

Date April 6, 1978

CHANGE - OPERATIONS SPECIFICATIONS

- Domestic and Flag Air Carriers
- Supplemental Air Carrier, Scheduled Cargo Air Carrier and Commercial Operator
- Commercial Operator - Scheduled Intrastate
- Foreign Flag Air Carrier
- Air Taxi Operators using Large Aircraft - FAR 121 Domestic and Flag Rules
- Air Taxi Operators Using Large Aircraft - FAR 121 Supplemental Rules
- Air Travel Clubs Using Large Airplanes

This change revises Part C, two pages of Category IIIa Operations Specifications dated September 1, 1976.

Earliest effective date: April 6, 1978.

Remarks: This revision incorporates the provisions of AC 120-28B dated December 1, 1977. Minima and operating requirements are listed for Boeing 727 and L-1011 aircraft. Other aircraft will be added as required. Provisions have been made to add in paragraph g. the Category II approved runways that have received approval for use in Category IIIa operations. Page numbers and paragraph numbers have been omitted so these specifications can be inserted into a certificate holder's operations specifications in sequence with the other operations specification pages. A new subparagraph has been added to list the required RVR equipment.

OPERATIONS SPECIFICATIONS

PART C  
PAGE

CATEGORY IIIa OPERATIONS

Category IIIa Operations.

a. Landing Minima. The certificate holder is authorized to use the following ILS straight-in landing minima:

- (1) B-727 Aircraft.
  - (a) RVR 1000.
  - (b) Decision height 50 feet.
- (2) L-1011 Aircraft.
  - (a) RVR 700.
  - (b) Alert height 100 feet.

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

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

- (1) For the B-727 aircraft, in addition to the flight instruments and radio navigation equipment required for Category II operation:
  - (a) Automatic approach coupler with fail-passive automatic landing system and dual radio altimeters.
  - (b) An immediate aural disconnect warning shall be provided in addition to the flashing red light.
- (2) For the L-1011 aircraft (itemized list).

Effective date April 6, 1978

..... hereby makes application for amendment  
of the Operations Specifications appearing on the reverse side hereof, as follows:

Reasons and supporting data (if insufficient space attach additional page):

I CERTIFY that the statements submitted in connection herewith are true and that I am duly authorized  
to make this application on behalf of the applicant.

.....  
(Signature)  
Date .....  
.....  
(Title)

INSPECTOR'S RECOMMENDATIONS:

.....  
(Signature)  
.....  
(Title)

The Operations Specifications set forth on the reverse side hereof are .....

Amendment No. .... By direction of the Administrator:  
Effective date .....  
.....  
(Signature)  
Supersedes specifications dated .....  
.....  
(Title)

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OPERATIONS SPECIFICATIONS

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CATEGORY IIIa OPERATIONS

NOTE. Notwithstanding paragraphs f.(3) through (5), if the failure occurs in conditions such that the pilot has sufficient visual cues to land the aircraft manually, and if the pilot determines that continuing a landing would be a safe course of action, the pilot may: (1) Following partial failure of a fail-operational system, land automatically using the remaining fail-passive channel or land manually; (2) Following failure of a fail-passive automatic system or ground ILS guidance system component, land manually; or (3) Following failure of a visual aid, land the aircraft either automatically or manually.

g. Authorized Airports. The certificate holder is authorized Category IIIa operations at airports and runways approved for Category IIIa operations in FAR Part 97. Category IIIa operations are also authorized for the runways listed at the following foreign airports, military airports, and for previously Category II approved runways that have specific approval from the certificate-holding district office for use in Category IIIa operations.

Airport name and location

Runway

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OPERATIONS SPECIFICATIONS

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CATEGORY IIIa OPERATIONS

d. Required RVR Equipment. For Category IIIa operations the following transmissometers are required:

(1) Three transmissometers are required unless it can be shown that touchdown and rollout 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.

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

e. Operating Limitations. An ILS approach shall not be started when the controlling RVR of the landing runway is reported to be less than RVR 1200, unless:

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

(2) All required elements of the Category IIIa ground system are in normal operation.

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

(4) 1000 feet or 15 percent, whichever is greater, is available over the required field length specified in FAR 121.195(b) (for Foreign Flag Air Carriers - 1000 feet or 15 percent, whichever is greater, is available over the landing field length for a dry runway as specified in the operator's manual).

f. Missed Approach. A missed approach will be initiated:

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

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

(3) When any of the elements of the Category IIIa ground system become inoperative.

