129329 FAA-99-5835-9

[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-1999-5835; Amendment No. 25-103 **]** EP 5/10/01

RIN 2120–AG72

~~Title:~~ Revised Landing Gear Shock Absorption Test Requirements

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This amendment revises the airworthiness standards for landing gear shock absorption test requirements for transport category airplanes by incorporating changes developed in cooperation with the Joint Aviation Authorities (JAA) of Europe and the U.S. and European aviation industry through the Aviation Rulemaking Advisory Committee (ARAC). This amendment reduces the number of design weight conditions required to be demonstrated by shock absorption tests and changes the objective of the tests to include the complete validation of the landing gear dynamic characteristics. This amendment also removes some means of compliance criteria from the rule since it is more appropriately set forth in advisory material.

DATE: Effective [*Insert date 30 days after date of publication in the Federal Register.*]

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SUPPLEMENTARY INFORMATION:

Availability of Final Rules

You can get an electronic copy using the Internet by taking the following steps:

(1) Go to the search function of the Department of Transportation's electronic Docket Management System (DMS) Web page (http://dms.dot.gov/search).

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(3) On the next page, which contains the Docket summary information for the Docket you selected, click on the final rule.

You can also get an electronic copy using the Internet through FAA's web page at http://www.faa.gov/avr/arm/nprm/nprm.htm or the Federal Register's web page at http://www.access.gpo.gov/su_docs/aces/aces140.html.

You can also get a copy by submitting a request to the Federal Aviation Administration, Office of Rulemaking, ARM-1, 800 Independence Avenue S.W., Washington, D.C. 20591, or by calling (202) 267-9680. Make sure to identify the amendment number or docket number of this final rule.

Small Business Regulatory Enforcement Fairness Act

The Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996, requires the FAA to comply with small entity requests for information or advice about compliance with statutes and regulations within its jurisdiction. Therefore, any small entity that has a question regarding this document may contact their local FAA official, or the person listed under FOR FURTHER INFORMATION CONTACT. You can find out more about SBFEFA on the Internet at our site

http://www.faa.gov/avr/arm/sbrefa.htm. For more information on SBREFA, e-mail us at 9-AWA-SBREFA@faa.gov.

Background

The manufacturing, marketing and certification of transport airplanes is increasingly an international endeavor. In order for United States manufacturers to export transport airplanes to other countries, the airplane must be designed to comply, not only with the U.S. airworthiness requirements for transport airplanes (14 CFR part 25), but also with the transport airworthiness requirements of the countries to which the airplane is to be exported.

The European countries have developed a common airworthiness code for transport airplanes that is administered by the JAA of Europe. This code is the result of a European effort to harmonize the various airworthiness codes of the European countries and is called the Joint Aviation Requirements (JAR)-25. It was developed in a format similar to part 25. Many other countries have airworthiness codes that are aligned closely to part 25 or to JAR-25, or they use these codes directly for their own certification purposes.

The ARAC was established by the FAA on February 15, 1991, with the purpose of providing information, advice, and recommendations to be considered in rulemaking activities. By notice in the Federal Register (59 FR 30081, June 10, 1994), the FAA assigned several new tasks to an ARAC working group of industry and government structural loads specialists from Europe, the United States, and Canada. Task 6 of the working group charter concerned the shock absorption test requirements for landing gear.

The ARAC working group completed its work for this task and the ARAC made recommendations to the FAA by letter dated October 29, 1997.

Although the requirements for landing gear shock absorption tests are essentially the same between the Federal Aviation Regulations (FAR) and JAR, the requirements do not address the capabilities of modern technology and do not take into account other related changes in the requirements for landing gear load conditions that have already been incorporated into other sections of the FAR. When the landing loads requirements for transport airplanes were originally developed, they required the landing load factors to be determined and applied to the airplane. The airplane was treated as a rigid body and the landing loads were applied to this rigid representation of the airplane for the purpose of structural analysis. For the early landing gear systems, analysis alone was considered sufficient for determining the landing load factor that will be applied to the rigid airplane. It was only necessary to determine the landing load factor (by analysis or tests) and this load factor will then be used to design and substantiate the airplane for the landing load conditions.

