

**§ 115.12 General program policies and provisions.**

\* \* \* \* \*

(e) \* \* \*

(5) *Guarantee authority for Contracts and Orders related to a major disaster area.* Subject to the availability of funds appropriated in advance specifically for the purpose of guaranteeing bonds for any Contract or Order related to a major disaster, SBA may guarantee bonds on any Contract or Order under the following terms and conditions:

(i) The Contract or Order does not exceed \$5,000,000 at the time of bond execution, and:

(A) For products or services procured under a Federal Contract or Order, the products will be manufactured or the services will be performed in the major disaster area identified in the Federal Emergency Management Agency (FEMA) Web site at <http://www.fema.gov>, or the products will be manufactured or the services will be performed outside the major disaster area and the products or services will directly assist in the recovery efforts in the major disaster area; or

(B) For products or services procured under any other Contract or Order, the products will be manufactured or the services will be performed in the major disaster area identified in the FEMA Web site at <http://www.fema.gov>;

(ii) At the request of the Head of the Agency involved in reconstruction efforts in response to a major disaster, SBA may guarantee bonds on Federal Contracts or Orders in excess of \$5,000,000, but not more than \$10,000,000;

(iii) The restrictions set forth in § 115.12(e)(3) do not apply to the guarantees issued under this paragraph (e)(5); and

(iv) A guarantee may be issued under this paragraph (e)(5) for any Contract or Order for which an offer is submitted or an award is made within 12 months from the date an area is designated a major disaster area in the **Federal Register**. SBA may, at its discretion, extend this time period for any particular disaster, and will publish a notice of the extension in the **Federal Register**.

\* \* \* \* \*

4. Amend § 115.16 as follows:
  - a. Remove the word “and” at the end of paragraph (f)(3);
  - b. Remove the punctuation “.” at the end of paragraph (f)(4); and
  - c. Add paragraph (f)(5) to read as follows:

**§ 115.16 Determination of Surety's Loss.**

\* \* \* \* \*

(f) \* \* \*

(5) Any costs that arise from the Principal's failure to secure and maintain insurance coverage required by the Contract or Order, or any costs that result from any claims or judgments that exceed the amount of any insurance coverage required by the Contract or Order, as well as any costs that arise as a result of any agreement by the Principal in the Contract or Order to indemnify the Obligor or any other Persons.

Karen G. Mills,  
Administrator.

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BILLING CODE 8025-01-P

**DEPARTMENT OF TRANSPORTATION****Federal Aviation Administration****14 CFR Part 33**

[Docket No. FAA-2010-0398; Notice No. 10-06]

RIN 2120-AJ62

**Airworthiness Standards; Rotor Overspeed Requirements**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Notice of proposed rulemaking (NPRM).

**SUMMARY:** The FAA proposes to amend the aircraft turbine engine rotor overspeed type certification standards. This action would establish uniform rotor overspeed design and test requirements for aircraft engines and turbochargers certificated by the FAA and the European Aviation Safety Agency (EASA). The proposed rule would also establish uniform standards for the design and testing of engine rotor parts in the United States and in Europe, eliminating the need to comply with two differing sets of requirements. The proposed rule would improve safety by clarifying existing overspeed requirements for aircraft turbine engine rotor parts.

**DATES:** Send your comments on or before July 26, 2010.

**ADDRESSES:** You may send comments identified by docket number FAA-2010-0398 using any of the following methods:

- *Federal eRulemaking Portal:* Go to <http://www.regulations.gov> and follow the online instructions for sending your comments electronically.
- *Mail:* Send Comments to Docket Operations, M-30; U.S. Department of Transportation, 1200 New Jersey Avenue, SE., West Building Ground

Floor, Room W12-140, Washington, DC 20590-0001.

• *Hand Delivery:* Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

• Fax: 1-202-493-2251.

For more information on the rulemaking process, see the **SUPPLEMENTARY INFORMATION** section of this document.

*Privacy:* We will post all comments we receive, without change, to <http://www.regulations.gov>, including any personal information you provide. Using the search function of our docket Web site, anyone can find and read the comments received into any of our dockets, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (65 FR 19477-78) or you may visit <http://DocketsInfo.dot.gov>.