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

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

NOTE: Paragraphs f.(3) through (5) do not preclude continuation of a higher minimum Category approach if the system failure does not affect the systems required for the higher minimum approach.

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AC NO: 120-28

DATE: 9/5/69



# ADVISORY CIRCULAR

## DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION

**SUBJECT:** CONCEPTS OF AIRBORNE SYSTEMS FOR CATEGORY IIIa OPERATIONS

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1. PURPOSE. This circular is being issued to assist the aviation industry with initial preparations for Category IIIa operations.
  2. DISCUSSION.
    - a. A number of manufacturers and airlines are actively working to develop Category IIIa systems. It is therefore appropriate that basic concepts and minimum airborne equipment requirements considered necessary for Category IIIa operations be publicized to assist the airlines and aircraft operators that are purchasing new aircraft or planning retrofit programs.
    - b. This circular does not set forth complete Category IIIa criteria and requirements for ground facilities, maintenance, training, operational limitations, etc., at this time. Additional Category IIIa criteria will be issued at a later date.
    - c. The accumulation of service experience with Category II systems in an operational environment and the development of confidence utilizing proposed Category IIIa airborne systems under weather minima higher than Category IIIa is considered an essential part of the evolutionary process leading to Category IIIa operations.
  3. DEFINITIONS.
    - a. Category IIIa Operations (ICAO definition). Operations with no decision height limitation, to and along the surface of the runway with external visual reference during the final phase of the landing and with a runway visual range not less than a value on the order of 700 feet.
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- b. Alert Height. A height (above the highest elevation in the touchdown zone), established, based on the characteristics of the aircraft and the particular airborne Category IIIa system, above which a Category IIIa approach would be discontinued if a significant failure occurred in the required operational systems, or in the ground equipment.
  - c. Fail-Passive Automatic Flight Control System. An automatic flight control system which, upon occurrence of any failure not shown to be extremely improbable, is protected against hardovers, leaves the aircraft in trim, causes a warning signal and does not interfere with the pilot's normal control of the aircraft.
  - d. Fail-Operational Category IIIa System. An airborne system which provides redundant operational capability (two or possibly more operational systems) down to the alert height. The redundant operational systems must have no common failure modes, and need not be the same (e.g., one system may be automatic-to-touchdown, and the other manually flown, using computed displays). If one of the two required operational systems fails below the alert height, the flare and touchdown may be accomplished using the remaining operational system.
  - e. Automatic Fail-Operational Category IIIa System. A system which provides redundant operational capability using (two or possibly more) automatic systems. If one of the automatic systems fails below the alert height, the flare and touchdown may be accomplished using the remaining automatic system. NOTE: See paragraph 7 c.
4. OPERATIONAL CONCEPTS.
- a. The primary mode of Category IIIa operations will be automatic to touchdown. The automatic landing system should provide a high degree of reliability in assuring safe landings on the runway without any pilot intervention until after touchdown. In addition, the airborne system should provide for pilot assessment of the approach to touchdown without any visual reference outside the cockpit.
  - b. A redundant operational flight control capability will be required at least down to the predetermined alert height. The redundancy may be provided by multiple automatic landing systems or by a manual back-up capability for landing by reference to instruments.

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- c. The following are typical arrangements by which this requirement may be met:
- (1) Two (or possibly more) monitored autopilots, (making up a dual-automatic fail-operational system) one remaining operative after a failure.
  - (2) An alternative arrangement would utilize two monitored systems, each consisting of an integrated autopilot and flight director system with common flare computation, with one monitored system remaining operational after a failure.
  - (3) Another alternative arrangement would utilize three autopilots, two remaining operative (to permit comparison and provide necessary hard-over protection) after a failure.
  - (4) Another alternative arrangement would utilize a single, monitored fail-passive automatic flight control system with flare computation and automatic flare and landing, plus an adequately failure-protected flight director system with dual displays (or dual flight director systems) with flare computation, (independent of that used for the autopilot) supplied to the command bars.

NOTE: The flight director displays (head-down and/or head-up) must provide sufficient guidance so that a pilot of average skill can demonstrate the same degree of repeatable performance as attainable with the automatic system. This demonstration is required only over the portion of the approach and landing during which the manual takeover is a part of the operational CAT IIIa system, i.e., essentially from the alert height to touchdown.

