U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Best Practices for Engine Time In Service Interval Extensions

Date: 1/6/16 **AC No:** 120-113

Initiated by: AFS-300 **Change:**

1 PURPOSE. This advisory circular (AC) provides information on engine time in service interval extensions. The AC explains the background of engine time in service intervals as well as the Federal Aviation Administration's (FAA) regulatory requirements for time limitations and time in service intervals for engine overhauls. The AC also provides aircraft operators with information on the best practices for an engine time in service interval extension program and how to obtain an engine time in service interval extension.

2 AUDIENCE. This AC applies to aircraft operators who want to learn about the best practices for a time in service interval extension program. The AC is also for operators who wish to propose an engine time in service interval extension for FAA approval.

3 DEFINITIONS.

1. Certificate-Holding District Office (CHDO). The FAA office with oversight responsibility for operators submitting proposed time in service interval extensions. For purposes of this AC, this includes the FAA's International Field Offices (IFO) with oversight responsibility for maintenance programs for foreign operators of U.S.-registered aircraft within and outside the United States in common carriage.
2. Time In Service Interval. The established operating time between engine overhauls.
3. Time In Service Interval Extension Program. For purposes of this AC, an engine time in service interval extension program means your documented policies and procedures to maintain your engines in an airworthy condition so you can extend the useful life of those engines.

4 RELATED TITLE 14 OF THE CODE OF FEDERAL REGULATIONS (14 CFR) PARTS. Parts 91; 119; 121; 125; 129; and 135.

5 BACKGROUND.

5.1 Extending the Useful Life of Engines. The engine manufacturer establishes the recommended time in service interval, which is an estimated number of hours, cycles, or events that an engine can safely and reliably operate without exceeding the overhaul service wear limits. Some engine manufacturers refer to the recommended time in service intervals as time between overhaul (TBO) intervals.

5.2 Guidance from Engine Manufacturers. Engine manufacturers usually list time in service intervals in their Service Bulletins (SB), Service Instructions, or Service Information Letters. Some engine manufacturers allow for time in service interval extensions based on how an operator operates and maintains its engines, while other engine manufacturers do not.

5.3 FAA Approval for Time In Service Interval Extensions. We may allow a time in service interval extension if you can extend the useful life of an engine without compromising safety. Time in service interval extensions should be based on:

- Demonstrated in-service reliability,
- Proper justification, and
- Risk analysis.

5.4 Unauthorized Extensions. You must be aware that time in service interval extensions do not authorize time extensions for life-limited parts or for items specified in an FAA-approved Airworthiness Limitation Section (ALS), or in an Airworthiness Directive (AD).

6 REGULATORY REQUIREMENTS FOR TIME LIMITATIONS AND/OR TIME IN SERVICE INTERVALS FOR ENGINE OVERHAULS.

6.1 Part 119. Section 119.49(a)(8) requires certificate holders conducting domestic, flag, or commuter operations to obtain operations specifications containing: “Time limitations, or standards for determining time limitations, for overhauling, inspecting, and checking airframes, engines, propellers, rotors, appliances, and emergency equipment.”

6.2 Part 121. Section 121.135(b)(18) requires that a certificate holder’s manual must contain: “Time limitations, or standards for determining time limitations, for overhauls, inspections, and checks of airframes, engines, propellers, appliances, and emergency equipment.”

6.3 Part 125. Section 125.247(d) states, “No person may operate an airplane subject to this part unless—(1) The installed engines have been maintained in accordance with the overhaul periods recommended by the manufacturer or a program approved by the Administrator; and (2) the engine overhaul periods are specified in the inspection programs required by § 125.247(a)(3).”

6.4 Part 129. Section 129.14(a) states, “Each foreign air carrier and each foreign person operating a U.S.-registered aircraft within or outside the United States in common carriage must ensure that each aircraft is maintained in accordance with a program approved by the Administrator in the operations specifications.” Operations Specifications paragraph D085 states: “The maintenance program must be sufficiently comprehensive in scope and detail to fulfill the foreign air carrier’s responsibility to maintain the aircraft in an airworthy condition in accordance with applicable 14 CFR sections and standards prescribed and approved by the Administrator. The program shall

be included in the foreign air carrier's manual. Each aircraft and its component parts, accessories, and appliances must be maintained in an airworthy condition in accordance with the time limits for the accomplishment of the overhaul, replacement, periodic inspection, and routine checks of the aircraft and its component parts, accessories, and appliances. Time limits or standards for determining time limits shall be contained in a document approved by the Administrator and referenced in these OpSpecs."

