U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Propeller Critical Parts

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Initiated By: ANE-111

AC No: 35.16-1
Change:

1. Purpose. This advisory circular (AC) provides guidance and acceptable methods, but not the only methods, that may be used to demonstrate compliance with the propeller critical parts requirements of Title 14 of the Code of Federal Regulations (14 CFR) § 35.16. This AC provides information about what a propeller critical part is, the identification of propeller critical parts by applicants, and engineering processes, manufacturing processes, and maintenance processes for those parts.

2. Applicability.

a. The guidance provided in this document is directed to propeller applicants, manufacturers, modifiers, foreign regulatory authorities, and Federal Aviation Administration (FAA) designated engineering representatives.

b. This material is neither mandatory nor regulatory in nature and does not constitute a regulation. It describes acceptable means, but not the only means, for demonstrating compliance with the applicable regulations. We ("the FAA") will consider other methods an applicant may present to demonstrate compliance. Terms such as "should," "shall," "may," and "must" are used only in the sense of ensuring applicability of this particular method of compliance when the method in this document is used. While these guidelines are not mandatory, they are derived from extensive FAA and industry experience in determining compliance with the relevant regulations. If we find that following this AC would not result in compliance with the applicable regulations, we will not be bound by this AC, and we may require additional substantiation as the basis for finding compliance.

c. This material does not change, create any additional, authorize changes in, or permit deviations from existing regulatory requirements.

3. Related regulations. Please check the FAA's website at **http://ecfr.gpoaccess.gov** for part 35 of Title 14 of the Code of Federal Regulations (14 CFR).

a. 14 CFR 35.15, Safety analysis.

4. Definitions. For the purpose of this AC, the following definitions apply:

a. Approved Life. The mandatory replacement life of a part that is approved by the FAA and is listed in the airworthiness limitation section (ALS) of the instructions for continued airworthiness (ICA).

b. Engineering Process. The process that defines the integrity of propeller critical parts throughout their service life.

c. Manufacturing Process. The process that identifies the requirements to produce propeller critical parts consistent with the engineering process.

d. Primary Failure. Failure of a part that is not the result of prior failure of another part or system.

e. Propeller Critical Part. A part on the propeller whose primary failure can result in a hazardous propeller effect, as determined by the safety analysis required by § 35.15.

f. Service Management Process. The process that identifies the continued airworthiness requirements of propeller critical parts as required by the engineering process.

5. Introduction.

a. The failure of a propeller critical part could result in a hazardous propeller effect as defined by § 35.15. Accordingly, applicants must meet the requirements of § 35.16 for propeller critical part management. Section 35.16 requires that applicants establish the integrity of propeller critical parts through defined engineering, manufacturing, and service management processes. These three processes form a closed-loop system linking design intent, as defined by the engineering process, to part manufacture and service management. Engineering, manufacturing, and service management work together as an integrated system that recognizes actions in one area may affect all.

b. The engineering process defines the requirements, technical data, and actions necessary to establish and maintain the integrity of propeller critical parts throughout their service life. The engineering process and the part life are established before the part is introduced into service. The engineering process is updated as new information becomes available.

c. The manufacturing process is a compilation of the controls and procedures, such as the drawings, procedures, specifications, and instructions required to produce and inspect a propeller critical part, as defined by the engineering process.

d. The service management process identifies the procedures for in-service maintenance, overhaul, and repair to ensure that a propeller critical part achieves the requirements defined by the engineering process. The service management process forms the basis for in-service maintenance, overhaul, and repair that are conveyed through the ICA, and the ALS of the ICA constant with the engineering process.

6. General.

a. The engineering, manufacturing, and service management processes should provide clear information for propeller critical part management. "Process" in the context of the proposed requirement does not mean that all the required technical information is within a single document. When relevant information exists elsewhere, the process documents may reference for example, drawings, material specifications, process specifications, as appropriate. These references should be clear enough to sufficiently identify the referenced document so as to allow the design history of an individual part to be traced.

b. When a critical part is inseparable from an assembly, the assembly is identified as a critical part. Both the inseparable part(s) and the assembly should be included in the engineering, manufacturing, and service management processes. This does not limit applicants from defining separable assemblies containing propeller critical parts as a propeller critical part in support of the engineering process.

7. Defining an engineering process.

a. Introduction. The engineering process includes procedures and requirements for how propeller critical parts are identified, associated life analysis is determined, and mandatory inspection intervals. Each of these is discussed in more detail below.

b. Identifying Propeller Critical Parts. Section 35.15 Safety analysis requires the identification of all propeller critical parts. The engineering process should have the drawing(s) distinguish propeller critical parts.

c. Life Analysis. The engineering process should establish the methodology for determining what propeller critical parts are life limited, if any. For those that require a life limit, the approved life is published in the ICA Airworthiness Limitations Section (ALS).