5. AIRBORNE EQUIPMENT. The following equipment in addition to the instrument and radio equipment required by the Federal Aviation Regulations is the minimum airborne equipment considered necessary for Category IIIa operations.
- a. Two ILS Localizers and Glide Slope Receivers, which meet the performance requirements for Category II and provide the special failure detection/warning capability outlined in paragraph 7.
  - b. Two Approved Radio (Radar) Altimeter Systems Which Meet The Performance Requirements For Category II.

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c. Redundant Flight Control Systems Meeting The Requirements Of Paragraph 4.d. Missed Approach Attitude Guidance.

- (1) Attitude gyro indicators with calibrated pitch attitude markings, or
- (2) Fixed or computed pitch command display, or
- (3) An automatic go-around system

NOTE: The missed approach system must be protected against failures due to the same causes which required the missed approach to be executed.

e. Auto Throttle Control System (Single). An auto throttle system is required for Category IIIa operations.f. Indication of "Flare Has Begun" is required. The system should keep the pilot aware that the flare system is ready to operate. Further, positive indication should be provided that the flare mode has (or has not) engaged at the minimum normal flare engage height.g. A Failure Detection and Warning Capability, as described in Section 7,6. AUTOMATIC LANDING SYSTEM PERFORMANCE REQUIREMENTS. Performance of the Automatic Landing System should meet the criteria outlined in AC 20-57 dated January 29, 1968, Subject: Automatic Landing System.7. FAILURE DETECTION AND WARNING.

## a. The basic requirements for failure detection and warning are to assure that a system malfunction of the Category IIIa system will not:

- (1) Cause significant displacement of the aircraft from its approach path, including altitude loss.

NOTE: Automatic disconnect in the event of a failure need not be used above 100 feet on the approach; warning is sufficient. At altitudes below 100 feet on the approach, automatic disconnect may not be required if the autopilot is fail-passive and the pilot warning is provided. Otherwise failures below 100 feet on the approach require automatic disconnect.

- (2) Upon disconnection of the failed system, involve any out of trim condition not easily controlled by the pilot or compensated by the remaining system.
  - (3) Cause any action of the flight control system/s that is not readily apparent to the pilot, either by control movement or advisory display.
- b. Indication of significant system malfunction should be conspicuous and unmistakable. Actions necessary upon failure of one of the two required operational channels should be self-evident.
- c. A failure detection and warning system must be provided which will provide for immediate detection of failures in the Category IIIa system. The adequacy of the system should be determined by a review and evaluation of the instrument and equipment configuration of the individual Category IIIa system.

The following systems should be considered in the evaluation:

- (1) Flight Control Systems, including flare computation and initiation.
  - (2) Radio Altimeters.
  - (3) ILS Sensors.
  - (4) Attitude and Heading Systems, if used.
  - (5) Air Data System Inputs, if significant.
  - (6) Other equipment and systems, the failure of which can cause improper performance of the Category IIIa system.
- d. The Category III system and associated components, considered separately and in relation to other systems, must be designed so that - -
- (1) The occurrence of a failure condition which could result in injury to the occupants or prevent the continued safe flight and landing of the airplane without exceptional skill or strength on the part of the crew is extremely improbable, and
  - (2) The occurrence of any other failure conditions which could reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions or cause marginal physiological conditions for the occupants is minimized.

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NOTE: For the purpose of this paragraph, "failure condition" means a single failure or malfunction, or damage from external sources, and any combination of failures, malfunctions and damage from external sources.

- e. Means must be provided to alert the crew to unsafe system operating conditions, and to enable them to take appropriate corrective action. Systems, controls, and associated monitoring and warning means must be designed to minimize the possibility of crew errors that would create additional hazards.
  - f. Compliance with the requirements of paragraphs (d) and (e) of this section must be shown by analysis, supported where necessary by appropriate ground, flight, or flight simulator tests. The analysis must consider the possible modes of failure, the resulting effects on the airplane and occupants considering the stage of flight and operating conditions, the crew warning cues and corrective action required, and the capability of detecting faults.
8. SYSTEM EVALUATION. Category IIIa airborne systems will be evaluated in accordance with approved engineering criteria to determine compliance with applicable airworthiness and performance requirements. Landing stop distances will be determined in accordance with existing airworthiness rules by using the complete automatic landing and throttle systems in conjunction with normal operating procedures.

NOTE: Compliance with airworthiness criteria will not constitute approval to conduct Category IIIa operation.

  
acting Director  
Flight Standards Service

DEPARTMENT OF TRANSPORTATION  
FEDERAL AVIATION ADMINISTRATION  
Washington, D.C. 20590

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