

DEPARTMENT OF TRANSPORTATION**Federal Aviation Administration****14 CFR Parts 27 and 29**

[Docket No. 27681; Amendment No. 27-32, 29-38]

RIN 2120-AE88

Airworthiness Standards; Occupant Protection in Normal and Transport Category Rotorcraft

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: The Federal Aviation Administration (FAA) is amending the airworthiness standards to improve occupant protection in normal and transport category rotorcraft. These amended standards significantly increase the static design ultimate inertial load factors for restraining heavy items located above or behind the occupied areas during emergency landings. These increased load factors also apply to certain cargo and baggage compartments. These amendments further complement and enhance the standards previously adopted for occupant restraint and protection in normal and transport category rotorcraft in the event of a survivable emergency landing.

EFFECTIVE DATE: June 11, 1996.

FOR FURTHER INFORMATION CONTACT: Mr. Mike Mathias, Regulations Group, Rotorcraft Directorate, Aircraft Certification Service, FAA, Fort Worth, Texas 76193-0111, telephone number (817) 222-5110.

SUPPLEMENTARY INFORMATION:

Background

These amendments are based on Notice of Proposed Rulemaking (NPRM) No. 94-8, which was published in the Federal Register on April 11, 1994 (59 FR 17156). That notice proposed to amend the occupant protection airworthiness standards of 14 CFR parts 27 and 29 (parts 27 and 29) to increase the ultimate inertial load factors in §§ 27.561(c) and 29.561(c) and to add a new 1.5g rearward design load factor to §§ 27.561(b) and 29.561(b). The amended standards of §§ 27.561(c) and 29.561(c) would apply to restraining heavy items located above and behind the cabin and other occupied areas against the loads created during emergency landings; and the amended standards of §§ 27.561(b) and 29.561(b) would apply to restraining and protecting occupants and restraining heavy items in the cabin and other

occupied areas against the loads created during emergency landings. In addition, the amended standards of §§ 27.561 (b) and (c) and 29.561 (b) and (c) would apply to current cargo and baggage compartment standards by their reference within the text of §§ 27.787 and 29.787.

The Crash Resistant Fuel Systems (CRFS) in Normal and Transport Category Rotorcraft Final Rule, Amendments 27-30 and 29-35 (59 FR 50380, October 3, 1994), amended the fuel tank and compartment standards of §§ 27.963 and 29.963 (which utilized the inertial factors contained in §§ 27.561 and 29.561, respectively) to specifically state the CRFS inertial factor standards in §§ 27.952(b)(2) and 29.952(b)(2). However, the specific inertial factors adopted in §§ 27.952(b)(2) and 29.952(b)(2) for fuel tanks located above or behind the occupied areas are lower than those factors adopted in these amendments. The FAA will consider whether further rulemaking is necessary to increase the inertial load factors for CRFS design in §§ 27.952(b)(2) and 29.952(b)(2) to the levels of those adopted in §§ 27.561(c) and 29.561(c) of these amendments.

In summary, occupant protection will be enhanced through the increased strength requirements for retention of items of mass, such as engines, transmissions, and baggage and cargo compartment contents located above or behind occupied areas. These amended standards stem from recommendations from the Aviation Rulemaking Advisory Committee (ARAC) to increase certain design inertial load factors. These amended standards will complement and enhance the occupant protection standards adopted by Amendments 27-25 and 29-29 (54 FR 47310, November 13, 1989) for survivable emergency landings.

Discussion of Comments

Interested persons have been afforded an opportunity to participate in the making of these amendments. Due consideration has been given to the comments received from the four commenters. The commenters are the Civil Aviation Authority (CAA) Australia, the Airline Pilots Association (ALPA), the Association Europeenne des Constructeurs de Material Aerospacial (AECMA), and the National Transportation Safety Board (NTSB).

The CAA agrees that increased design inertial load factors are appropriate but questions the logic in the difference between design factors for occupant restraint and protection previously adopted for interior items and the proposed factors for restraint of external

items. This commenter recommends adoption of the larger design inertial factors found in §§ 27.561(b) and 29.561(b) applicable to restraint of occupants and cabin items rather than the factors proposed. The commenter highlights the differences between the two sets of design inertial factors.