*Docket:* To read background documents or comments received, go to <http://www.regulations.gov> at any time and follow the online instructions for accessing the docket or go to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** For technical questions concerning this proposed rule, contact Tim Mouzakis, Engine and Propeller Directorate Standards Staff, ANE-111, Engine and Propeller Directorate, Federal Aviation Administration, 12 New England Executive Park, Burlington, Massachusetts 01803-5299; telephone (781) 238-7114; fax (781) 238-7199; e-mail [timoleon.mouzakis@faa.gov](mailto:timoleon.mouzakis@faa.gov). For legal questions concerning this proposed rule contact Vincent Bennett, ANE-7, Office of Regional Counsel, Federal Aviation Administration, 12 New England Executive Park, Burlington, Massachusetts 01803-5299; telephone (781) 238-7044; fax (781) 238-7055; e-mail [vincent.bennett@faa.gov](mailto:vincent.bennett@faa.gov).

**SUPPLEMENTARY INFORMATION:** Later in this preamble under the Additional Information section, we discuss how you can comment on this proposal and how we will handle your comments. Included in this discussion is related information about the docket, privacy, and the handling of proprietary or confidential business information. We also discuss how you can get a copy of

this proposal and related rulemaking documents.

### Authority for This Rulemaking

The FAA's authority to issue rules regarding aviation safety is found in Title 49 of the United States Code. Subtitle I, Section 106 describes the authority of the FAA Administrator. Subtitle VII, Aviation Programs, describes in more detail the scope of the agency's authority.

We are issuing this rulemaking under the authority described in Subtitle VII, Part A, Subpart III, Section 44701, "General requirements." Under that section, Congress charges the FAA with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce, including minimum safety standards for aircraft engines. This proposed rule is within the scope of that authority because it updates existing regulations for rotor overspeed for aircraft turbine engines.

### Background

Part 33 of Title 14 of the Code of Federal Regulations prescribes aircraft engine airworthiness certification standards for products certified in the United States. The Certification Specifications for Engines (CS-E) prescribe the corresponding airworthiness standards for products certified in Europe by the European Aviation Safety Agency. While part 33 and CS-E are similar, they differ in several respects.

The FAA tasked the Aviation Rulemaking Advisory Committee through its Engine Harmonization Working Group to review existing regulations and recommend changes that would eliminate differences between the U.S. and European engine certification standards by harmonizing to the higher standards. This proposed rule is a result of this harmonization effort.

This proposed rule would harmonize rotor overspeed requirements found in 14 CFR part 33 with EASA CS-E specifications in CS-E 840, Rotor Integrity. The proposed rule would improve safety by establishing one harmonized standard requiring:

- (1) Rotors be designed with a burst/failure speed that exceeds the certified operating speeds;
- (2) Burst speeds to exceed overspeed conditions that can result from the failure of other engine components; and
- (3) Limits on the amount of rotor growth or damage that results from an overspeed.

### Definition of Terms Used in the Rule

For the purposes of the rule, the following definitions, which are consistent with part 33 and CS-E, apply:

*Maximum permissible rotor speed.* The maximum approved rotor speed, including transients, for the maximum approved rating, including One-Engine-Inoperative (OEI) ratings.

*Overspeed Capability.* The r.p.m. (revolutions per minute) at which the part fails or bursts.

*Rotor Growth.* The permanent increase in a rotor part's radial dimensions caused by an overspeed condition.

### General Discussion of the Proposal

The proposed rule would require that rotor parts be designed with a safety margin large enough that the parts have an overspeed capability that exceeds the engine's certified operating conditions, including overspeed conditions which can occur in the event of a failure of another engine component and/or system malfunction. For failures that may result in an overspeed, the proposed rule would limit rotor growth to that which would not lead to a hazardous condition as defined by § 33.75.

The proposed rule would harmonize U.S. requirements with EASA's by:

- Changing the current FAA overspeed design margin from 115 to 120 percent of maximum permissible speed for all engine ratings except OEI ratings of less than 2½ minutes;
- Changing the current FAA overspeed design margin from 100 to 105 percent for operating conditions associated with multiple failures;
- Introducing similar OEI overspeed design requirements;
- Requiring new similar rotor pass/fail design criteria;
- Requiring similar overspeed margin requirements;
- Allowing the use of validated structural analysis tools to demonstrate compliance;
- Requiring that validated structural analysis tools be calibrated to actual overspeed tests of similar rotors; and
- Allowing engine test durations of less than 5 minutes for failure conditions for which a 5-minute duration is not realistic.

