failures or abnormalities which require flightcrew intervention after passing 100 feet during operations in weather conditions below Category I minima. The certificate-holding office will forward this information to the Office of Flight Operations as expeditiously as possible.

NOTE: The reporting burden contained in this AC does not require Office of Management and Budget approval under the provisions of the Paperwork Reduction Act of 1980, according to Section 3502(4)(a).

Kenneth S. Hunt
Director of Flight Operations

APPENDIX 1. AIRWORTHINESS APPROVAL FOR CATEGORY III AIRBORNE SYSTEMS

1. PURPOSE. This appendix contains criteria for the approval of airborne equipment and installations required for Category III 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, as well as the operational concepts in paragraph 7 of this AC. In addition, approval should be based on demonstrated compatibility with ground facilities designated as U.S. Type II or Type III. The guidelines and procedures contained herein are considered acceptable methods of determining transport category airplane airworthiness for use in Category III 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.

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

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 FAR.

4. SYSTEM EVALUATION. A flight test program should be conducted to determine that the pertinent systems installed are in accordance with the criteria of this document and agreement should be reached with the applicant on his proposed program to demonstrate compliance. Upon completion of an FAA engineering design review and supporting simulation studies, a type inspection authorization (TIA) should be issued to determine if the complete installation of equipment associated with Category III meets the criteria of this appendix.

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 ATC 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 the safety of go-arounds from any point in the approach or landing prior to touchdown as described in paragraph 7a of this AC. For aircraft in which a go-around from very low altitude may result in an inadvertent touchdown, the safety of such a procedure should be established. For fail-operational systems, in the event of an engine failure, the cockpit cues or indications after passing 100 feet AGL should not cause the flightcrew to attempt a go-around. Additionally, engine failure cues should not be overpowered by other cautions or warnings from the flight guidance system if the engine failure causes

the flight guidance system to disconnect. Clearly defined go-around procedures should be incorporated in the airplane flight manual.

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. SYSTEM SAFETY CRITERIA. The Category III system and associated components, considered separately and in relation to other systems, should be designed to comply with FAR Section 25.1309, Amendment 25-23. For fail-operational systems, the airplane must be shown to be capable of completing the approach from 100 feet AGL to a safe landing within the touchdown zone and, if applicable, a safe rollout, except for failure conditions which are shown to be extremely improbable. A safety analysis as described in AC 25.1309-1, System Design Analysis, should be accomplished. The safety analysis must show that:

a. The probability of an unsafe landing due to system malfunction is extremely improbable.

b. The probability of system malfunction which reduces the capability of the crew to cope with adverse operating conditions is improbable.

c. The exposure times for assessing probabilities for the Category III landing and rollout functions are:

(1) Category IIIa.

(i) Unsafe landing - the average time required to go from 100 feet AGL, or higher, to touchdown.

(ii) Availability of Function - the average time required to go from 1,500 feet AGL on approach to touchdown.

(2) Category IIIb.

(i) Unsafe landing - the average time required to go from 100 feet AGL, or higher, to a speed where safe manual control of the aircraft by the crew is assured in Category IIIb weather conditions.

(ii) Availability of Function - the average time required to go from 1,500 feet AGL on approach to the speed where safe manual control of the aircraft by the crew is assured in Category IIIb weather conditions.

(3) Category IIIc.

(i) Unsafe landing - the average time required to go from 100 feet AGL, or higher, to full stop on the runway.

(ii) Availability of Function - the average time required to go from 1,500 feet AGL on approach until clear of the runway.

d. The availability of function for Category III should be at least 99 percent.

7. INDIVIDUAL SYSTEM CRITERIA. Individual Category III 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 appropriate minimum performance standards set forth in FAA Technical Standard Orders (TSO) C36, C36a, C36b, C36C, or RTCA Paper DO-131A, dated November 2, 1978, "Minimum Performance Standards - ILS Localizer Receiving Equipment," and be compatible for integration into the overall aircraft system used to perform Category III operations.

(2) The localizer system installation should meet or exceed the appropriate 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:

(i) The absence of a radio frequency signal.

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

(iii) The reduction of either modulation signal to one-half the normal 20 percent.

