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for FAR Part 121

Title 14—Aeronautics and Space

CHAPTER I—FEDERAL AVIATION ADMINISTRATION, DEPARTMENT OF TRANSPORTATION

[Docket No. 12762; Amdt. No. 121-114]

PART 121—CERTIFICATION AND OPERATIONS: DOMESTIC, FLAG, AND SUPPLEMENTAL AIR CARRIERS AND COMMERCIAL OPERATORS OF LARGE AIRCRAFT

Ground Proximity Warning Systems

The purpose of this amendment to Part 121 of the Federal Aviation Regulations is to require installation of an approved ground proximity warning system on each large turbine-powered airplane (turbojet and turboprop) used in operations under Part 121. These amendments also apply to air travel clubs certificated under Part 123 and to air taxi operators certificated under Part 135, when conducting operations governed by those parts with large turbine-powered airplanes.

Interested persons have been afforded an opportunity to participate in the making of this amendment by a Notice of Proposed Rule Making (Notice 74-32) issued on September 12, 1974 (published in the FEDERAL REGISTER on September 16, 1974; 39 FR 33234), as amended by Notice 74-32A, issued October 1, 1974 (published in the FEDERAL REGISTER on October 7, 1974; 39 FR 36017). Due consideration has been given to all comments presented in response to the notice. Except for editorial changes, and except as specifically discussed hereinafter, these amendments and the reasons therefor are the same as those in Notice 74-32.

Of the 31 public comments received in response to Notice 74-32, 18 favored the adoption of the proposed rule. Some commentators recommended changes that are discussed hereinafter. Several commentators made suggestions that were not within the scope of the notice, and, accordingly, those comments are not discussed, but will be retained by the FAA for future study.

In light of recent air carrier accidents involving large turbine-powered airplanes caused by inadvertent contact with the ground, the FAA believes that public interest requires the installation of ground proximity warning systems on these aircraft as soon as possible. Based on comments received and on further investigations, the FAA has determined that these systems can be developed, manufactured, and installed on all large turbine-powered airplanes operated under Part 121 by December 1, 1975. Accordingly, § 121.360, as adopted, prohibits the operation of a large turbine-powered airplane under Part 121 after December 1, 1975, unless it is equipped with a ground proximity warning system that meets the requirements of that section.

Several commentators asserted that flight crewmembers now have adequate warning of ground proximity through the use of present instrumentation, including altitude alerting systems, and appropriate inflight procedures. The FAA believes that present instrumentation and inflight procedures provide for safe and adequate terrain clearance as long as proper flight crewmember discipline is maintained and appropriate flight operations procedures are followed. However, notwithstanding those instruments and procedures, as stated in Notice 74-32, a number of air carrier accidents involving large turbine-powered airplanes have been caused by inadvertent contact with the ground, and might have been avoided if a ground proximity warning system had been installed to give warning of the impending disaster to the flight crew.

Several commentators pointed out that the warning system should operate during non-precision approaches. The FAA agrees, and any system for which approval is sought under new § 121.360 must be capable of providing warnings during non-precision approaches.

A number of comments were received with respect to the kind of warnings to be given. One commentator suggested that a visual warning should not be required, since it could distract the pilot from taking corrective action. For the same reason, another commentator stated that the warning should not operate continuously until the hazardous condition no longer exists and should be capable of being muted or cancelled.

The FAA believes that a ground proximity warning system should provide automatic and distinct aural and visual warnings with no required input from the flight crew, and that it should operate continuously as long as a terrain

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hazard exists, since the cessation of the warning might lead to a mistaken belief that the hazard no longer exists. The FAA does not agree that the continuous operation of either the visual or the aural warning will distract the pilot from taking corrective action.

With respect to comments concerning the capability of the equipment that would be required under the proposed rule, it should be noted that the equipment must be capable of providing not only a warning based on the rate of descent of the aircraft and the height of the aircraft above the terrain directly beneath the aircraft, but also a warning based on the computed height of the aircraft above the terrain along the aircraft's projected flight path. The rule, as adopted, has been clarified so that it clearly states this requirement and the other requirements for approval discussed in the preamble to Notice 74-32.