The development of more complex landing gear systems, for which analysis alone was unreliable, led to the adoption of a requirement to verify the landing load factor by actual shock absorption tests. This requirement was added to the Civil Air Regulations (CAR) 4b, which was the predecessor to part 25. These shock absorption tests were allowed by § 4b.200 of the CAR to be free drop tests in which the gear alone, could be dropped in free fall to impact the ground. In these tests, mass is added to represent the proportion of the airplane weight on the landing gear unit, and the mass may be reduced to account for the effects of airplane lift acting during the landing impact. Later, the

corresponding requirement in § 25.723(a), was modified to allow the substantiation of some changes to the landing gear shock absorption systems by analysis alone without verification by tests.

Prior to this amendment, §§ 25.473(d) and 25.723(a) for shock absorption tests required just the determination of the limit landing load factor from the shock absorption test. However, the landing gear shock absorption systems had become even more sophisticated and the airplane structure had become more flexible. Part 25 was previously revised to require that determinations of airplane loads in the landing configuration take into account the dynamic flexibility of the airplane. In order to determine the airplane loads in the landing load conditions, it was no longer sufficient to determine just the load factor from a drop test of a landing gear unit. A comprehensive analysis of the combined dynamic systems for the landing gear and airplane had become essential in order to determine the structural design loads for the airplane. In developing the mathematical model, it is necessary to provide an accurate representation of all the landing gear dynamic characteristics. This includes the energy absorption characteristics and the time histories of force and displacement during a landing impact.

Notice 99-08 was published in the Federal Register on June 18, 1999 (64 FR 32978). The notice proposed to revise the main objective of the shock absorption tests to be the validation of the landing gear dynamic characteristics which make up the analytical model rather than just to determine the landing load factors. In addition, the number of actual design weight conditions were proposed to be reduced to include just the design landing weight, or design take-off weight, whichever provided the greatest landing impact energy. Furthermore, §§ 25.725 and 25.727 were proposed to be removed

from part 25, since these sections only contained criteria for one means of compliance to the shock absorption test requirement. These criteria were proposed to be set forth as acceptable means of compliance in Advisory Circular (AC) 25.723-1 "Shock Absorption Tests."

Discussion of comments

There are 6 commenters from aviation manufacturers and foreign airworthiness authorities. Although one commenter objects to the proposed rule, most of the commenters support the proposed changes. Several of the commenters provide suggestions for clarity, consistency and organization. Comments are summarized as follows along with disposition.

One commenter objects to the proposed change in the basic purpose of the shock absorption test from the validation of the load factors to the validation of the dynamic characteristics of the landing gear. The commenter believes that the new proposal has the potential for requiring a significant volume of recalculation for refinement of load values and this would be neither productive nor cost effective. Furthermore, the commenter believes that this approach would not fit well in the timeline between design concept and the development of the first prototype and so would bring the potential for discovering a different answer for the completed product late in the design process. Finally, the commenter believes the existing regulations are sufficient. The FAA agrees that validation of dynamic characteristics by test always brings a risk if the assumptions made in the prediction of these characteristics are not sufficiently accurate or conservative. However, the process of prediction, design, and validation are normal, and expected, in the development of aircraft and the risks can be minimized by the use of conservative

assumptions. Furthermore, the FAA does not agree that the existing shock absorption test requirements are sufficient. The development of airplane loads for dynamic landing conditions requires a valid analytical model of the landing gear which includes a valid representation of the energy absorbing characteristics of the gear. The dynamic landing requirement has existed in 14 CFR part 25 for a number of years but the validation shock absorption test requirement has remained outdated, since it requires only the validation of a simple static landing load factor which may not even be used in design of the airplane. Because of the existing dynamic landing requirement, it has become a standard practice to develop the design loads for the airplane structure based on a mathematical model of the airplane and landing gear and to validate the assumed gear characteristics by shock absorption tests. Therefore, the requirement is being updated to be consistent with the related design landing load requirements and also to be consistent with standard practice.

One commenter points out that the terminology used in the proposed § 25.723(a)(1) for design weight conditions was inconsistent with that used in § 25.473, "Landing load conditions and assumptions," which is the same as that used in the proposed AC 25.723-1. The FAA agrees, and the language in the new § 25.723(a)(1) has been changed to refer to these design weight conditions as "limit design conditions" and to use the terms "design landing weight" and "design takeoff weight" to be consistent with § 25.473(a).

