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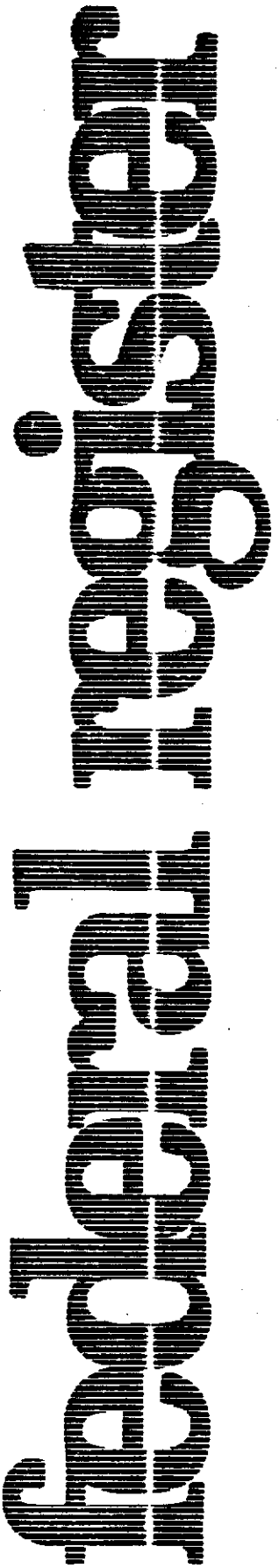

Thursday
December 5, 1991

Part II

Department of Transportation

Federal Aviation Administration

14 CFR Parts 25, 121 and 125
Landing Gear Aural Warning; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 25, 121 and 125

[Docket No. 25991, Amendment Nos. 25-75, 121-227, and 125-16]

RIN 2120-AC82

Landing Gear Aural Warning

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: These amendments to the Federal Aviation Regulations (FAR) update the airworthiness standards for landing gear aural warning systems in transport category airplanes to reflect current design practices. They require that if a landing is attempted when the landing gear is not locked down, the flightcrew must be given an aural warning in sufficient time to allow the landing gear to be locked down or a go-around to be made. These amendments state the intent of the current regulations in more objective terms to eliminate nuisance warnings and to simplify the certification process.

EFFECTIVE DATE: January 6, 1992.

FOR FURTHER INFORMATION CONTACT: Gene Vandermolen, Flight Test and Systems Branch (ANM-111), Transport Airplane Directorate, Aircraft Certification Service, FAA, 1601 Lind Ave. SW., Renton, Washington 98055-4056; telephone (206) 227-2135.

SUPPLEMENTARY INFORMATION:

Background

This amendment is based on Notice of Proposed Rulemaking (NPRM) 89-20 (54 FR 34116, August 17, 1989). As discussed in the notice, parts 25, 121, and 125 of the FAR contain similarly worded requirements for a landing gear aural warning system. The function of this system is to provide the flightcrew with an aural alert if the landing gear is not extended and locked at the appropriate time. For example, § 25.729(e), as amended by Amendment 25-42 (43 FR 2302, January 16, 1978) states, in pertinent part, that:

(2) Landplanes must have an aural warning device that will function continuously when one or more throttles are closed, if the landing gear is not fully extended and locked.

(3) If there is a manual shutoff for the aural warning device prescribed in paragraph (e)(2) of this section, the warning system must be designed to [sic] that, when the warning has been suspended after one or more throttles are closed, subsequent retardation of any throttle to or beyond the position for a normal landing approach will activate the aural warning.

(4) Landplanes must have an aural warning device that will function continuously, when the wing flaps are extended beyond the maximum approach position determined under § 25.67(e), if the gear is not fully extended and locked. There may not be a manual shutoff for this warning device. The flap position sensing unit may be installed at any suitable location. The system for this device may use any part of the system (including the aural warning device) for the device required in paragraph (e)(2) of this section.