One commentator contended that turbopropeller-powered airplanes should not be required to have the proposed warning system because they do not have "sink rates" as high as those of turbojet-powered airplanes, they are more responsive to the application of power, and they are less subject to an insidious loss of altitude after takeoff. In addition, the commentator indicated that the proposed warning system requirement would cause engineering and installation problems for older aircraft. The FAA does not agree that turbopropeller-powered airplanes should be excepted from this requirement, since a review of air carrier accidents involving inadvertent contact with the ground does not support such an exception.

One commentator questioned whether the rule as proposed would require a ground proximity warning system separate from all other aircraft systems. It was not the intent of the FAA to preclude the integration of such a warning system with other aircraft systems when compatability exists.

Certain commentators pointed out that the requirement in proposed § 121.360 (a), that the ground proximity warning system provide a warning at any height less than 3,000 feet above the ground, is not appropriated in the light of the capability of radio altimeters presently in use in large turbine-powered airplanes. The FAA agrees, and § 121.360(a), as adopted, requires only that the system provide a warning at any height less than 2,500 feet.

A number of commentators urged the FAA to expedite the development of standards for ground proximity warning systems. As stated in Notice 74-32, the FAA has initiated a study to develop either a Technical Standard Order or an amendment to Part 25 establishing specific standards. The FAA expects to issue those standards in the very near future. However, pending the development of such standards the FAA intends to continue to approve the installation of ground proximity warning systems through the issuance of supplemental type certificates after compliance has been shown with the general equipment requirements of Part 25.

The phrase "impending terrain hazard" in proposed § 121.360(a) has been changed to "imminent inadvertent contact with the ground," so as to more clearly describe the hazard for which the system must provide a warning.

Proposed § 121.360(c) would have prohibited the operation of a large turbine-powered airplane under Part 121 6 months after the effective date of the amendment unless it had been equipped with a radio altimeter that automatically provides a discrete aural warning when the airplane descends below a predetermined height between 1,000 and 500 feet above the ground. In view of the shortening of the period for compliance with § 121.360(a) to require the installation of ground proximity warning systems by December 1, 1975, proposed § 121.360(c) has not been adopted.

In lieu of proposed § 121.360(d), a reference to new § 121.360 has been added to § 121.303(d)(2). This will prohibit the takeoff of any large turbine-powered airplane being operated under Part 121 unless the ground proximity warning system required by § 121.360 is in operable condition. However, § 121.627(c) will allow the continuation of a flight beyond a terminal point with the equipment inoperative if the minimum equipment list and procedures for the continuation of flight are included in the certificate holder's manual.

(Secs. 313(a), 601, 603, and 604 of the Federal Aviation Act of 1958; 49 U.S.C. 1354(a), 1421, 1423, and 1424. Sec. 6(c) of the Department of Transportation Act; 49 U.S.C. 1655(c))

In consideration of the foregoing, and for the reasons stated in Notice No. 74-32, Part 121 of the Federal Aviation Regulations is amended, effective January 23, 1975, as follows:

**§ 121.303 [Amended]**

1. By amending paragraph (d)(2) of § 121.303 by deleting the phrase "and 121.359" and substituting therefor the phrase ", 121.359, and 121.360".

2. By adding a new § 121.360 immediately after § 121.359 to read as follows:

**§ 121.360 Ground proximity warning systems.**

(a) After December 1, 1975, no person may operate a large turbine-powered airplane unless it is equipped with an approved ground proximity warning system that is designed, constructed, and installed to provide a warning of imminent inadvertent contact with the ground.

(b) The ground proximity warning system required by paragraph (a) of this section must:

(1) Operate at any height less than 2,500 feet above the ground;

(2) Provide both visual and aural warnings that—

(i) Initiate simultaneously and are distinct from each warning provided by any other aircraft warning device;

(ii) Initiate automatically without any crewmember action; and

(iii) Operate continuously until the hazardous condition no longer exists; and

(3) Provide warnings based on the—

(i) Rate of descent of the aircraft (including any negative rate of climb after takeoff) in relation to the height of the aircraft above the terrain directly beneath the aircraft;

(ii) Computed height of the aircraft above the terrain along the aircraft's projected flight path;

(iii) Landing gear and flap positions of the aircraft; and

(iv) Performance capability of the aircraft.

Issued in Washington, D.C., on December 18, 1974.

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*Administrator.*