(1) Establishing the Propeller Critical Part Life. The applicants engineering process should provide a systematic and uniform methodology to predict part life. The applicants life prediction

methodology should consider: airplane operating conditions, engine compatibility, stress analysis, materials data, safe life analysis and/or damage tolerance analysis, wear analysis and service experience. Any in-service inspections identified as required to maintain the part life should be incorporated into the ICA of the ALS.

(2) Maintaining the Propeller Critical Part Life. The engineering process should include a provision for incorporating design, manufacturing and service data, relative to the condition of propeller critical parts, into the part life methodology. This is to assure that design changes and changes introduced during manufacture or service will be evaluated, and if necessary, corrective action taken to restore or maintain part life.

d. Mandatory Inspection Interval. The engineering process should include a methodology for determining any mandatory inspection intervals, and for incorporating them into the ALS of the ICA.

8. Defining a manufacturing process.

a. Introduction. The manufacturing process identifies the requirements to consistently produce propeller critical parts as required by the engineering process. The requirements established by the manufacturing process should include engineering requirements, and apply controls to ensure that manufacturing and inspection methods and processes are maintained. The manufacturing process can be broadly grouped as process and source approvals, and part marking. Each is discussed below:

b. Manufacturing Process Approval.

(1) The essential manufacturing processes should be reviewed and approved by the appropriate engineering, quality and manufacturing personnel established by the applicant. Changes to the manufacturing processes should be subject to the same or similar review and approval process. The review and approval of changes should include an assessment of the impact on the life of the critical part. The applicant may integrate the manufacturing process with the quality system to assure conformance for all propeller critical parts.

(2) The applicant should identity the appropriate inspection personnel who will ensure the manufactured product is consistent with the requirements of the engineering process. This group of personnel should also evaluate and approve non-conformance dispositions, and all propeller critical part manufacturing sources.

(3) The level of detail in the inspection process may vary depending on the process step being considered, the sensitivity of the step, and the level of control necessary to achieve the propeller critical part requirements.

c. Source Approval. The applicant should impose source approval requirements on suppliers of parts, materials or processes that are incorporated into critical parts. Approval means the source has successfully demonstrated to the applicant that they have the capability to produce parts or materials that satisfy the requirements of the critical part established in the engineering and manufacturing processes.

d. Part Marking. Propeller critical parts marking should be consistent with 14 CFR part 45. Propeller critical parts not addressed in part 45 do not require part number and serial number markings. The procedures for marking propeller critical parts should be defined in the manufacturing or engineering process, as applicable.

9. Defining a service management process.

a. Introduction. The service management process is part of the process to maintain propeller critical parts throughout their service life. The service management process identifies and conveys the requirements for in-service repair, maintenance, and overhaul to remain consistent with the requirements contained in the engineering process.

(1) The ICAs and ALS of the ICA, operation and maintenance manuals, bulletins and other service documents are part of the service management process. The service management process has been developed with the expectation that general procedures such as pre-flight or other periodic inspections and overhauls will be accomplished in accordance with the published service documents and do not need to be in the ALS of the ICA.

(2) Critical parts should be identified in the service documents.

b. Elements of a Service Management Process. The service management process should include the following:

(1) Service requirements and procedures to maintain continued airworthiness.

(2) Propeller installation, maintenance and overhaul procedures.

(3) Airworthiness limitations.

(4) Repair procedures.

(5) Maintenance intervals

c. Determining the Acceptability of Repair, Maintenance and Overhaul Processes.

(1) Repair, maintenance, and overhaul should be reviewed and approved by the appropriate engineering, quality and manufacturing personnel established by the applicant. The review should include an assessment of the impact on the life of the critical part. Changes to repair, maintenance, and overhaul should be subject to the same or similar review and approval process.

d. ICA Statement.

(1) To ensure a closed-loop between the in-service parts and the engineering process, the applicant should highlight the importance of limits to the repair and maintenance of propeller critical parts in the propeller maintenance manuals. Applicants may use the following wording in the propeller maintenance manual, or something similar, to highlight the criticality of repairs on propeller critical parts, or parts that affect propeller critical parts:

> "The following maintenance and repair instructions have been substantiated based on engineering analysis that expects this product will be operated and maintained using the procedures and inspections provided in the ICA supplied with this product."

for Robert Ganley,
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