Like EASA's CS-E, the proposed rule would specify that rotors may not burst for overspeed conditions that do not involve component or system failure. For component or engine failures that result in an overspeed, the proposed rule specifies that rotors may not burst and limits the amount of rotor growth.

### Overspeed Test Requirements

The current rule allows the rotor part being tested to be selected at random and does not require the test speed to be adjusted to ensure a minimum specification rotor can achieve the required overspeed. The proposed rule would allow the test speed to be adjusted/increased to account for the most adverse combination of material properties and dimensional tolerances. This proposed change harmonizes our overspeed test requirements with CS-E 840(a) and (d).

Single or multiple failures of components and/or systems can result in an overspeed that is sudden, transient and continues for a brief period of time. In this situation, the FAA considers it unrealistic to require an engine test that is attempting to duplicate these types of failures to maintain an overspeed beyond that which can be expected to occur. Under the proposed rule, the FAA would accept the actual overspeed duration provided the required maximum rotor speed is achieved.

### Overspeed Requirements for OEI Ratings

The current rule does not specify the overspeed requirements for one-engine inoperative ratings and assumes overspeed requirements are the same for any engine rating. The current rule requires an overspeed margin of 115 percent of the maximum permissible speed if tested in an engine. The proposed rule requires an overspeed margin of 120 percent for all ratings, except for 115 percent for OEI ratings less than 2½ minutes. The proposed change to overspeed requirements for OEI ratings would harmonize with CS-E 840(b).

### Overspeed Events Due to Failure of Components or Systems

The current rule requires a 5 percent overspeed margin for the failure of a single component or system and zero overspeed margin for the failure of multiple components. The proposed rule specifies a 5 percent overspeed margin for both single and combined failure situations for all ratings except OEI ratings of less than 2½ minutes.

When operating at an OEI rating of less than 2½-minute duration and a single failure occurs, the proposed rule requires that rotor components be designed and tested to withstand 100 percent of the resulting overspeed. The proposed changes to overspeed requirements for OEI ratings harmonize with those in CS-E 840(b).

### Exclusion of Certain Shaft Sections From Overspeed Tests

The current rule in § 33.27(c)(2)(v) requires that all shaft locations be considered in determining the terminal rotor speed due to failure and be tested to 105 percent of the highest terminal rotor speed. The proposed rule in § 33.27(f) would exclude certain shaft sections, but not the whole shaft system, from this requirement. The FAA finds the proposed rule is consistent with the way the FAA has applied the current rule to industry in certification tests. The FAA has consistently accepted engineering assessments that support the applicant's findings that certain location(s) (sections) of a shaft system are considered "prime reliable," which means that these shaft locations are not likely to fail during the life of the engine. The FAA is, therefore, proposing to change the current rule to be consistent with the current certification practices. The proposed changes to overspeed requirements due to shaft failures would be consistent with those in CS-E-850(b).

### Rulemaking Analyses and Notices

#### *Paperwork Reduction Act*

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that the FAA consider the impact of paperwork and other information collection burdens imposed on the public. We have determined there is no current or new information collection requirements associated with this proposed rule.

#### *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. We determined that no conflict with ICAO Standards and Recommended Practices exists, since there are no corresponding ICAO Standards and Recommended Practices.

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

Proposed changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs that each Federal agency 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 (Pub.

L. 96-354) requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act (Pub. L. 96-39) 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. Fourth, the Unfunded Mandates Reform Act of 1995 (Pub. L. 104-4) 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 private sector, of \$100 million or more annually (adjusted for inflation with base year of 1995). This portion of the preamble contains the FAA's analysis of the economic impacts of this proposed rule.

In conducting these analyses, the FAA has determined that this proposed rule: (1) Has benefits that justify its costs, (2) is not an economically "significant regulatory action" as defined in section 3(f) of Executive Order 12866, (3) is not "significant" as defined in DOT's Regulatory Policies and Procedures; (4) would not have a significant economic impact on a substantial number of small entities; (5) would not create unnecessary obstacles to the foreign commerce of the United States; and (6) would not impose an unfunded mandate on State, local, or tribal governments, or on the private sector by exceeding the threshold identified above.