6.5 Part 135. Paragraphs (a) and (b) of § 135.421 state, "(a) Each certificate holder who operates an aircraft type certificated for a passenger seating configuration, excluding any pilot seat, of nine seats or less, must comply with the manufacturer's recommended maintenance programs, or a program approved by the Administrator, for each aircraft engine, propeller, rotor, and each item of emergency equipment required by this chapter. (b) For the purpose of this section, a manufacturer's maintenance program is one which is contained in the maintenance manual or maintenance instructions set forth by the manufacturer as required by this chapter for the aircraft, aircraft engine, propeller, rotor or item of emergency equipment."

6.6 Part 91.

6.6.1 Section 91.1015. For fractional ownership operations conducted under subpart K of part 91, paragraph (a)(5) of § 91.1015 states, "(a) Each person conducting operations under this subpart, or furnishing fractional ownership program management services to fractional owners, must do so in accordance with management specifications issued by the Administrator to the fractional ownership program manager under this subpart. Management specifications must include: (5) Time limitations, or standards for determining time limitations, for overhauls, inspections, and checks for airframes, engines, propellers, rotors, appliances, and emergency equipment of aircraft."

6.6.2 Section 91.409. Section 91.409(f) states, in pertinent part, that: "The registered owner or operator of each airplane or turbine-powered rotorcraft described in paragraph (e) of this section must select, identify in the aircraft maintenance records, and use one of the following programs for the inspection of the aircraft: (1) A continuous airworthiness inspection program that is part of a continuous airworthiness maintenance program currently in use by a person holding an air carrier operating certificate or an operating certificate issued under part 121 or 135 of this chapter and operating that make and model aircraft under part 121 of this chapter or operating that make and model under part 135 of this chapter and maintaining it under § 135.411(a)(2) of this chapter. (2) An approved aircraft inspection program approved under § 135.419 of this chapter and currently in use by a person holding an operating certificate issued under part 135 of this chapter. (3) A current inspection program recommended by the manufacturer. (4) Any other inspection program established by the registered owner or operator of that airplane or turbine-powered rotorcraft and approved by the Administrator under paragraph (g) of this section. However, the Administrator may require revision of this inspection program in accordance with the provisions of § 91.415."

Note: Owner/Operators of small reciprocating engine aircraft that are being operated strictly under part 91 do not have to follow the engine manufacturer's recommended time in service intervals. Therefore, they are not required to request a time in service interval extension.

7 OPERATIONS SPECIFICATIONS/MANAGEMENT SPECIFICATIONS CONTAINING TIME LIMITATIONS AND/OR TIME IN SERVICE INTERVALS FOR ENGINE OVERHAULS. The appropriate paragraph in Part D of an operator's operations specifications (OpSpecs)/management specifications (MSpecs) contains or references the time limitations, or standards for determining time limitations, for overhauling, inspecting, and checking airframes, engines, propellers, rotors, appliances, and emergency equipment.

8 APPROVED MAINTENANCE RELIABILITY PROGRAM. An approved maintenance reliability program allows an operator subject to a Continuous Airworthiness Maintenance Program (CAMP) under part 121 or 135 to establish the time limitations or standards for determining intervals between overhauls, inspections, and checks without prior FAA review. If an operator has an approved maintenance reliability program, the operator should follow that program's procedures when adjusting engine time in service intervals.

9 ENGINE TIME IN SERVICE INTERVAL EXTENSION PROGRAM.

9.1 Policy and Procedures to Extend the Useful Life of an Engine. An engine time in service interval extension program describes an operator's documented policies and procedures to maintain its engines in an airworthy condition so the operator can extend the useful life of those engines. An operator may include a time in service interval extension program as part of its aircraft inspection or maintenance program.

9.2 Instructions from Engine Manufacturers. Operators should follow any specific instructions available from the engine manufacturer in order to operate and maintain engines in a manner that warrants a time in service interval extension.

9.3 Monitor and Determine Engine Condition. An operator's time in service interval extension program should monitor the health of an engine from the last overhaul through the time in service interval extension. The time in service interval extension program should be able to determine an engine's condition so that the operator can remove the engine from service prior to failure.

10 BEST PRACTICES FOR A TIME IN SERVICE INTERVAL EXTENSION PROGRAM. An operator's time in service interval extension program can include policies and procedures for performing and documenting the following best practices. Operators may include the following items in the program at their discretion unless required by the engine type certificate (TC) and/or the operator's CHDO.

