



Federal Aviation Administration

Memorandum

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To: SEE DISTRIBUTION

From: Manager, Engine and Propeller Directorate, Aircraft Certification Service

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Subject: **ACTION:** Policy for Continued Airworthiness Assessment Methodology for Turbine Engine Rotating Life-Limited Parts Life Shortfall [ANE-2007-33.70-1]

1. PURPOSE.

a. This policy memorandum provides guidance for corrective action when turbine engine rotating Life-Limited Parts (LLP) are found prematurely cracked due to Low-Cycle Fatigue (LCF), or an analysis reveals a deficiency, such that the type design LLP is not capable of meeting its published life limit. This policy does not apply to situations in which the deficiency is associated with quality escapes, maintenance error, handling damage, contamination, foreign object damage, etc. that affect a limited percentage of parts.

b. This policy memorandum applies to any Aircraft Certification Office (ACO) when evaluating and mandating corrective actions involving turbine engine rotating LLP life shortfalls under Title 14 of the Code of Federal Regulations (14 CFR) part 39.

2. RELATED DOCUMENTS.

a. 14 CFR 33.4, Instructions for Continued Airworthiness.

b. 14 CFR 33.14, Start-stop cyclic stress (low-cycle fatigue).

c. 14 CFR 33.70, Aircraft Engine Standards for Engine Life Limited Parts.

d. Advisory Circular (AC) No. 39-8, "Continued Airworthiness Assessments of Powerplant and Auxiliary Power Unit Installations of Transport Category Airplanes", dated 9/8/03.

3. BACKGROUND.

a. The Engine and Propeller Directorate (E&PD) has observed inconsistencies in Airworthiness Directives (ADs) for LLP life shortfalls, such as:

(1) Establishing a new lower life limit, or not.

(2) Whether suspect parts are permitted to be re-installed after inspection, and remain in service until the original life limit is reached, or not.

Note that for the purposes of this policy, an LLP life shortfall is defined as the inability of a type design LLP to meet the Federal Aviation Administration (FAA) approved life limit for that part number.

b. AC 39-8 provides a means to manage unsafe conditions, such as one that may be posed by an LLP life shortfall. The AC approach uses risk analysis to predict the risk associated with the unsafe condition, including the risk during the control program. This methodology determines if the proposed control program actions limit the risk of serious and severe outcomes sufficiently by providing guidance on control program considerations, including acceptable short-term risk for level 3 and level 4 events. Overall, a control program involves activities that limit the risk of failure associated with continued temporary use of these parts until the product is brought back to the level of safety defined at the time of certification. In certification, LLP life limits are established that limit the useful life of an LLP to the minimum number of flight cycles required to initiate a crack.

c. Once an unsafe condition is identified, AC 39-8 provides acceptable level 3 and level 4 short-term guidelines that determine how quickly the corrective action must be implemented. AC 39-8 includes guidelines for both the number of future events (risk factor) and the risk per flight. The control program risk is expected to meet the both the risk factor and risk per flight short term guidelines. The goal in resolving an LLP life shortfall is the development and implementation of corrective actions that, when fully incorporated, meet both the long-term risk guidelines from AC 39-8 and the rotor integrity standards, such as §§ 33.15, 33.27, and 33.14 or 33.70.

d. Section 33.70 states, “By a procedure approved by the FAA, operating limitations must be established which specify the maximum allowable number of flight cycles for each engine life-limited part...” Note that § 33.70 replaced § 33.14 by refining the requirements of § 33.14, and adding additional requirements. Lifting procedures approved to satisfy §§ 33.14 or 33.70 generally require that an LLP be retired from service before exceeding its life limit based on the crack initiation life. The life limit for each affected rotor part is specified within the engine type design data. Also, Appendix A of Part 33, A33.4 (Airworthiness Limitations Section) requires that all mandatory replacement times be specified in the airworthiness limitations section of the engine manual.

4. POLICY STATEMENT.

a. When LLPs are found prematurely cracked, or an analysis reveals a deficiency in the design such that the type design is not capable of meeting its published life limit, then the product does not meet the level of safety intended by §§ 33.14 and 33.70, and corrective action is required. A corrective action must take the form of an AD to ensure the new life limit is established, and the approved corrective action is complied with by all operators. When the final corrective action is implemented, the LLP should once again meet the long-term risk guidelines and the level of safety defined at certification. This policy does not apply to situations in which the deficiency is associated with quality escapes, maintenance error, handling damage, contamination, foreign object damage, etc. that affect a limited percentage of parts.

b. The following control programs are the expected methods for managing LLPs above their reduced life limits, providing the risk is below the short term risk guidelines.

- Removal of the LLP at piece part exposure.
- Removal of the LLP at a scheduled engine shop visit.
- Removal of the LLP before a scheduled engine shop visit using a drawdown schedule.

c. Even if a control program (for example, an inspection only plan) meets the AC 39-8 short-term risk guidelines, parts that exceed the reduced life limit should be removed from service as soon as feasible to bring the product back to the level of safety defined at the time of certification. Inspections may be used on an interim basis prior to removing the part in accordance with paragraph 4b of this policy. If the type certificate (TC) holder's control plan does not require removal of LLPs from service at the first shop visit above the reduced life limit, the TC holder must show that it is not practicable to do so. If the FAA certification office responsible for the TC holder concurs, the certification office must obtain agreement by the Standards Staff.

d. If the investigation of a cracked LLP revealed a deficiency in the LLP design, where the type design is not capable of meeting its published life, then the FAA must issue an AD to establish a reduced life limit and mandate part removal (refer to paragraph 4b of this policy).

e. Parts installed after the effective date of the AD should be removed from service before the new reduced life limit is exceeded.

5. EFFECT OF POLICY. The general policy stated in this document does not constitute a new regulation or create a "binding norm." Whenever a TC holder's proposed method of compliance differs from this policy, the proposal must be coordinated with the Engine and Propeller Directorate Standards Staff, ANE-110.

6. CONCLUSION.

a. When LLPs are found prematurely cracked, or an analysis reveals a deficiency in the design, such that the type design is not capable of meeting its published life limit, then action is necessary to bring the product back to the level of safety defined at the time of certification.

b. The FAA must issue an AD to establish the new life limit and ensure the control plan to remove LLPs above the new reduced life limit are complied with by all operators.

A handwritten signature in black ink, appearing to read "Francis A. Favara". The signature is cursive and includes a small mark at the end.

Francis A. Favara,
Manager, Engine and Propeller Directorate
Aircraft Certification Service.

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