#### *Total Estimated Benefits and Costs of This Proposed Rule*

Presently, turbine aircraft engine manufacturers must satisfy both FAA part 33 and EASA CS-E regulations to certify their products in the United States and Europe. Certification to one standard would improve certification efficiency by eliminating duplicate testing and documentation. We have not attempted to quantify the cost savings that may accrue due to this improved certification efficiency beyond noting that these are expected to be minor. We have drawn that conclusion based on the consensus among potentially affected aircraft engine manufacturers.

Industry must currently certificate to the two standards that are substantively similar, but have a few slightly different testing and documentation procedures and requirements. The proposed rule would harmonize these procedures and requirements to the higher standard

and, thereby, may increase safety. In addition, by reducing the amount of duplicative testing that would need to be either witnessed or analyzed by the FAA, the FAA would be better able to prioritize its resources to other, more safety critical areas. Consequently, the FAA determines there could be unquantifiable future minimal benefits from the proposed rule.

As a result, the FAA concludes that the combination of cost savings and potential increased safety benefits would make this proposed rule cost beneficial.

The FAA requests comments on these estimates of potential cost savings and benefits from this proposed rule.

The FAA has, therefore, determined that this proposed rule is not a "significant regulatory action" as defined in section 3(f) of Executive Order 12866, and is not "significant" as defined in DOT's Regulatory Policies and Procedures.

#### *Regulatory Flexibility Determination*

The Regulatory Flexibility Act of 1980 (Pub. L. 96-354) (RFA) establishes "as a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration." The RFA 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 rule will have a significant economic impact on a substantial number of small entities. If the agency determines that it will, the agency must prepare a regulatory flexibility analysis as described in the RFA.

However, if an agency determines that a rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the RFA 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 net effect of this proposed rule would provide regulatory cost relief. Second, all but one U.S. aircraft turbine engine manufacturer exceeds the Small

Business Administration small-entity criteria for aircraft engine manufacturers of 1,500 employees. U.S. transport category aircraft engine manufacturers include: General Electric (GE); CFM International (a joint company of GE and Snecma); Pratt & Whitney (P&W); Honeywell; Rolls-Royce Corporation (formerly Allison Engines); International Aero Engines (a privately-held consortium that includes P&W, Rolls-Royce, Japanese Aero Engines Corporation, and MTU Aero Engines); and Williams International. Williams International is the only one of these manufacturers that is categorized as a U.S. small business by the SBA criteria. This proposed rule would reduce costs, and there is only one small entity manufacturing part 33 aircraft engines. Therefore, the FAA certifies that this action would not have a significant economic impact on a substantial number of small entities. The FAA solicits comments regarding this determination.

#### *International Trade Impact Assessment*

The Trade Agreements Act of 1979 (Pub. L. 96–39), as amended by the Uruguay Round Agreements Act (Pub. L. 103–465), prohibits Federal agencies from establishing standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Pursuant to these Acts, the establishment of standards is not considered an unnecessary obstacle to the foreign commerce of the United States, so long as the standard has a legitimate domestic objective, such as protection of safety, and does not operate in a manner that excludes imports that meet this objective. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards. The FAA assessed the potential effect of this proposed rule and determined that it uses European standards as the basis for regulation and thus is consistent with the Trade Assessments Act.

#### *Unfunded Mandates Assessment*

Title II of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4) 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 an expenditure of \$100 million or more (in 1995 dollars) 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.” The FAA currently uses an inflation-adjusted value of

\$136.1 million in lieu of \$100 million. This proposed rule does not contain such a mandate, therefore, the requirements of Title II of the Act do not apply.

#### *Executive Order 13132, Federalism*

The FAA has analyzed this proposed rule under the principles and criteria of Executive Order 13132, Federalism. We determined that this action would not have a substantial direct effect 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, and therefore would not have federalism implications.

#### *Environmental Analysis*

FAA Order 1050.1E defines FAA actions that are categorically excluded from preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act (NEPA) in the absence of extraordinary circumstances. The FAA has determined this proposed rulemaking action qualifies for the categorical exclusion identified in Chapter 3, paragraph 312d, and involves no extraordinary circumstances.