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

(4) The localizer receiver centering criteria outlined in RTCA Paper DO-131A for Class E equipment are applicable for Category III installation approval.

(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 appropriate minimum performance standards set forth in FAA TSO C34, C34a, C34b, C34C, or RTCA Paper DO-132A, dated November 2, 1978, "Minimum Performance Standards - ILS Glide Slope Receiving Equipment."

(2) The glide slope system installation should meet or exceed the appropriate 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," and be compatible for integration into the overall aircraft system used to perform Category III operations.

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

(i) The absence of a radio frequency signal.

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

(iii) The reduction of either modulation signal to one-half of its normal 40 percent.

(iv) When a difference of depth of modulation equal to 0.091 $\pm$ .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-132A for Class D equipment are applicable for Category III 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 Systems.

(1) For operations conducted without a DH, a fail-operational flight control system, as described in paragraph 7c of this AC, is required. For operations conducted with a 50-foot DH, a fail-passive flight control system, as described in paragraph 7b of this AC, may be used. Both fail-passive and fail-operational systems should be shown to provide the capability to safely touchdown within the touchdown zone and not preclude a safe go-around from any point on the approach to touchdown. A safe touchdown should consider airplane structural limit loads, vertical and cross track velocity at touchdown, the airplane attitude and the airplane's track, with respect to the runway centerline, which occurs immediately before and after touchdown.

(2) Automatic Flight Control Systems. Systems which provide automatic landing capability used as part of a Category III installation should, in addition to complying with applicable FAR and AC 20-57A (Automatic Landing Systems), provide the following:

(i) Airplane Speed. The performance specified by AC 20-57A considering maximum and minimum design approach speeds.

(ii) Wind Limitations. The maximum headwind, tailwind, and crosswind conditions in which the automatic system will provide safe landing performance and result in touchdown within the area defined by paragraph 5b(4) of AC 20-57A should be determined and published in the airplane flight manual.

(iii) Type II ILS. The performance specified by AC 20-57A when operating on Type II ILS ground facilities, if Category III operations are to be conducted using this type of ILS facility.

(iv) Warning.

(A) Fail-passive and fail-operational systems should provide an aural and visual warning to the flightcrew for failures or failure combinations not shown to be extremely improbable which could result in an unsafe landing.

(B) Automatic systems should provide an immediate aural and visual warning of system disconnect.

(v) Tracking. The systems should be free of significant offsets or sustained oscillations about the extended runway centerline.

(3) Manually Flown Flight Guidance Systems. A system which provides guidance signals to the flightcrew for a manually flown approach and landing as one of the required redundant systems for Category III approach and landing should provide the following:

(i) Touchdown Performance. The flight guidance system should provide sufficient information so that a pilot of average skill can provide the same degree of repeatable touchdown performance (dispersions), without outside visual reference, as specified by AC 20-57A for automatic landing systems. The demonstration should include the ability to take control from the automatic system (or from the other pilot, if applicable) from any point in the approach to touchdown.

(ii) Airplane Speed. The performance specified by AC 20-57A considering maximum and minimum design approach speeds.

(iii) Wind Limitations. The maximum headwind, tailwind, and crosswind conditions in which the flight guidance system will provide safe landing performance and result in a touchdown within the area defined by paragraph 5b(4) of AC 20-57A should be determined and published in the airplane flight manual.

(iv) Type II ILS. The performance specified in AC 20-57A when operating on Type II ILS ground facilities, if Category III operations are to be conducted using this type of ILS facility.

(v) Warning.

(A) An aural and visual warning should be provided to the flightcrew for failures of the primary flight control systems (automatic or manual) not shown to be extremely improbable which requires reversion to the secondary flight guidance system in order to prevent unsafe landings.

(B) Probable failures of the flight guidance system should be annunciated to the flightcrew.

(vi) Tracking. The flight guidance system should be free of significant offsets or sustained oscillations about the extended runway centerline.

d. Automatic Throttle System (if installed).

(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:

(i) 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 point, such as reference speed or angle-of-attack, may be set manually or automatically. Rapid airspeed fluctuations associated with turbulence may be disregarded.

(ii) 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.