4. Engine trend monitoring.
5. Engine oil analysis.

6. Maintaining a history of the oil consumption for each engine.
7. Accomplishing oil changes at frequent intervals (reciprocating engines).
8. Inspecting oil filter elements/oil filter debris analysis (reciprocating and turbine engines).
9. Documenting cylinder compression checks at scheduled intervals (reciprocating engines).
10. Inspecting baffle conditions to ensure proper engine cooling (reciprocating engines).
11. Inspecting the condition of the engine case.
12. Documenting borescope inspections and any findings.
13. Documenting propeller balancing.
14. Documenting engine instrumentation calibrations/checks.
15. Adopting engine manufacturer or operator's engine vibration analysis/monitoring program.
16. Inspecting engine components for security and condition.
17. Ground running an engine at scheduled intervals to determine satisfactory performance of powerplant systems and static power output.
18. Using the engine manufacturer or a single source as the engine maintenance provider when seeking fleet-wide time in service interval extensions.
19. Verifying the quality of the maintenance provider's engine maintenance and overhaul performance. Any replacement parts recommended in the appropriate engine manufacturer's SB can be replaced at the overhaul or at the appropriate maintenance task interval.
20. Although not a regulatory requirement, installing new cylinders on a reciprocating engine at the overhaul may add to the engine's reliability.
21. Overhauling or replacing all engine accessories per the manufacturer's recommendations. Accessories play a very important part in the life of an engine.
22. Requesting engine overhaul teardown reports that show dimensional checks and wear of critical parts. Prior to teardown, you should have operated the engine to within five percent of the current approved time in service interval.
23. Continued compliance with the pilot's operating handbook (POH), Airplane Flight Manual (AFM), or Rotorcraft Flight Manual (RFM) can make a big difference in the reliability of the engine, and it may help to extend the TBO.
24. Using all or parts of an engine manufacturer's time in service interval extension program.

11 HOW AN OPERATOR PROPOSES AN ENGINE TIME IN SERVICE INTERVAL EXTENSION. If an operator plans to propose an engine time in service interval extension, the operator should submit the proposal in writing to its CHDO or IFO.

11.1 Collaboration Between the Operator and the FAA. The operator and the CHDO will collaborate with each other to determine a reasonable length of the time in service interval extension.

11.2 Length of the Time In Service Interval Extension. The length of the time in service interval extension may vary depending on an operator's particular operation. For example, a time in service interval extension could be a one-time extension of 25 flight hours for one engine, or a fleet-wide extension of several hundred hours per engine. It is the operator's responsibility to provide the CHDO with adequate information to justify all aspects of the proposed time in service interval extension. The length of the extension should allow the operator to extend the useful life of the engines without compromising the safety of the flying public.

11.3 Responsibility for Operating Engines During Time In Service Interval Extensions. The operator is responsible for operating any engine during a time in service interval extension in accordance with all terms and conditions of the interval extension approval.

12 SUPPORTING DOCUMENTATION TO SUBSTANIATE THE PROPOSED ENGINE TIME IN SERVICE INTERVAL EXTENSION. Depending on the type of engine (i.e., turbine or reciprocating), the items that the operator should submit for review may include:

12.1 Mechanical Interruption Summary Reports (MISR). The CHDO should review previous MISR to detect trends or irregularities. These may indicate problem areas in maintenance procedures, or operational procedures with regard to the reliability of the operator's engines.

12.2 Service Difficulty Reports (SDR). The CHDO should query the SDR database for information on the type of engine the operator wants to extend. A high number of reports, failures, or other deficiencies may be a reason to reject the time in service interval extension.

12.3 Aircraft/Engine Utilization Information. The monthly aircraft/engine utilization report provides data for entry into the utilization system database. This utilization system database is one of several data repositories that provide information for aviation safety inspectors (ASI) to review.

12.4 Type Certificate Data Sheets (TCDS). The CHDO should review the appropriate current TCDS for any information relating to time extensions or restrictions. The TCDS may also indicate life limits or reference the manual where life limits are located, if applicable.

12.5 Engine Manufacturer's SBs, Service Instructions, Service Information Letters, or Recommendations. The operator should supply the CHDO a list of the engine manufacturer's SBs, Service Instructions, and Service Information Letters that contain time in service interval extension information, as well as any information supporting or not supporting an extension, including statements of no technical objection from the manufacturer. The FAA may require the operator to comply with certain inspections and other criteria in the service documents before it grants a time in service interval extension.