#### *Regulations That Significantly Affect Energy Supply, Distribution, or Use*

The FAA has analyzed this NPRM under Executive Order 13211, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use (May 18, 2001). We have determined that it is not a “significant energy action” under the executive order and is not likely to have a significant adverse effect on the supply, distribution, or use of energy.

#### *Additional Information*

##### *Comments Invited*

The FAA invites interested persons to participate in this rulemaking by submitting written comments, data, or views. We also invite comments relating to the economic, environmental, energy, or federalism impacts that might result from adopting the proposals in this document. The most helpful comments reference a specific portion of the proposal, explain the reason for any recommended change, and include supporting data. To ensure the docket does not contain duplicate comments, please send only one copy of written comments, or if you are filing comments electronically, please submit your comments only one time.

We will file in the docket all comments we receive, as well as a report summarizing each substantive public contact with FAA personnel

concerning this proposed rulemaking. Before acting on this proposal, we will consider all comments we receive on or before the closing date for comments. We will consider comments filed after the comment period has closed if it is possible to do so without incurring expense or delay. We may change this proposal in light of the comments we receive.

#### *Proprietary or Confidential Business Information*

Do not file in the docket information that you consider to be proprietary or confidential business information. Send or deliver this information directly to the person identified in the **FOR FURTHER INFORMATION CONTACT** section of this document. You must mark the information that you consider proprietary or confidential. If you send the information on a disk or CD-ROM, mark the outside of the disk or CD-ROM and also identify electronically within the disk or CD-ROM the specific information that is proprietary or confidential.

Under 14 CFR 11.35(b), when we are aware of proprietary information filed with a comment, we do not place it in the docket. We hold it in a separate file to which the public does not have access, and we place a note in the docket that we have received it. If we receive a request to examine or copy this information, we treat it as any other request under the Freedom of Information Act (5 U.S.C. 552). We process such a request under the DOT procedures found in 49 CFR part 7.

#### *Availability of Rulemaking Documents*

You can get an electronic copy using the Internet by—

- (1) Searching the Federal eRulemaking Portal (<http://www.regulations.gov>);
- (2) Visiting the FAA's Regulations and Policies Web page at [http://www.faa.gov/regulations\\_policies/](http://www.faa.gov/regulations_policies/); or
- (3) Accessing the Government Printing Office's Web page at <http://www.gpo.gov/fdsys/search/home.action>.

You can also get a copy by sending a request to the Federal Aviation Administration, Office of Rulemaking, ARM–1, 800 Independence Avenue, SW, Washington, DC 20591, or by calling (202) 267–9680. Make sure to identify the docket number or notice number of this rulemaking.

You may access all documents the FAA considered in developing this proposed rule, including economic analyses and technical reports, from the Internet through the Federal eRulemaking Portal referenced in paragraph (1).

**List of Subjects in 14 CFR Part 33**

Air transportation, Aircraft, Aviation safety, Safety.

**The Proposed Amendment**

In consideration of the foregoing, the Federal Aviation Administration proposes to amend Chapter I of Title 14, Code of Federal Regulations as follows:

**PART 33—AIRWORTHINESS  
STANDARDS: AIRCRAFT ENGINES**

1. The authority citation for part 33 continues to read as follows:

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

2. Revise § 33.27 to read as follows:

**§ 33.27 Turbine, compressor, fan, and turbosupercharger rotor overspeed.**

(a) For each fan, compressor, turbine, and turbosupercharger rotor, the applicant must establish by test, analysis, or a combination of both, that each rotor will not burst when operated in the engine for 5 minutes at whichever of the conditions defined in paragraph (b) of this section is the most critical with respect to the integrity of such a rotor.

(1) Test rotors used to demonstrate compliance with this section that do not have the most adverse combination of material properties and dimensional tolerances must be tested at conditions which have been adjusted to ensure the minimum specification rotor possesses the required overspeed capability. This can be accomplished by increasing test speed, temperature, and/or loads.

(2) When an engine test is being used to demonstrate compliance with the overspeed conditions listed in paragraph (b)(3) or (b)(4) of this section and the failure of a component or system is sudden and transient, it may not be possible to operate the engine for 5 minutes after the failure. Under these circumstances, the actual overspeed duration is acceptable if the required maximum overspeed is achieved.