These standards are very specific as to when the aural warning system should function. While they were appropriate in that regard for the reciprocating-powered airplanes, the standards were later found to be inappropriate for the operation of modern turbojet-powered airplanes for the following reasons:

a. An aural warning is required by the FAR whenever the thrust levers are retarded and the landing gear is not fully extended and locked. Since this often occurs at the start of descent, at an altitude that is inappropriate for gear extension, the warning is immediately canceled by the crew. This untimely alert and the subsequent cancellation causes flightcrew distraction. Once the warning is canceled, there is no warning to the flightcrew just prior to landing if it is needed.

b. If an engine fails immediately after takeoff, the pilot must immediately raise the landing gear to minimize airplane drag and retard the thrust lever on the failed engine. This results in an immediate aural warning that is inappropriate for the situation. Furthermore, it could create a hazardous distraction to members of the flightcrew when they are coping with the engine failure.

c. An aural warning is also required when the flaps are extended beyond the maximum setting for approach and the landing gear is not fully extended and locked. This is appropriate for reciprocating-powered airplanes, which typically have landing flap settings that are greater than the approach and takeoff flap settings. Today some turbine-powered airplanes have flap settings that are the same for approach and takeoff as for landing. For those airplanes, compliance with these standards results in an inappropriate aural warning when the landing gear is raised after takeoff. Furthermore, no warning is provided when nonstandard flap settings and thrust levels are used for one-engine-inoperative approaches.

In order to preclude such nuisance or inappropriate aural warnings, modern transport category airplanes typically have means to inhibit the aural warning system during some phases of flight. Because the warning systems on these airplanes do not comply with the existing certification and operational standards, findings of equivalent level of safety or exemptions are necessary. This process is time-consuming and may result in type certification delays. Furthermore, as noted above, the means to inhibit the warning system may result in no warning to the flightcrew at the very time a warning is needed.

The fundamental problem with the current standards is that they fail to state the safety intent, but instead state how the requirements should be met. Therefore, the regulations on landing gear aural warning are being revised to state the performance objectives without stating how the requirements should be implemented. This allows the manufacturers to use their ingenuity in designing systems that minimize nuisance warnings.

It should be noted that the term "throttle" is a carry-over from reciprocating-powered airplanes and is a misnomer insofar as turbine-powered airplanes are concerned. The term "thrust lever" is generally used instead for turbine-powered airplanes.

Discussion of Comments

Several commenters responded to the request for comments contained in Notice 89-20. These included the public, foreign authorities, industry, and manufacturers.

One of the airplane manufacturers is concerned that the new rule might not allow a system in which the aural warning is silenced when the flightcrew selects the landing gear handle down rather than when the landing gear is actually down and locked. The commenter contends that the former configuration should be acceptable.

The FAA does not concur. The objective of the old rule, which required a continuous aural warning until the landing gear was fully extended and locked, was to provide warning of either flightcrew error or failure of the landing gear to extend and lock. That objective is unchanged. The system described by the commenter would not be acceptable under either the old rule or the amended rule.

Many commenters object to the proposed rule's not allowing a manual shutoff for the aural warning. Examples are given of situations during which deliberate silencing of the aural warning would be desirable. These commenters do not believe that nuisance alerts could be completely eliminated no matter how sophisticated the design might be.

In consideration of these comments, the FAA agrees that a manual shutoff

should not be prohibited; however, the control device that shuts off the aural warning must be designed so that it cannot be inadvertently actuated by the flightcrew. It also should not be so convenient to the flightcrew that it is operated by habitual reflexive action (i.e., like an autopilot disconnect switch on the control wheel). It should be obvious to the flightcrew, or a means should be provided to inform the flightcrew, when the manual control device has been positioned to silence the warning.

One commenter suggests that the following design requirements be instituted: (1) The warning system should incorporate a means to inhibit the warning based on high airspeed and/or altitude to eliminate nuisance warnings during descent, (2) The warning system should be designed to re-energize the aural warning after a time delay when it is manually silenced, and (3) The warning system should retain the "gear not down—landing flaps selected" feature.

The FAA does not concur with the suggestion, because adding design requirements to the rules would dictate specific design. Requirement (1) above may be one means for preventing nuisance warnings, but not the only means. Requirement (2) is considered unnecessary because the majority of nuisance warnings will be eliminated by careful system design. Also, if the flightcrew deliberately silences the aural warning in an emergency situation, for example, recurring warnings could be disruptive. Requirement (3) would not be needed if the objective of the rule is met; namely, that an aural warning must be given if a landing is attempted when the landing gear is not locked down. It should be noted that this amendment is needed because the existing landing gear aural warning rules were too specific. Stating the requirements in an objective manner provides more latitude in tailoring the system to the specific airplane involved.