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

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

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

e. Radio Altimeter. Each radio altimeter system should have an authorization in accordance with TSO C87 or should provide the performance specified below under the test conditions stated. Radio altimeters with TSO C87 authorization should also comply with the criteria of subparagraph e(2)(iv) of this appendix.

(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:

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

(A) Pitch angle ± 5° about the mean approach attitude.

(B) Roll angle zero to ± 20°.

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

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

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

(iii) 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.

(iv) 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.

(v) 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.

f. Flare Computer or Flare Computation. Each flare system should provide the following performance in conjunction with other components of the flight control system:

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

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

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

g. Failure Detection and Warning Capability.

(1) Failure detection and warning capability should be provided in accordance with criteria listed in paragraphs 6 and 7a through f of this appendix.

(2) Notwithstanding subparagraph g(1), for fail-operational systems, failure warning may be inhibited for certain noncritical failures below 100 feet AGL or the AH, if:

(i) The failure does not preclude continuation of a successful approach and landing.

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

8. CERTIFICATION DOCUMENTATION. The following documents shall be submitted to the appropriate FAA Aircraft Certification Division with sufficient lead time to allow evaluation prior to TIA.

a. System Description Document - A description of the system: Operation (flightcrew viewpoint), function description (control laws), and hardware (LRU interface).

b. For Non-TSO'd Items - Environmental test results showing compliance with RTCA Document DO-160A, Environment Conditions and Test Procedures and Airborne Electronics, Electrical Equipment and Instruments, or later FAA accepted standard.

c. Compatibility Test Report - Noninterference with other systems.

d. Failure Modes and Effects Analysis.

e. Safety Analysis - Analysis showing that the system meets the probability of unsafe landing requirements of FAR Section 25.1309.

For Digital Systems:

f. Software Description Document.

g. Software Verification and Validation Document.

h. Software Control Procedures.

i. Preliminary Landing Performance Analysis (Simulator Results).

Post TIA and prior to type certificate the final performance analysis will be submitted. This document includes statistical analysis of final simulator results showing compliance with AC 20-57A and correlation between flight test and simulator approach and landing performance.

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

a. Appropriate limitations if necessary, including the maximum wind condition in which use of the flight control system will result in a safe landing.

b. Revision to the performance section, if appropriate.

c. The airborne equipment, installation, and flightcrew procedures related to the Category III system.

d. A statement to the effect that, "the airborne systems associated with approach and landing of the airplane to touchdown, or touchdown and rollout, if applicable, have been found to meet the airworthiness and performance criteria

required by AC 120-28C, Appendices 1 and 2, or Appendix 3, if applicable (or previous editions as appropriate)." "Compliance with the performance standards referenced above, does not constitute approval to conduct Category III operations."

APPENDIX 2. CATEGORY III FAIL-PASSIVE ROLLOUT CONTROL SYSTEMS

1. PURPOSE. This appendix contains criteria for the approval of fail-passive rollout control airborne equipment and installation.

2. GENERAL CRITERIA. The type certification approval for the equipment, system installation, and test methods should be based on a consideration of factors such as the intended function of the installed system, its accuracy, reliability, and failure features, as well as the operational concepts in paragraph 7 of this AC. In addition, approval should be based on demonstrated compatibility with ground facilities designated as U.S. Type II or U.S. Type III. The guidelines and procedures contained herein are considered acceptable methods of determining transport category airplane airworthiness for use of fail-passive rollout control systems in Category III operations. After touchdown and until the point where safe manual control of the aircraft by the crew using visual references is assured, aircraft system failures (when considered separately or with other system failures that are not shown to be extremely improbable) cannot preclude the joint pilot/rollout control system from controlling the aircraft and maintaining the aircraft on the runway and stopping the aircraft within the runway length available.