ALPA supports the proposal but requests that the FAA determine if the proposed 1.5g rearward inertial factor for seats is sufficient in light of a possible emergency landing scenario in which the rotorcraft would itself rotate 180 degrees and cause the seats and occupants to exceed the 1.5g design inertial load factor.

AECMA notes that publication and prompt adoption of the final rule as proposed are essential to harmonize these sections of the Federal Aviation Regulations with the comparable European Joint Aviation Regulations (JAR) 27 and 29 Rotorcraft Standards.

The NTSB comments that the proposed standards represent a significant advancement in occupant protection and in crashworthiness of normal and transport category rotorcraft and supports the proposal.

The FAA acknowledges the CAA's concern with proposed differing design inertial factors and attempted to address these concerns in the preamble of Notice No. 94-8 under the heading "FAA Evaluation of ARAC Recommendation." In addition, the information in Report No. DOT/FAA/CT-85/11, "Analysis of Rotorcraft Crash Dynamics for Development of Improved Crashworthiness Design Criteria," June 1985, was the genesis for the inertial factors contained in a previous amendment to §§ 27.561 and 29.561. According to that report, inertial factors for restraint of external items can safely differ from the factors for interior items since severe injury due to penetration into the cabin is not identified as a significant hazard in that earlier report. However, the increased design inertial factors proposed in Notice 94-8 will improve both occupant protection from external items and rotorcraft structural crashworthiness.

The FAA understands ALPA's concern about the adequacy of the 1.5g rearward load factor in the event of an emergency landing impact in which the rotorcraft fuselage is either fully or partially reversed for some time interval during the overall impact sequence. Some cases of reverse impact could exceed the proposed rearward load factor. However, FAA research has considered the overall spectrum of reverse impacts and that research shows that occurrences of severe, sustained reverse impacts are remote. This

research also shows that reverse impacts constitute an extremely small portion of all rotorcraft impacts. In addition, the research shows that the gravity forces felt by occupants are significantly less in most reverse impacts because of the larger crushing distances inherent in most rotorcraft aft fuselage structures and because the reverse direction of the impact is typically not sustained. Additional fuselage motion such as tumbling and further rotation usually occur, thus the full impact is not in a reverse direction. Therefore, the total impact energy dissipated in a reverse impact is considered minimal. In addition, the complementary inertial design factors in §§ 27.561(b) and 29.561(b), as well as the companion dynamic test standards in §§ 27.562 and 29.562, inherently provide strength for occupant protection in the event of a reverse impact. Therefore, the FAA has determined that the 1.5g rearward inertial factor is an adequate, practical safety standard.

In response to AECMA's concern that the publication date of this final rule correspond to the publication date of the JAR amendment, the FAA is committed to processing this final harmonized rule so that it can be published as near as possible to the publication date of the JAR.

The CAA also recommends application of a 1.33 inertial attachment factor for litter and berth installations as a logical application of the seat design standard found in §§ 27.785(f)(2) and 29.785(f)(2) but recognizes that this request exceeds the scope of the proposal. The CAA further recommends a research program to address litter installations and litter occupant protection. To improve protection of litter occupants, the FAA anticipates conducting an internal FAA research program to address litter installations for airplanes and rotorcraft.

After considering all of the comments, the FAA has determined that air safety and the public interest require adoption of the amendments as proposed.

Regulatory Evaluation Summary

Proposed changes to federal regulations must undergo several economic analyses. First, Executive Order 12866 directs that each Federal agency shall propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic effect of regulatory changes on small entities. Third, the Office of Management and Budget directs agencies to assess the effect of

regulatory changes on international trade. In conducting these analyses, the FAA has determined that this rule: (1) Will generate benefits exceeding its costs and is not significant as defined in Executive Order 12866; (2) is not significant as defined in DOT's Policies and Procedures; (3) will not have a significant impact on a substantial number of small entities; and (4) will not affect international trade. These analyses, available in the docket, are summarized below.

Cost-Benefit Analysis

The increased forward, sideward, and downward load factors can be accommodated without changing current design practices. In many cases, sizable increases in load factors have been achieved by the use of larger bolts and/or fasteners and minor reinforcements to attach items of mass to the rotorcraft structure. The addition of 1.5g rearward load factors will require no design or production modifications because the 12g and 16g forward load factors of the new and current standards will inherently result in sufficient structural strength to meet this rearward requirement.