One commenter is concerned about the interpretation of the requirement that failures of systems which provide inhibit logic to the aural warning system, that would prevent the aural warning system from operating, must be improbable. The commenter believes "improbable" has a wide probability range and should be clearly defined.

The FAA does not agree that the term "improbable" is not clearly defined. Though it does have a wide probability range, that range is defined precisely in AC 25.1309-1A. This requirement would be satisfied by meeting the upper boundary of the probability range given in the AC.

The European Joint Aviation Authorities (JAA) suggest that the FAA and JAA requirements for landing gear aural warning should be standardized. For a number of years the JAA D and F Study Group has also been working on a revision to the landing gear aural warning requirements contained in Joint Aviation Requirements (JAR) 25.729(e) (2), (3) and (4). The intent of the JAR revision is the same as that proposed in NPRM 89-20. However, the FAA revision includes a statement that emphasizes the need to eliminate false or inappropriate alerts in the design of the system. It also contains a reliability requirement for systems that provide inhibit logic to the aural warning system. These requirements are considered necessary to assure a design of high reliability.

The FAA concurs that U.S. and European requirements should be standardized wherever feasible. Therefore, the FAA is adopting the JAR revision of § 25.729(e) (2), (3), and (4). In addition, § 25.729(e) (5) and (6) are being added as follows:

(5) The system used to generate the aural warning must be designed to eliminate false or inappropriate alerts.

(6) Failures of systems used to inhibit the landing gear aural warning, that would prevent the warning system from operating, must be improbable.

These are all minor nonsubstantive changes that place no additional burden on any person. Except for the changes noted above, the amendments are adopted as proposed in Notice 89-20.

Regulatory Evaluation

This section summarizes the regulatory evaluation prepared by the FAA on The Landing Gear Aural Warning System. The summary discusses expected costs and benefits of these amendments.

Executive Order 12291, dated February 17, 1981, directs Federal agencies to promulgate new regulations or modify existing regulations only if potential benefits to society for each regulatory change outweigh potential costs. The order also requires the preparation of a Regulatory Impact Analysis of all "major" rules except those responding to emergency situations or other narrowly defined exigencies. A "major" rule is one that is likely to result in an annual effect on the economy of $100 million or more, a major increase in consumer costs, or a significant adverse effect on competition.

The FAA has determined that this rule is not "major" as defined in the executive order; therefore, a full regulatory analysis, that includes the identification and evaluation of cost reducing alternatives to this rule, has not been prepared. Instead, the agency has prepared a more concise document termed a regulatory evaluation that analyzes only this rule without identifying alternatives. In addition to a summary of the regulatory evaluation, this section also contains a regulatory flexibility determination required by the 1980 Regulatory Flexibility Act (Pub.L. 96-354) and an international trade impact assessment.

This rule will amend the airworthiness standards for transport category airplanes (part 25). The existing standards are specific with respect to method of compliance and are more appropriate for reciprocating-powered airplanes than for modern turbojet-powered airplanes. The rule states the objectives of the requirements without stating how the requirements should be implemented, thereby allowing manufacturers to use their ingenuity in designing systems. The rule will not affect existing certificated aircraft.

None of the comments received in response to Notice 89-20 pertain to the economic evaluation.

This rule updates the airworthiness standards for landing gear aural warning systems in transport category airplanes to reflect current design practices. However, the rule will not affect existing certificated airplanes and hence, will not result in incremental compliance costs to operators or to manufacturers of airplanes. Furthermore, the rule relieves the aircraft manufacturing industry of the burden of following regulations that have become outdated due to technological change, and eliminates a manufacturer's need to apply for exemptions in order to utilize technologies that are not in technical compliance with the FAR, but nevertheless meet the safety requirements of the FAA.