(b) When determining the maximum overspeed condition applicable to each rotor in order to comply with paragraphs (a) and (c) of this section, the applicant must evaluate the following rotor speeds taking into consideration the part's operating temperatures and temperature gradients throughout the engine's operating envelope:

(1) 120 percent of the maximum permissible rotor speed associated with any of the engine ratings except one-engine-inoperative (OEI) ratings of less than 2½ minutes.

(2) 115 percent of the maximum permissible rotor speed associated with any OEI ratings of less than 2½ minutes.

(3) 105 percent of the highest rotor speed that would result from either:

(i) The failure of the component or system which, in a representative installation of the engine, is the most critical with respect to overspeed when operating at any rating condition except OEI ratings of less than 2½ minutes, or

(ii) The failure of any component or system in a representative installation of the engine, in combination with any other failure of a component or system that would not normally be detected during a routine pre-flight check or during normal flight operation, that is the most critical with respect to overspeed, except as provided by paragraph (c) of this section, when operating at any rating condition except OEI ratings of less than 2½ minutes.

(4) 100 percent of the highest rotor speed that would result from the failure of the component or system which, in a representative installation of the engine, is the most critical with respect to overspeed when operating at any OEI rating of less than 2½ minutes.

(c) The highest overspeed that results from a complete loss of load on a turbine rotor, except as provided by paragraph (f) of this section, must be included in the overspeed conditions considered by paragraphs (b)(3)(i), (b)(3)(ii), and (b)(4) of this section, regardless of whether that overspeed results from a failure within the engine or external to the engine. The overspeed resulting from any other single failure must be considered when selecting the most limiting overspeed conditions applicable to each rotor. Overspeeds resulting from combinations of failures must also be considered unless the applicant can show that the probability of occurrence is not greater than  $10^{-9}$  per flight.

(d) In addition, the applicant must demonstrate that each fan, compressor, turbine, and turbosupercharger rotor complies with paragraphs (d)(1) and (d)(2) of this section for the maximum overspeed achieved when subjected to the conditions specified in paragraphs (b)(3) and (b)(4) of this section. The applicant must use the approach in paragraph (a) of this section which specifies the required test conditions.

(1) Rotor Growth must not cause the engine to:

(i) Catch fire,  
(ii) Release hazardous fragments through the engine casing or result in a hazardous failure of the engine casing,  
(iii) Generate loads greater than those ultimate loads specified in § 33.23(a), or  
(iv) Lose the capability of being shut down.

(2) Following an overspeed event and after continued operation, the rotor may

not exhibit conditions such as cracking or distortion which preclude continued safe operation.

(e) The design and functioning of engine control systems, instruments, and other methods not covered under § 33.28 must ensure that the engine operating limitations that affect turbine, compressor, fan, and turbosupercharger rotor structural integrity will not be exceeded in service.

(f) Failure of a shaft section may be excluded from consideration in determining the highest overspeed that would result from a complete loss of load on a turbine rotor if the applicant:

(1) Identifies the shaft as an engine life-limited-part and complies with § 33.70.

(2) Uses material and design features that are well understood and that can be analyzed by well-established and validated stress analysis techniques.

(3) Determines, based on an assessment of the environment surrounding the shaft section, that environmental influences are unlikely to cause a shaft failure. This assessment must include complexity of design, corrosion, wear, vibration, fire, contact with adjacent components or structure, overheating, and secondary effects from other failures or combination of failures.

(4) Identifies and declares, in accordance with § 33.5, any assumptions regarding the engine installation in making the assessment described above in paragraph (f)(3) of this section.

(5) Assesses, and considers as appropriate, experience with shaft sections of similar design.

(6) Does not exclude the entire shaft.

(g) If analysis is used to meet the overspeed requirements, then the analytical tool must be calibrated to prior overspeed test results of a similar rotor. The tool must be calibrated for the same material, rotor geometry, stress level, and temperature range as the rotor being certified. Calibration includes the ability to accurately predict rotor dimensional growth and the burst speed. The predictions must also show that the rotor being certified does not have lower burst and growth margins than rotors used to calibrate the tool.

Issued in Washington, DC, on April 20, 2010.

**Dorenda D. Baker,**

*Director, Aircraft Certification Service.*

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