One commenter is concerned that the proposed location of the requirement for shock absorption tests in § 25.473(d) implies that the individual tests would be required for each of the landing conditions and configurations specified in § 25.473, including unsymmetrical conditions. The FAA does not agree since the specific landing conditions

are referenced in § 25.473(a) while the requirement related to validating landing gear dynamic characteristics, potentially of use in some or all conditions, is set forth in § 25.473(d). Validation is intended to mean that the adequacy of the dynamic characteristics would be confirmed by shock absorption tests to whatever extent necessary to provide confidence in the analysis of the specified landing conditions. To clarify this intent, an additional sentence is added to § 25.723(a) which would require that a range of tests be conducted to ensure that the analytical representation is valid for the design condition specified in § 25.723.

The same commenter suggests that the terms, "dynamic characteristics," are ambiguous and that the rule should completely define dynamic characteristics and specify which dynamic characteristics must be validated by tests. The FAA agrees that these terms are general. However, the FAA does not agree that an exhaustive list of dynamic characteristics or shock absorption characteristics can be provided in the rule. The relevant landing gear dynamic characteristics depend on the parameters chosen by the applicant for use in the analysis. The analysis must represent the full energy absorbing characteristics of the landing gear and it would be impossible to provide an exhaustive list of characteristics that would apply to all designs. Typically the manufacturer will validate the dynamic characteristics used in the analysis in a gross fashion by using the analytical mathematical model to predict the shock absorption response time histories in the test for a range of test conditions. In response to this comment, changes have been made to the proposed advisory material to identify some of the energy absorption components and characteristics that are usually of significance and the extent that they could be changed or revised without additional testing.

One commenter is concerned that the elimination of § 25.723(b) means that the reserve energy shock absorption tests would no longer be required. Removal of § 25.723(b) was not a proposal of Notice 99-08. The commenter fails to recognize that the paragraph is represented in the notice as a set of asterisks at the end of § 25.723(a) signifying that that the remaining paragraphs of § 25.723 would remain unchanged. However, consideration of the commenters concern brings to light the fact that the allowance provided in § 25.723(a)(3) for using analysis in lieu of tests, would not necessarily apply to the reserve energy drop test of § 25.723(b). In order to correct this oversight, § 25.723(b) is clarified, and the allowance in the proposed § 25.723(a)(3) is now set forth in a separate § 25.723(c) and made applicable to both §§ 25.723(a) and (b).

One commenter is concerned that the removal of the free drop test requirements in §§ 25.725 and 25.727 of the rules means that these tests would no longer be required and that this could result in a reduction in the degree of safety. These specific types of tests, known as free drop tests, have never been required. They have always been a means of compliance to the general requirement to conduct shock absorption tests. This general requirement for conducting shock absorption tests remains in the revised § 25.723. The free drop test criteria are provided for the manufacturer that chooses to use this particular method of performing the required shock absorption tests. In the free drop test, the manufacturer may represent the airplane lift by using a reduced effective weight for the test. However many manufacturers represent the lifting force directly in a drop test or perform other types of shock absorption tests. The criteria for establishing the effective drop weight is applicable to only this one means of compliance and would be

more appropriately presented in an advisory circular (AC). To this end, AC 25.723-1 "Shock Absorption Tests," was made available to provide this means of compliance.

Two commenters are concerned that the removal of the free drop test criteria from the regulation would result in the loss of the current method for establishing the effective mass over the nose gear for the free drop test. As stated above, this information is not being lost but is being moved to an AC as acceptable means of compliance.

Except for the minor editorial and organizational changes mentioned above, the amendment is issued as proposed.

Paperwork Reduction Act

In accordance with the Paperwork Reduction Act of 1995 (44 U.S.C, 3507(d)), there are no requirements for information collection associated with this amendment.

International Compatibility

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to comply with International Civil Aviation Organization (ICAO) Standards and Recommended Practices to the maximum extent practicable. The FAA has reviewed the corresponding ICAO Standards and Recommended Practices and has identified no differences with these regulations.