This rule will allow aircraft manufacturers to remain in regulatory compliance without asking the FAA for equivalent-level-of-safety findings. The rule will impose no compliance costs. However, there is a small cost savings to the FAA amounting to approximately $68,000, discounted over the next ten years. Hence, this rule is considered cost beneficial by the FAA.

This rule will not affect foreign or domestic operators or manufacturers. Hence, the rule will have no impact on international trade. Since this rule has no cost impact, a substantial number of small entities including airplane manufacturers and operators under

parts 121 and 125 will not incur significant economic costs.

Federalism Implications

The regulations contained herein do not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this amendment does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Conclusion

Because the regulations contained herein are expected to result only in negligible costs, the FAA has determined that this rule is not major as defined in Executive Order 12291. Because this is an issue that has not prompted a great deal of public concern, this rule is not considered to be significant as defined in Department of Transportation Regulatory Policies and Procedures (44 FR 11034, February 26, 1979). In addition, since there are no small entities affected by this rule, it is certified under the criteria of the Regulatory Flexibility Act that this rule, at promulgation, will not have a significant economic impact, positive or negative, on a substantial number of small entities.

List of Subjects

14 CFR Part 25

Aircraft, Aviation safety, Safety.

14 CFR Part 121

Aircraft, Airplanes, Airworthiness, Pilots.

14 CFR Part 125

Aviation safety, Safety, Air carriers, Aircraft pilots, Airplanes, Pilots.

The Amendment

Accordingly, parts 25, 121, and 125 of the Federal Aviation Regulations (FAR) (14 CFR parts 25, 121, and 125) are amended as follows:

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

1. The authority citation for part 25 continues to read as follows:

Authority: 49 U.S.C. 1344, 1354(a), 1355, 1421, 1423, 1424, 1425, 1428, 1429, 1430; 49 U.S.C. 106(g).

2. By amending § 25.729, by revising paragraphs (e)(2) through (e)(4) and by adding paragraphs (e)(5) and (e)(6) to read as follows:

§ 25.729 Retracting mechanism.

* * * * *

(e) * * *

(2) The flightcrew must be given an aural warning that functions continuously, or is periodically repeated, if a landing is attempted when the landing gear is not locked down.

(3) The warning must be given in sufficient time to allow the landing gear to be locked down or a go-around to be made.

(4) There must not be a manual shut-off means readily available to the flightcrew for the warning required by paragraph (e)(2) of this section such that it could be operated instinctively, inadvertently, or by habitual reflexive action.

(5) The system used to generate the aural warning must be designed to eliminate false or inappropriate alerts.

(6) Failures of systems used to inhibit the landing gear aural warning, that would prevent the warning system from operating, must be improbable.

* * * * *

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

3. The authority citation for part 121 continues to read as follows:

Authority: 49 U.S.C. 1354(a), 1355, 1356, 1357, 1401, 1421–1430, 1472, 1485, and 1502; 49 U.S.C. 106(g).

4. By amending § 121.289 by revising the introductory text of paragraph (a) to read as follows:

§ 121.289 Landing gear: Aural warning device.

(a) Except for airplanes that comply with the requirements of § 25.729 of this chapter on or after January 6, 1992, each large airplane must have a landing gear aural warning device that functions continuously under the following conditions:

* * * * *

PART 125—CERTIFICATION AND OPERATIONS: AIRPLANES HAVING A SEATING CAPACITY OF 20 OR MORE PASSENGERS OR A MAXIMUM PAYLOAD CAPACITY OF 6,000 POUNDS OR MORE

5. The authority citation for part 125 continues to read as follows:

Authority: 49 U.S.C. 1354, 1421 through 1430, and 1502; 49 U.S.C. 106(g).

6. By amending § 125.187 by revising the introductory text of paragraph (a) to read as follows:

§ 125.187 Landing gear: Aural warning device.

(a) Except for airplanes that comply with the requirements of § 25.729 of this chapter on or after January 6, 1992, each airplane must have a landing gear aural warning device that functions continuously under the following conditions:

* * * * *

Issued in Washington, DC, on November 26, 1991.

James B. Busey,

Administrator.

[FR Doc. 91-29033 Filed 12-4-91; 8:45 am]

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