3. EQUIPMENT APPROVAL CRITERIA. As in Appendix 1.

4. SYSTEM PERFORMANCE CRITERIA AFTER TOUCHDOWN FOR LATERAL STEERING CONTROL. The performance of the rollout control system should be consistent with the performance of the flight guidance and control system required for Category III approach and landing. In addition, it should be shown by a combination of demonstration and analysis, for wet and dry runway surface conditions, that the performance of the rollout control system is satisfactory. Demonstrations in simulated or actual reduced visibility, representative of expected conditions in which the system is to be used, should also be conducted.

a. The following environmental conditions are to be considered in meeting the criteria of this appendix:

(1) The full range of environmental conditions and airplane configurations used in meeting the airworthiness requirements for a Category III system should be considered, including headwinds of at least 25 knots, tailwinds of at least 10 knots, and crosswinds of at least 15 knots. These environmental conditions and airplane configurations should be compatible with the conditions and configurations demonstrated during airworthiness approval of the Category III airborne systems as specified in Appendix 1 of this AC.

(2) The range of certificated runway conditions (dry and wet) should be considered.

b. It should be demonstrated that, considering the conditions prescribed in subparagraph a, the rollout control system meets the following accuracy criteria:

(1) The maximum distance from the aircraft centerline, at the main landing gear, to the runway centerline should not exceed 27 feet during the

rollout, when evaluated on a two-sigma basis. Compliance with this requirement should be shown by flight test or a combination of analysis and flight test. The maximum lateral deviations observed during demonstrations to meet this requirement should be used when computing the two-sigma deviation. Methods equivalent to the two-sigma basis may be used for nonstandard distributions.

(2) A suitable analysis should show that, with normal operation of the aircraft and the rollout control system, no more than 1 landing in one million will result in the outboard landing gear being closer than 5 feet to the lateral limits of a 150-foot wide runway during rollout.

c. It should be shown by analysis and confirmed by tests, under both dry and wet runway conditions, that the rollout control system provides sufficient damping to prevent unacceptable overshoot of, or excessive oscillation about, the localizer centerline during normal system operations.

d. Probable flight crewmember actions should not significantly affect the normal tracking performance of the rollout control system.

5. PROTECTION FROM DISENGAGEMENT AND INDICATION OF SYSTEM STATUS.

a. The rollout control system should be protected from inadvertent disengagement when operating in the ground rollout mode and the indication of any system malfunction should be conspicuous and unmistakable.

b. There should be a positive indication to the flightcrew that:

(1) The rollout control system is available or alternatively, is not available, before the airplane descends to the AH.

(2) The ground rollout has, or alternatively has not, been initiated at touchdown.

6. SYSTEM FAILURE PROTECTION CRITERIA. It should be demonstrated by flight test, or a combination of analysis and flight test, that the rollout control system meets the performance criteria of paragraph 4 of this appendix under normal conditions and meets the following additional criteria when failures occur in these systems. Additionally, the most adverse runway and visibility conditions expected in service with fail-passive rollout control systems should be considered. In making these determinations, normal flight crewmember actions associated with the visual cues that are available should be included in the consideration of the failure condition.

a. Single failures of the rollout control system and its associated components, should not:

(1) Cause any significant displacement of the aircraft from its normal rollout 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.

b. An aural and visual warning should be provided for rollout control systems failure conditions not shown to be extremely improbable, which would result in the aircraft wheels leaving the lateral confines of a 150-foot wide runway.

c. Aircraft system failures should not preclude the joint pilot/rollout control systems from controlling the aircraft, maintaining the aircraft on the runway, and stopping within the runway available under the most adverse runway and visibility conditions expected in service.

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

a. Appropriate limitations, if necessary;

b. Revision to the performance section, if appropriate;

c. The airborne equipment, installation, and flightcrew procedures related to the rollout control system;

d. A statement to the effect that, "the airborne system associated with approach and landing of the airplane to touchdown and through rollout have been found to meet the airworthiness and performance criteria required by AC 120-28C, Appendices 1 and 2." "Compliance with the performance standards referenced above, does not constitute approval to conduct Category III operations."

APPENDIX 3. CATEGORY III FAIL-OPERATIONAL ROLLOUT CONTROL SYSTEMS

1. PURPOSE. This appendix contains criteria for the approval of fail-operational rollout control airborne equipment and installation.