12.6 Oil Analysis Reports. The CHDO should review the operator's oil analysis reports (if applicable) for abnormal wear and recommendations from the lab for follow-up action. Repeat abnormal wear reports may indicate a problem with the operator's engine maintenance program.

12.7 Trend Monitoring Reports. If an operator has a trend monitoring program, the CHDO should review it for abnormalities that would indicate a problem with their engine maintenance program.

12.8 Engine Overhaul Teardown Reports. The operator should provide the CHDO any current (last overhaul) in-depth teardown reports showing recorded dimensional checks and the condition of critical parts. The operator should have operated the engine(s) that are chosen for the teardown to within five percent of the currently-approved time in service interval. The number of teardown reports that an operator should provide will be determined by the CHDO and will depend on the size and complexity of the operator's aircraft fleet.

12.9 Recommendations from the Engine Maintenance Provider. An operator's engine maintenance provider is in a position to help determine the length of the proposed time in service interval extension. This is the maintenance organization that disassembled, inspected, performed dimensional checks of critical parts, and completed the overhaul of the sample engine(s).

12.10 Engine Maintenance History. The CHDO should review the operator's aircraft fleet's past engine maintenance history for early engine removals from service, early overhauls, repeat maintenance actions, cylinder changes, compression checks, oil filter inspections, and static power output engine runs. The CHDO should determine if the engine(s) received other maintenance actions, including the installation of recommended replacement parts (identified in the appropriate engine manufacturer's service-related information) that should be replaced at the engine's overhaul.

12.11 Oil Consumption History. This is the history of oil consumption throughout the engine's operation since its last overhaul.

12.12 AD Records. Some ADs may restrict operating an engine past the recommended time in service interval.

12.13 Continuing Analysis and Surveillance System (CASS) Reports. The CHDO should review CASS reports (for those operators who have a CASS program) for any trends involving the operation of the operator's engines or powerplant systems.

12.14 Maintenance Review Board Report (MRBR). If an operator operates a transport category aircraft, the MRBR (if applicable) may contain pertinent information about the engine.

12.15 Other Data. Any other data that the CHDO or the FAA's Engine Directorate office requests that has been deemed necessary to substantiate the time in service interval extension.

13 HOW THE FAA APPROVES OR REJECTS THE PROPOSAL.

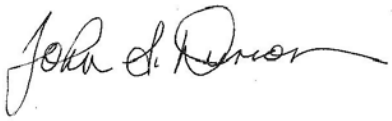
13.1 Notification of Rejection. If the CHDO determines the proposed time in service interval extension is unacceptable, it will notify the operator by letter that the proposal is rejected. The letter should include the reasons for the rejection. Also, the CHDO should return the proposed time in service interval extension documentation to the operator.

13.2 Notification of Approval. If the CHDO determines that the proposed time in service interval extension does not present a safety hazard and is not contrary to any regulatory requirement, it will accomplish the following:

13.2.1 Notify and Advise the Operator. Notify the operator by letter that the FAA approves the operator's proposed time in service interval extension and advise the operator to revise its inspection or maintenance program, and/or time limitations document (whichever is applicable to the operator's operation).

13.2.2 Update OpSpecs/MSpecs. Update the appropriate paragraph of Part D of the operator's OpSpecs/MSpecs to reflect their revised time limitation or time in service interval.

14 COMMENTS AND QUESTIONS REGARDING THIS AC. Direct questions or comments to the Air Carrier Maintenance Branch (AFS-330) at 202-267-1686. For your convenience, the Advisory Circular Feedback Form is the last page of this AC. Note any deficiencies found, clarifications needed, or suggested improvements regarding the contents of this AC on the Advisory Circular Feedback Form.



John S. Duncan
Director, Flight Standards Service

Advisory Circular Feedback Form

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by contacting the Air Carrier Maintenance Branch (AFS-330) or the Flight Standards Directives Management Officer.

Subject: AC 120-113, Best Practices for Engine Time In Service Interval Extensions

Date: _____

Please check all appropriate line items:

☐ An error (procedural or typographical) has been noted in paragraph _____ on page _____.

☐ Recommend paragraph _____ on page _____ be changed as follows:

_____

_____

☐ In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

_____

_____

☐ Other comments:

_____

_____

☐ I would like to discuss the above. Please contact me.

Submitted by: _____ Date: _____