Consequently, the amendments that add and revise requirements will impose little or no incremental costs on rotorcraft manufacturers. Additionally, they will impose no or minimal weight penalties and operating costs on rotorcraft operators.

Occupant safety will be enhanced by the amendments, but this enhancement is difficult to quantify. The FAA study, "Analysis of Rotorcraft Crash Dynamics for Development of Improved Crashworthiness Design Criteria" (Report No. DOT/FAA/CT-85/11, June 1985), identified separation of items of mass from the rotorcraft structure and penetration into occupied areas as one of 14 hazards associated with otherwise survivable rotorcraft accidents. Such occurrences have resulted in approximately one injury (of at least moderate severity) per year. The benefits of averting just one such occurrence will more than offset the negligible costs of the rule. The FAA therefore finds the rule to be cost-beneficial.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) was enacted by Congress to ensure that small entities are not unnecessarily and disproportionately burdened by Federal regulations. The RFA requires a Regulatory Flexibility Analysis if a rule has significant economic impact on a substantial number of small entities. FAA Order

2100.14A outlines FAA's procedures and criteria for implementing the RFA. The FAA has determined that this rule will not have a significant economic impact on a substantial number of small manufacturers or operators of rotorcraft because there are no small rotorcraft manufacturers, as that term is defined in the Order.

International Trade Impact Assessment

This rule will not constitute a barrier to international trade, including the export of American goods and services to foreign countries and the import of foreign goods and services into the United States. Each applicant for a new type certificate for a transport or normal category rotorcraft, whether the applicant be U.S. or foreign, will be required to show compliance with this rule. This rule will have no effect on the sale of U.S. rotorcraft in foreign markets and the sale of foreign rotorcraft in the United States.

Federalism Implications

The regulations adopted herein will not have substantial direct effects on the states, on the relationships 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 regulation will not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Conclusion

For the reasons stated above, including the findings of the Regulatory Flexibility Determination and the International Trade Impact Analysis, the FAA has determined that this regulation is not a significant regulatory action under Executive Order 12866. In addition, the FAA certifies that this regulation will not have a significant economic impact on a substantial number of small entities under the criteria of the Regulatory Flexibility Act. This rule is not considered significant under DOT Regulatory Policies and Procedures (44 FR 11034; February 26, 1979). A regulatory evaluation of this regulation, including a Regulatory Determination and Trade Impact Analysis, has been placed in the docket. A copy may be obtained by contacting the person identified under the section entitled **FOR FURTHER INFORMATION CONTACT**.

List of Subjects in 14 CFR Parts 27 and 29

Air transportation, Aircraft, Aviation safety, Rotorcraft, Safety.

The Amendments

Accordingly, the Federal Aviation Administration amends 14 CFR parts 27 and 29 of the Federal Aviation Regulations as follows:

PART 27—AIRWORTHINESS STANDARDS: NORMAL CATEGORY ROTORCRAFT

1. The authority citation for part 27 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701–44702, 44704.

2. Section 27.561 is amended by adding new paragraphs (b)(3)(v) and (c)(5) and by revising paragraphs (c)(2), (c)(3), and (c)(4) to read as follows:

§ 27.561 General.

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- (b) * * *
- (3) * * *
- (v) Rearward—1.5g.
- (c) * * *
- (2) Forward—12g.
- (3) Sideward—6g.
- (4) Downward—12g.
- (5) Rearward—1.5g.

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PART 29—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY ROTORCRAFT

3. The authority citation for part 29 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701–44702, 44704.

4. Section 29.561 is amended by adding new paragraphs (b)(3)(v) and

(c)(5) and by revising paragraphs (c)(2), (c)(3), and (c)(4) to read as follows:

§ 29.561 General.

* * * * *

- (b) * * *
- (3) * * *
- (v) Rearward—1.5g.
- (c) * * *
- (2) Forward—12g.
- (3) Sideward—6g.
- (4) Downward—12g.
- (5) Rearward—1.5g.

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Issued in Washington, DC, on March 8, 1996.

David R. Hinson,
Administrator.

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