2. GENERAL CRITERIA. The type certification approval for the equipment, system installation, and test methods should be based on a consideration of factors such as the intended function of the installed system, its accuracy, reliability, and failure features, as well as the operational concepts in paragraph 7 of this AC. In addition, approval should be based on demonstrated compatibility with ground facilities designated as U.S. Type II or U.S. Type III. The guidelines and procedures contained herein are considered acceptable methods of determining transport category airplane airworthiness for use of fail-operational rollout control systems in Category IIIb operations.

After touchdown and until the point where safe manual control of the aircraft by the crew using visual references is assured, aircraft system failures (when considered separately or in conjunction with other system failures that are not shown to be extremely improbable) cannot preclude the joint pilot/rollout control system from controlling the aircraft and maintaining the aircraft on the runway and stopping the aircraft within the runway length available. Additionally, these failure conditions cannot present cockpit cues or indications to the pilot which could cause him/her to attempt a manual rollout using visual reference. These capabilities should be demonstrated under the most critical conditions expected in service.

3. EQUIPMENT APPROVAL CRITERIA. As in Appendix 1.

4. SYSTEM PERFORMANCE CRITERIA AFTER TOUCHDOWN FOR LATERAL STEERING CONTROL. The performance of the rollout control system should be consistent with the performance of the flight guidance and control system required for Category III approach and landing. In addition, it should be shown by a combination of demonstration and analysis, for wet and dry runway surface conditions, that the performance of the rollout control system is satisfactory. Demonstrations in simulated or actual reduced visibility, representative of expected conditions in which the system is to be used, should also be conducted if system operation is dependent on crew actions or manual control.

a. The following environmental conditions are to be considered in meeting the criteria of this appendix:

(1) The full range of environmental conditions and airplane configurations used in meeting the airworthiness requirements for a Category III system should be considered, including headwinds of at least 25 knots, tailwinds of at least 10 knots, and crosswinds of at least 15 knots. These environmental conditions and airplane configurations should be compatible with the conditions and configurations demonstrated during airworthiness approval of the Category III airborne systems as specified in Appendix 1 of this AC.

(2) The range of certificated runway conditions (dry and wet) should be considered.

APPENDIX 4. DECELERATION SYSTEMS FOR CATEGORY IIIB

1. PURPOSE. This appendix contains criteria for approval of airborne equipment and installation of deceleration systems used in Category IIIb operations.

2. CRITERIA FOR AUTOMATIC BRAKING, DECELERATION DISPLAYS, OR RUNWAY REMAINING SYSTEMS. If automatic braking, deceleration displays, groundspeed displays, or runway remaining indicators are used for credit under paragraph 9c of this AC, a means will be demonstrated for the flightcrew to determine that deceleration of the airplane is proceeding satisfactorily or that the airplane will reach a complete stop prior to reaching the end of the runway.

a. If used, an automatic braking system should allow antiskid protection and have manual reversion capability. An automatic braking system should provide smooth and continuous deceleration from touchdown until the airplane comes to a complete stop on the runway and provide the following:

(1) Disconnect must not create unacceptable additional crew workload or crew distraction from normal rollout braking.

(2) Normal operation of the automatic braking system should not interfere with the rollout control system. Manual override of the automatic braking system must be possible without excessive brake pedal forces or interference with the rollout control system. The system should not be susceptible to inadvertent disconnect.

(3) A positive indication of system disengagement and a conspicuous indication of system failure should be provided.

(4) No malfunction of the automatic braking system should interfere with either pilots' use of the manual braking system.

b. If an automatic braking system is installed for rollout deceleration credit, demonstrated wet and dry runway landing distances, based upon the use of the automatic landing system with automatic throttle, for each mode of the automatic braking system, should be determined in a manner consistent with Section 25.125 of the FAR and presented in the airplane flight manual as performance information. Procedures should be established to permit pilots, prior to landing, to determine the automatic brake setting needed to obtain a safe stop on the runway being used for landing.

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

a. Appropriate limitations, if necessary.

b. Revision to the performance section, if appropriate.

c. The airborne equipment, installation, and flightcrew procedures related to the Category IIIb deceleration system.

APPENDIX 5. SAMPLE OPERATIONS SPECIFICATIONS FOR AUTHORIZATION TO CONDUCT CATEGORY III OPERATIONS

Category III Operations
(Example)

1. CATEGORY III OPERATIONS.

a. Landing Minima for Category IIIa

(1) Category IIIa Fail-Passive Operations.