Executive Order 12866 and DOT Regulatory Policies and Procedures

Executive Order 12866, Regulatory Planning and Review, directs the FAA to assess both the costs and benefits of a regulatory change. We are not allowed to propose or adopt a regulation unless we make a reasoned determination that the benefits of the intended regulation justify its costs. Our assessment of this proposal indicates that its economic impact is minimal. Since its costs and benefits do not make it a "significant

regulatory action" as defined in the Order, we have not prepared a "regulatory impact analysis." Similarly, we have not prepared a "regulatory evaluation," which is the written cost/benefit analysis ordinarily required for all rulemaking proposals under the DOT Regulatory and Policies and Procedures. We do not need to do the latter analysis where the economic impact of a proposal is minimal.

Economic Evaluation, Regulatory Flexibility Determination, International Trade Impact Assessment, and Unfunded Mandates Assessment

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 impact of regulatory changes on small entities. Third, the Trade Agreements Act (19 U.S.C. section 2531-2533) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. In developing U.S. standards, this Trade Act requires agencies to consider international standards and, where appropriate, that they be the basis of U.S. standards. And fourth, the Unfunded Mandates Reform Act of 1995 requires agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local, or tribal governments, in the aggregate, or by the private sector, of $100 million or more, in any one year (adjusted for inflation).

However, for regulations with an expected minimal impact, the above-specified analyses are not required. The Department of Transportation Order DOT 2100.5

prescribes policies and procedures for simplification, analysis, and review of regulations. If it is determined that the expected impact is so minimal that the proposal does not warrant a full Evaluation, a statement to that effect and the basis for it is included in proposed regulation. Since this final rule makes landing gear requirements consistent with other requirements in the FAR, harmonizes these standards to be consistent with the European JAR, and since industry is currently in compliance with the new requirements, the expected outcome is to have a minimal cost impact with positive net benefits.

This regulatory evaluation summary examines the costs and benefits of a Final Rule entitled Revised Landing Gear Shock Absorption Test Requirements. The rule changes the transport category airplane certification requirements for landing gear shock absorption tests. This amendment to part 25 updates the current standards to take into account the structural dynamic flexibility of modern airplanes, the complexity of landing gear shock absorption systems, and the ability of highly sophisticated computer models to simulate dynamic structural loads. The amendment also makes landing gear requirements consistent with other requirements in the FAR, harmonizes these standards with those being proposed for the European JAR, and is expected to maintain the level of safety provided by the test requirements.

Background

Landing load requirements have evolved as the designs of transport category airplanes have changed. Initially, analysis alone was considered sufficient for determining the landing load factor that would be applied to a rigid airplane. The development of more complex landing gear systems and flexible airplanes led to the requirement for actual shock absorption tests. Later, the requirement for tests was modified to allow analysis alone to substantiate some changes to landing gear systems.

The current landing load requirements in Subpart D (Design and Construction) of part 25 require determination of the landing load factors for landing gear by means of energy absorption tests (drop tests) at maximum takeoff and landing weights. To comply with the landing load requirements of Subpart D and the requirements of Subpart C (Structure) of part 25, manufacturers build sophisticated computer models that comprehensively analyze landing gear and airplane structure and accurately represent landing gear shock absorption characteristics. These analytical models for landing conditions are validated through shock absorption tests (usually drop tests) at the maximum takeoff weight and the maximum landing weight.

The rule will allow manufacturers to validate the analytical representation of the dynamic characteristics of landing gear by conducting energy absorption tests at the weight (maximum takeoff weight or maximum landing weight) which provides the maximum impact energy. Because of the ability of the computer models to describe landing gear characteristics, tests at weights other than that of maximum impact energy are unnecessary. The rule will continue to provide for the substantiation of minor changes in landing gear systems through the use of analyses.

The current §§ 25.725 and 25.727 are deleted as regulatory requirements and moved to a new proposed Advisory Circular 25.723-1, except that current § 25.725(c), which describes conditions for the attitude of the landing gear and the representation of drag loads during the tests, is included in § 25.723.

This amendment was developed by the ARAC and presented to the FAA as a recommendation for rulemaking. This amendment will harmonize shock absorption tests with those being proposed by the JAA.

