



U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Best Practices for Engine
Time-In-Service Interval Extensions

Date: 1/9/18

AC No: 120-113

Initiated by: AFS-300

Change: 1

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. The contents of this document do not have the force and effect of law and are not meant to bind the public in any way, and the document is intended only to provide information to the public regarding existing requirements under the law or agency policies.

2. PRINCIPAL CHANGES. This change to the AC removes content referring to airframe/engine utilization reports, as these reports are no longer required. This change also clarifies maintenance program instructions and requirements.

PAGE CONTROL CHART

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Executive Director, Flight Standards Service



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- 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 WHERE YOU CAN FIND THIS AC.** You can find this AC on the FAA's website at https://www.faa.gov/regulations_policies/advisory_circulars and the Dynamic Regulatory System (DRS) at <https://drs.faa.gov>.
- 4 DEFINITIONS.**
 1. Responsible Flight Standards Office. 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.

5 RELATED TITLE 14 OF THE CODE OF FEDERAL REGULATIONS (14 CFR) PARTS.

- Part [91](#),
- Part [119](#),
- Part [121](#),
- Part [125](#),
- Part [129](#), and
- Part [135](#).

6 BACKGROUND.

- 6.1 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.
- 6.2 Guidance From Engine Manufacturers.** Engine manufacturers usually list time-in-service intervals in their Service Bulletins (SB), Service Instructions (SI), or Service Information Letters (SIL). 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.
- 6.3 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.
- 6.4 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).

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

- 7.1 Part 119.** Section [119.49\(a\)\(8\)](#) requires certificate holders (CH) conducting domestic, flag, or commuter operations to obtain operations specifications (OpSpecs) containing: “Time limitations, or standards for determining time limitations, for overhauling,

inspecting, and checking airframes, engines, propellers, rotors, appliances, and emergency equipment.”

7.2 Part 121. Section [121.135\(b\)\(18\)](#) requires that a CH’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.”

7.3 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).”

7.4 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.” OpSpec 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 Federal aviation regulations 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 operations specifications.”

7.5 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.” For further information on what constitutes the manufacturer’s “maintenance instructions,” refer to the requirements for the instructions for continued airworthiness (ICA) in the applicable certification rule (e.g., 14 CFR part [23](#) appendix [A](#), § A23.3(b)).

7.6 Part 91.

7.6.1 Fractional Ownership (part 91 subpart [K](#) (part 91K)). For fractional ownership operations conducted under part 91K, 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.” Note, however, there is no specific regulation in part 91K that requires compliance with the manufacturer’s overhaul limits. Therefore overhauls would only be required under part 91K if included as part of a Continuous Airworthiness Maintenance Program (CAMP) submitted by the program manager and approved under § [91.1411](#).

- 7.6.2** Part 91 (excluding part 91K). Owners/operators of aircraft that are being operated strictly under part 91 do not have to follow the manufacturer’s recommended time-in-service overhaul intervals. This is because by definition overhauls are a form of maintenance, not inspection (refer to 14 CFR part [1](#), § [1.1](#)), and are not included in the inspection program requirements under § [91.409](#). Overhauls are part of the maintenance program; as such, overhauls are not mandatory for part 91 operators. Therefore, part 91 operators are not required to request time-in-service interval extensions.

- 8 OPSPECS/MANAGEMENT SPECIFICATIONS (MSPECS) CONTAINING TIME LIMITATIONS AND/OR TIME-IN-SERVICE INTERVALS FOR ENGINE OVERHAULS.** The appropriate paragraph in Part D of an operator’s OpSpecs/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.

- 9 APPROVED MAINTENANCE RELIABILITY PROGRAM.** An approved maintenance reliability program allows an operator subject to a 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.

10 ENGINE TIME-IN-SERVICE INTERVAL EXTENSION PROGRAM.

- 10.1 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.
- 10.2 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.
- 10.3 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.

11 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 responsible Flight Standards office.