(i) B-727, DC-9-80, B-757, B-767 (A-300/B-747/DC-10/L-1011, if "proof of concept" acceptably demonstrated).

(A) Touchdown zone and mid 700 RVR (200 meters).

(B) DH 50 feet (15 meters).

(2) Category IIIa Fail-Operational Operations.

(i) A-300, B-757, B-767, DC-10, L-1011

(A) Touchdown zone and mid 700 RVR (200 meters).

(B) AH 100 feet (30 meters).

(3) Category IIIb Fail-Operational Operations.

(i) A-300, B-757, B-767, DC-10, L-1011

(A) Touchdown zone and mid 600 RVR (175 meters).

(B) AH 100 feet (30 meters).

(ii) A-300, B-757, B-767, DC-10, L-1011

(A) Touchdown zone, mid, and rollout 300 RVR (100 meters).

(B) AH 100 feet (30 meters).

NOTE: Requires the use of an automatic rollout control system approved for Category IIIb.

b. Pilot Qualifications. The minima prescribed in subparagraph a are authorized for only those pilots in command and seconds in command who have completed the approved Category III training program and who have been certified by a company check airman or an FAA inspector (for Foreign Flag Air Carriers - certified by the State of the Operator) as being qualified for Category IIIa or Category IIIa and Category IIIb operations. No pilot in command shall be authorized to conduct Category III operations in turbojet aircraft unless he/she

has had at least 300 hours as pilot in command in turbojet aircraft, including 100 hours in the Category III type aircraft.

c. Required Airborne Equipment. In addition to the flight instruments and radio navigation equipment required by applicable FAR, the following equipment is required and must be used for Category III operations (specify by type aircraft authorized - see example in paragraph 1a(1)(i) of this appendix).

(1) For the B-727 aircraft for fail-passive Category IIIa - in addition to the flight instruments and radio navigation equipment required for Category II operation:

(i) Itemized list including: automatic approach coupler with fail-passive automatic landing system and dual radio altimeters.

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

(2) For the DC-9-80, B-757, B-767 for fail-passive Category IIIa - itemized list which includes the equipment specified in the Airplane Flight Manual.

(3) For the A-300, B-757, B-767, DC-10, L-1011 aircraft for fail-operational Category IIIa - itemized list which includes the equipment specified in the Airplane Flight Manual.

(4) For the A-300, B-757, B-767, DC-10, L-1011 aircraft for fail-operational Category IIIb - itemized list.

(i) The equipment specified in subparagraph c(3), plus

(ii) Rollout control system approved for Category IIIb, and

(iii) Automatic braking or other means specified in this AC, paragraph 9c.

d. Required RVR Equipment.

(1) For Category IIIa operations and for Category IIIb operations with minima of 600 RVR (175 meters), the following transmissometers are required:

(i) Three transmissometers are required unless it can be shown that two transmissometers can meet the operational needs for a particular airport. When three transmissometers are installed, touchdown and mid are controlling and rollout provides advisory information to pilots.

(ii) If only two transmissometers are required, they must be touchdown and rollout, both are controlling.

(2) For Category IIIb operations using fail-passive rollout control systems with minima below 600 RVR (175 meters), three transmissometers are required and touchdown, mid, and rollout are controlling.

(3) For Category IIIb operations using fail-operational rollout control systems with minima below 600 RVR (175 meters), three transmissometers are normally required and touchdown, mid, and rollout are controlling. However, in the event that one transmissometer is temporarily inoperative, these operations may continue using the two remaining transmissometers and both RVR reports are controlling.

e. Operating Limitations. A Category IIIa ILS approach shall not be started when the controlling RVR of the landing runway is reported to be less than Category II minima or a Category IIIb approach started when weather is reported below Category IIIa minima unless:

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

(2) All required elements of the ground system, except sequence flashing lights, are in normal operation.

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

(4) For Category IIIa - Runway field length as specified in paragraph 7g of this AC.

(5) For Category IIIb.

(i) Minima 600 RVR (175 meters). (Runway field length as specified in paragraph 7g of this AC.)