Costs and Benefits

The requirements, applicable to future type certificated transport category airplanes, will result in two regulatory changes: utilizing landing gear energy absorption tests to validate the landing gear dynamic characteristics rather than the limit load factor value, and confirming energy absorption characteristics by requiring tests at either the maximum landing weight or maximum takeoff weight condition, whichever provides the maximum landing impact energy. This is in contrast to current requirements, which require tests at both weight conditions.

The test results will be used to develop the analytical modeling of the landing gear dynamic characteristics. These regulatory changes are not expected to result in any physical change in the way landing gears are tested: the attitude of the gear being usually simulated directly by orienting the gear on the rig and drag loads being applied by spinning the wheel up to the ground speed. Therefore, it is not expected to impose additional costs on manufacturers. This was confirmed by two manufacturers. No comments to the contrary were received in response to the Notice of Proposed Rulemaking.

Significant cost savings may result from not having to test both at maximum landing weight and maximum takeoff weight, but instead, conducting shock absorption tests only for the conditions associated with maximum energy. One manufacturer estimates that this would result in 15 fewer test conditions per airplane certification. At a cost of $5,000 per condition, the total cost savings as a result of this provision equals $75,000 per airplane certification. Another manufacturer estimates a cost saving of approximately $190,000 for a ten-year period.

Additionally, by harmonizing the standards of the FAR and JAR, the rule is expected to yield cost savings by eliminating duplicate certification activities. One manufacturer "applauds" this FAA/JAA harmonization effort and its influence on the regulations.

The imposition of this rule is expected to maintain the current level of aviation safety.

Based on the finding of regulatory cost savings, coupled with the cost savings realizable from harmonization, and the expectation that these revisions will maintain the existing level of safety provided by the test requirements, the FAA has determined that the rule is expected to be cost-beneficial.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) establishes "as a principle of regulatory issuance that agencies shall endeavor, consistent with the objective of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the business, organizations, and governmental jurisdictions subject to regulation." To achieve that principle, the Act requires agencies to solicit and consider flexible regulatory proposals and to explain the rationale for their actions. The Act covers a wide-range of small entities, including small businesses, not-for-profit organizations and small governmental jurisdictions.

Agencies must perform a review to determine whether a proposed or final rule will have a significant economic impact on a substantial number of small entities. If the determination is that it will, the agency must prepare a regulatory flexibility analysis as described in the Act.

However, if an agency determines that a proposed or final rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the 1980 act provides that the head of the agency may so certify and a regulatory flexibility analysis is not required. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

The primary effect of this rule is expected to be cost savings for aircraft manufacturers. The FAA received no comments regarding its earlier assessment of no impact on small entities. The U. S. Small Business Administration specifies in its Table of Size Standards of March 1, 1996 that, for aircraft manufacturers, a small entity is one with 1,500 or fewer employees. Since no part 25 airplane manufacturer is believed to

have 1,500 or fewer employees, and the rule is expected to reduce manufacturing costs, the FAA certifies that the rule is not expected to have a significant economic impact on a substantial number of small entities.

Unfunded Mandates Reform Act

The Unfunded Mandates Reform Act of 1995 (the Act), enacted as Pub. L. 104-4 on March 22, 1995, is intended, among other things, to curb the practice of imposing unfunded Federal mandates on State, local, and tribal governments.

Title II of the Act requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in a $100 million or more expenditure (adjusted annually for inflation) in any one year by State, local, and tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a "significant regulatory action."

This final rule does not contain such a mandate. Therefore, the requirements of Title II of the Unfunded Mandates Reform Act of 1995 do not apply.

International Trade Impact Assessment

The Trade Agreement Act of 1979 prohibits Federal agencies from setting any standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are not considered unnecessary obstacles. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards. In addition, consistent with the Administration's belief in the general superiority and desirability of free trade, it is the policy of the Administration to remove or diminish, to the extent feasible, barriers to international trade, including both barriers affecting the export of

American goods and services to foreign countries and barriers affecting the import of foreign goods and services into the United States.

