tests may be used to develop appropriate test criteria.

One commenter suggests that the term ''inner annulus flowpath line'' be substituted for ''inner flowpath diameter'' to eliminate ambiguity of definition.

The FAA concurs. The inner annulus flowpath line provides a better description of the flowpath contour because flowpath diameter suggests a line of constant radius. These Final Special Conditions will be revised to include this term.

One commenter states it is an issue of unnecessary additional risk that, in the absence of full compliance to § 33.94, these proposed special conditions are insufficient in scope and detrimental to aviation safety.

The FAA disagrees. The FAA has concluded that upon compliance with all of the requirements of these special conditions, together with additional testing beyond that typically employed for metallic blades within the scope of 14 CFR part 33, an equivalence to the safety standard provided in § 33.94 has been achieved and no additional risk has been assumed.

One commenter states that the most significant feature of the notice is the proposed probability of fan blade retention system failure of ''extremely improbable'' is a reduction in severity of the effects of a blade failure.

The FAA agrees. The FAA recognizes that certain loads associated with a blade release at the inner annulus flowpath line may be less than the loads associated with release of a fan blade at the outermost retention. Those loads imparted to the engine mount system based on the inner annulus flowpath line will be identified in the Engine Installation Manual. Since there is potential for a reduction in certain loads, it is imperative that the blade retention system demonstrates sufficiently improved reliability to provide an equivalent level of safety to that provided by § 33.94.

One commenter requested on what basis has it been decided that a failure along the inner flowpath line is the most critical for failures which are not assessed as being extremely improbable.

The FAA selected the inner annulus flowpath line as the critical location for blade release based on design, blade stresses, and demonstrated fatigue and impact testing.

One commenter states that these proposed special conditions make no mention of the design and construction requirements of either § 33.19 relating to containment design and uncontained blade fragments, or § 33.23 relating to mounting attachments and structure.

The FAA concluded that the requirements of §§ 33.19 and 33.23 were adequate and appropriate when applied to this design of the GE90 engine, and no additional special conditions were necessary.

One commenter suggests that these special conditions should also address the effects of possible detachment of those metallic portions of the blade.

The FAA disagrees. These special conditions provide an alternative to the release failure location on the blade. The metal to composite blade bonding capability has been addressed through tests conducted under 14 CFR part 33. There were no additional special conditions that are required.

One commenter suggests that the text of these proposed special conditions paragraph (a), has been mis-compiled.

The FAA concurs. The intent of the paragraph (a) is to identify the location of the release point for the fan blade containment test and to prescribe the additional safety standards to be demonstrated. These special conditions will be modified by reorganizing paragraph (a) to more clearly express this intent.

One commenter states that some re-wording is also necessary to make it clear that the fan blade test must be conducted as a full engine test.

The FAA concurs. These special conditions will be modified to incorporate this change.

One commenter states that these special conditions ought to make more visible how there can be meaningful confidence in ''extremely improbable'' as the assessed probability of fan blade retention system failure if the stress levels are not so conservative as to result in an infinite fatigue life.

The FAA disagrees. The intent is to assure that within the service life of the blade, that the fan blade retention system is not likely to fail due to manufacturing and material variations, in-service deterioration, and environmental effects.

One commenter asks how will it be established that any large bird ingestion is not a possible cause of fan blade retention system failure, a mode of failure that is likely to be much more severe than an airfoil only fan blade containment tests.

The damage effects on the blade retention system will be substantiated by developmental and certification testing. It is incumbent upon the applicant to demonstrate that the blade attachment system is designed to withstand the affects of an eight pound bird impact on the blade airfoil, and is less severe than the effects from fan blade release.

One commenter requests a definition of ''without failure,'' with regard to the two times centrifugal load test.

The FAA definition for ''without failure'' in this context is to demonstrate the blade root is retained within the disk dovetail slot, and that there are no conditions present which would indicate impending release.

One commenter suggests relative to paragraph (a)(2) of the proposed special conditions, that there is a need for explicit reference to consideration of both high cycle and low cycle fatigue during start stop stress cycles.

The FAA concurs. The determination of the life cycle of the composite fan blade must include the effects of combined high cycle and low cycle fatigue with enhanced load factors. These special conditions will be modified to include the requirement for high cycle and low cycle fatigue tests.

One commenter requests clarification of the term ''extremely improbable.''

For the purpose of these special conditions, ''extremely improbable'' refers to the unlikelihood that a failure will occur during the engine's operational life.

One commenter questions why paragraph (d) of these proposed special conditions is applicable only to the tests and analyses required by paragraphs (a)(1) and (a)(2) of the proposed special conditions.

The effects of in-service deterioration, manufacturing and material variations, and environmental effects must be accounted for during the centrifugal load test and in lifting determinations. The intent is to determine the effects on material capability under centrifugal loads significantly greater than will be seen in service. Combined high cycle and low cycle tests will further determine the effects on material capability. The blade releases demonstration, however, may or may not be conducted accounting for these effects.

After careful review of the available data, including the comments noted above, the FAA determined that air safety and the public interest require the adoption of these special conditions as proposed with the changes as noted above.

Conclusion

This action affects only General Electric Aircraft Engines on Model(s) GE90–75B/–85B/–76B turbofan engines. It is not a rule of general applicability and affects only the manufacturer who applied to the FAA for approval of these engines containing this novel or unusual design feature.