(ii) Minima 300 RVR (100 meters). (Runway field length as specified in paragraph 7g of this AC.)

f. Missed Approach.

(1) For Category IIIa approaches with a fail-passive Flight Control System, a missed approach will be initiated:

(i) If the controlling RVR is reported to decrease below the applicable minima prior to reaching the DH. However, if the aircraft is established on the final approach segment when this report is received, the approach may be continued to the DH:

(ii) At the DH, if the pilot has not established adequate visual reference with the touchdown zone or touchdown zone lights.

(iii) If, after passing the DH, visual reference is lost or a reduction in visual reference occurs which prevents the pilot from continuing to verify that the aircraft will touchdown in the touchdown zone.

(iv) When a failure in the automatic landing system occurs prior to touchdown. However, if the failure occurs in conditions such that the pilot has adequate visual reference to land manually, and the pilot determines that continuing a landing would be a safe course of action, the pilot may land manually following a failure of the airborne system, ground system, or visual aid.

(v) If the pilot determines that an automatic touchdown cannot be safely accomplished within the touchdown zone.

(vi) If prior to DH, any of the required elements of the ground system become inoperative. However, Category III approaches and landings may be continued if sequence flashers are inoperative.

(2) For fail-operational Category IIIa approaches with a rollout control system and for Category IIIb approaches, a missed approach will be initiated:

(i) If the controlling RVR is reported to decrease below the applicable minima prior to reaching the AH. However, if the aircraft is established on the final approach segment when this report is received, the approach may be continued to the AH. Unless a fail-passive rollout control system is used for Category IIIa/Category IIIb (600 RVR) operations, or a fail-operational rollout control system is used for Category IIIb operations with minima below 600 RVR, a missed approach is required upon reaching the AH if the latest reported controlling RVR is below the applicable minima.

(ii) If the pilot determines that an automatic touchdown cannot be safely accomplished within the touchdown zone.

(iii) If, prior to the AH, the pilot cannot determine that the rollout control system is available.

(iv) When a failure occurs prior to the AH in one of the required systems in the aircraft.

(v) If prior to AH or DH, as applicable, any of the required elements of the ground system become inoperative. However, Category III approaches and landings may be continued if sequence flashers are inoperative.

g. Subparagraph f does not preclude continuation of a higher minimum Category approach if the system failure does not affect the systems required for the higher approach minima.

> NOTE: Notwithstanding subparagraph f, if a 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 automatic system or land manually; (2) following failure of a ground ILS guidance component, land manually, or (3) following failure of a visual aid, land the aircraft either automatically or manually.

h. Authorized Airports. The certificate holder is authorized Category III operations at the following airports and runways.

i. Example of an acceptable format to specify required airborne equipment for a specific airplane in the operations specifications as required in paragraph 1c. The required equipment for a specific aircraft would be as specified in the approved Airplane Flight Manual.

OPERATIONS SPECIFICATIONS PART C, Page_____

Required Airborne Equipment - In addition to the flight instruments and radio navigation equipment required by FAR, Part 121, the following equipment is required for Category III operation:

REQUIRED EQUIPMENT	ASA LAND 2* 700 RVR/50' DH	ASA LAND 3* 700 RVR/100' AH	ASA LAND 3* 600 RVR/100' AH
Autopilot	2	3	3
Flight Director Display	2	2	2
Electronic ADI	2**	2**	2**
ILS Deviation	2**	2**	2**
Radio Alt Readout	2**	2**	2**
AFDS Mode Annunciation	2**	2**	2**
Missed Approach Attitude Guidance	Electronic ADI or FD Pitch Command		
Autoland Status Annunciator	1#	2	2
Inertial Reference Unit (in NAV Mode)	2***	3	3
Autothrottle System	As Required	With	With
AC Electrical Power Source	2	2	2
Rollout Guidance	NR	NR	With
Hydraulic System	3	3	3
Windsheild Wipers	With	With	With

* Autoland Status Annunciator.
** Must be supplied by seperate symbol generators.
*** Associated with engaged autopilot.
# Must be operative for the pilot monitoring the approach below 100 feet.