1. Engine trend monitoring.
2. Engine oil analysis.
3. Maintaining a history of the oil consumption for each engine.
4. Accomplishing oil changes at frequent intervals (reciprocating engines).
5. Inspecting oil filter elements/oil filter debris analysis (reciprocating and turbine engines).
6. Documenting cylinder compression checks at scheduled intervals (reciprocating engines).
7. Inspecting baffle conditions to ensure proper engine cooling (reciprocating engines).
8. Inspecting the condition of the engine case.
9. Documenting borescope inspections and any findings.
10. Documenting propeller balancing.
11. Documenting engine instrumentation calibrations/checks.
12. Adopting engine manufacturer or operator's engine vibration analysis/monitoring program.
13. Inspecting engine components for security and condition.
14. Ground running an engine at scheduled intervals to determine satisfactory performance of powerplant systems and static power output.
15. Using the engine manufacturer or a single source as the engine maintenance provider when seeking fleet-wide time-in-service interval extensions.
16. 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.
17. Although not a regulatory requirement, installing new cylinders on a reciprocating engine at the overhaul may add to the engine's reliability.
18. Overhauling or replacing all engine accessories per the manufacturer's recommendations. Accessories play a very important part in the life of an engine.

19. 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.
20. 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.
21. Using all or parts of an engine manufacturer's time-in-service interval extension program.

12 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 responsible Flight Standards office or IFO.

12.1 Collaboration Between the Operator and the FAA. The operator and the responsible Flight Standards office will collaborate with each other to determine a reasonable length of the time-in-service interval extension.

12.2 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 responsible Flight Standards office 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.

12.3 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.

13 SUPPORTING DOCUMENTATION TO SUBSTANTIATE 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:

13.1 Mechanical Interruption Summary Reports (MISR). The responsible Flight Standards office should review previous MISRs 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.

13.2 Service Difficulty Reports (SDR). The responsible Flight Standards office 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.

- 13.3 Type Certificate Data Sheets (TCDS).** The responsible Flight Standards office 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.
- 13.4 Engine Manufacturer's SBs, SIs, SILs, or Recommendations.** The operator should supply the responsible Flight Standards office with a list of the engine manufacturer's SBs, SIs, and SILs 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.
- 13.5 Oil Analysis Reports.** The responsible Flight Standards office 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.
- 13.6 Trend Monitoring Reports.** If an operator has a trend monitoring program, the responsible Flight Standards office should review it for abnormalities that would indicate a problem with their engine maintenance program.
- 13.7 Engine Overhaul Teardown Reports.** The operator should provide the responsible Flight Standards office any current (last overhaul) indepth 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 responsible Flight Standards office and will depend on the size and complexity of the operator's aircraft fleet.
- 13.8 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).
- 13.9 Engine Maintenance History.** The responsible Flight Standards office 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 responsible Flight Standards office 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.
- 13.10 Oil Consumption History.** This is the history of oil consumption throughout the engine's operation since its last overhaul.

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

13.12 Continuing Analysis and Surveillance System (CASS) Reports. The responsible Flight Standards office 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.

13.13 Maintenance Review Board Report (MRBR). If an operator operates a transport category aircraft, or one built to Maintenance Steering Group – 3rd Task Force (MSG-3) standards, the MRBR (if applicable) may contain pertinent information about the engine.

13.14 Other Data. Any other data that the responsible Flight Standards office or the Policy and Standards Division (AIR-600) requests that has been deemed necessary to substantiate the time-in-service interval extension.

14 HOW THE FAA APPROVES OR REJECTS THE PROPOSAL.

14.1 Notification of Rejection. If the responsible Flight Standards office 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 responsible Flight Standards office should return the proposed time-in-service interval extension documentation to the operator.

14.2 Notification of Approval. If the responsible Flight Standards office 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:

14.2.1 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).

14.2.2 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.

15 AC FEEDBACK FORM. For your convenience, the AC 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 Feedback Form.

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 Flight Standards Directives Management Officer at 9-AWA-AFB-120-Directives@faa.gov.

Subject: AC 120-113 CHG 1, 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: _____