In accordance with the above statute and policy, the FAA has assessed the potential effect of this rule and has determined that it is not expected to constitute a barrier to international trade, including the export of American airplanes to foreign countries and the import of foreign airplanes into the United States. The requirements in this rule are expected to have no adverse impact on trade opportunities for U.S. manufacturers selling airplanes in foreign markets and foreign manufacturers selling airplanes into the U.S. market. Instead, by harmonizing the standards of the FAR and the JAR, it will serve to facilitate international trade.

Executive Order 13132, Federalism

The FAA has analyzed this final rule under the principles and criteria of Executive Order 13132, Federalism. We determined that this action will not have a substantial direct effect on the States, or the relationship between the national Government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, we determined that this final rule does not have federalism implications.

Regulations Affecting Intrastate Aviation in Alaska

Section 1205 of the FAA Reauthorization Act of 1996 (110 Stat. 3213) requires the Administrator, when modifying regulations in Title 14 of the CFT in a manner affecting intrastate aviation in Alaska, to consider the extent to which Alaska is not served by transportation modes other than aviation, and to establish such regulatory distinctions, as he or she considers appropriate. Because this final rule applies to the

certification of future designs of transport category airplanes and their subsequent operation, it could affect intrastate aviation in Alaska. The Administrator has considered the extent to which Alaska is not served by transportation modes other than aviation, and how the final rule could have been applied directly to intrastate operations in Alaska. However, the Administrator has determined that airplanes operated solely in Alaska would present the same safety concerns as all other affected airplanes; therefore, it would be inappropriate to establish a regulatory distinction for the intrastate operation of affected airplanes in Alaska.

Environmental Analysis

Federal Aviation Administration Order 1050.1D defines FAA actions that may be categorically excluded from preparation of a National Environmental Policy Act (NEPA) environmental impact statement. In accordance with FAA Order 1050.1D, appendix 4, paragraph 4(j), this amendment qualifies for a categorical exclusion.

Energy Impact

The energy impact of the amendment has been assessed in accordance with the Energy Policy and Conservation Act (EPCA) Pub. L. 94-163, as amended (42 U.S.C. 6362) and FAA Order 1053.1. It has been determined that the final rule is not a major regulatory action under the provisions of the EPCA.

List of Subjects

14 CFR Part 25

Air transportation, Aircraft Aviation safety, Safety.

The Amendment

In consideration of the foregoing, the Federal Aviation Administration amends part 25 of Title 14, Code of Federal Regulations (14 CFR part 25) as follows:

PART 25 - AIRWORTHIENSS STANDARDS: TRANSPORT CATEGORY AIPRLANES

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

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

2. Section 25.473 is amended by revising paragraph (d) to read as follows:

§ 25.473 Landing load conditions and assumptions.

* * * * *

(d) The landing gear dynamic characteristics must be validated by tests as defined in § 25.723(a).

* * * * *

3. Section 25.723 is ~~amended~~ revised to read as follows:

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§ 25.723 Shock absorption tests.

(a) The analytical representation of the landing gear dynamic characteristics that is used in determining the landing loads must be validated by energy absorption tests. A range of tests must be conducted to ensure that the analytical representation is valid for the design conditions specified in § 25.473.

(1) The configurations subjected to energy absorption tests at limit design conditions must include at least the design landing weight or the design takeoff weight, whichever produces the greater value of landing impact energy.

(2) The test attitude of the landing gear unit and the application of appropriate drag loads during the test must simulate the airplane landing conditions in a manner consistent with the development of rational or conservative limit loads.

(b) The landing gear may not fail in a test, demonstrating its reserve energy absorption capacity, simulating a descent velocity of 12 f.p.s. at design landing weight, assuming airplane lift not greater than airplane weight acting during the landing impact.

(c) In lieu of the tests prescribed in this section, changes in previously approved design weights and minor changes in design may be substantiated by analyses based on previous tests conducted on the same basic landing gear system that has similar energy absorption characteristics.

§ 25.725 [Reserved]

4. By removing § 25.725 and reserving. ~~and marking it reserved.~~

§ 25.727 [Reserved]

5. By removing § 25.727 and reserving. ~~and marking it reserved.~~

nm 5-11-01

Issued in Renton, Washington, on MAY 9 2001

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