

Scope

These requirements are applicable to all operators/owners and organisations in Iceland operating piston engine aircraft as stated in the definitions.

Definitions

Light aircraft piston engine is a piston engine of 400 hp or less installed in aircraft which do not exceed 2730 kg maximum take-off weight.

Time between overhaul is any overhaul period recommendation, which is stated in terms of operating time and calendar time.

Calendar time period run from the date on which the appropriate release document was signed, by the manufacturer in the case of a new engine, or by the overhauler in the case of an overhauled engine.

1.0 Introduction

Many factors affect the wear which takes place in an engine, including the efficiency of the air filter, the techniques used in the engine handling, particularly during and immediately after starting, the type of fuel and oil used in the engine, the conditions of storage when the aircraft is not in use, the length of flights, the atmospheric conditions during flight and on the ground, and the type of operation.

The environmental conditions that an engine is operated in play a major role in causing wear-and-tear, be it corrosive salt water air, a dry dusty environment, or one where the climatic changes are dramatic, In such conditions, the result can be excessive internal corrosion.

Short term use can as well results in increased moisture condensation within the engine. Unless a piston engine is run for reasonable periods of time, an average of 40 hours/month is recommended, it can experience corrosion due to condensation that doesn't get evaporated off its parts due to heat.

Many of these factors are within the control of the owner/operator and the approved Maintenance Organisation (MO) and/or the licensed maintenance technician. Continued compliance with the Pilot Operating Handbook, Aircraft Flight Manual, Engine Operating Manual, and the maintenance practices recommended by the manufacturer, may help to extend the time between overhauls (TBO).

There comes a time in the life of every piston engine when it must be overhauled. There's no exception to this rule and therefore these requirements does not eliminate the need for periodic engine overhaul. These requirements are a means to extend the useful life of an engine without compromising safety to the point where routine maintenance can no longer ensure the continued safe operation of the engine and overhaul becomes necessary. This consists of repetitive periodic inspections to determine the engine condition so that it can be removed from service prior to failure.

Unless otherwise stated, engines may be operated to the periods between overhauls which have been recommended by the manufacturer and promulgated under a system approved by the airworthiness authority responsible for the engine. All such recommendations, whether stated in terms of operating time or calendar time, constitute a recommended overhaul period including recommendations by the manufacturer for reduced overhaul periods with particular types of operation or particular service bulletin/modification configurations.

The condition for allowing engines to run beyond the manufacturer's recommended overhaul period depends upon it being possible to assess the condition of the engine by prescribed inspections carried out at defined intervals. It is not intended to provide a freedom to run until the engine fails.

Although it is possible to identify engine degradation in many areas of the engine, there are some potential failure modes (e.g. crankshaft cracking, counterweight wear) for which predictive checks would not be effective without engine disassembly. For the above reasons, the overhaul period extensions may not be applied unless adequate in-service reliability has been demonstrated, particularly in relation to failures which cannot be prevented by on-wing inspection.

1.1 Responsibility

Manufacturers recommended TBO is not considered an Airworthiness Limitation (AL) unless it is specified as such in the Instruction for Continued Airworthiness (MM chapter 4 or 5, AD etc).

ICETRA has taken the decision to allow extension of recommended overhaul periods not specified as AL on the basis of the effect on airworthiness only. The economics of operation is not the responsibility of the ICETRA, although this may have been considered by the manufacturer in establishing the recommended overhaul periods. Aircraft Owners/Operators must make their own decisions on these other aspects and these requirements does not prevent owners/maintainers from performing any inspection they feel are necessary to provide them with the level of confidence to allow the engine to continue without overhaul. Unless satisfied that the engine remains in an airworthy condition, the Owner/Operator should have the engine overhauled. The application of the TBO extension and the resulting consequences shall be in the sole responsibility of the owner/ operator. It is the owner/operator whole responsibility to be satisfied that the engine is in condition to justify the TBO extension.

These requirements do not override the necessity to comply with new or amended requirements of the manufacturer where these new or amended requirements conflict with these requirements.

1.2 Components

The intent of these requirements is to enable the engine TBO to be extended excluding the components. Vendor/OEM/AMP recommendations apply to all components and must remain within their respective recommendation life for the duration of the extension on the engine.

1.3 Airworthiness Directive (AD) / Airworthiness Limitation (AL)

AD, AL, service life limits (MM e.g. chapter 4), shall always be carried out in accordance with manufacturer's requirements, TC authorities and EASA.

Prior to availing of an extension all AD's and mandatory requirements due at the **normal** overhaul periods shall be complied with.

After the engine has started its operation beyond the normal TBO i.e. its TBO has been extended as these requirements stipulates, then where compliance with new AD's is due "at next overhaul", this time is considered to be the next time the engine is overhauled.

1.4 Limitation

The provisions of this requirement are applicable to all light aircraft piston engines except where listed below:

- Rolls-Royce (de Havilland) Gipsy Major Engines - Prior to running beyond 120% of the manufacturer's recommended overhaul period, engines other than Major 10 and earlier marks incorporating Modification 2385 (splined propeller attachment) must have the taper portion of the crankshaft "Sulfinuz" treated by Modification 2690 or appropriate alternative. In accordance with Rolls-Royce Technical News Sheet G15, engines must not exceed an overhaul period of 1000 hours unless Modification 2495 is embodied.
- Rolls-Royce (de Havilland) Gipsy Engines — With effect from 1 January 2011, crankshafts fitted to engines on aircraft used for the purposes of Commercial Air Transport or Aerial Work must be fully inspected in accordance with the relevant overhaul manual workshop instructions at intervals not exceeding 20 years, if operating hours limits requiring overhaul are not achieved within this period.
- The following engine types have yet to accumulate sufficient service experience to demonstrate acceptable reliability when operating at the manufacturer's recommended overhaul period. The provisions of this requirement are not applicable to:
 - Societe de Motorisations Aeronautique — All types
 - Rotax — All types
 - Thielert Centurion Engines — All types
 - Mid-West Engines — All types
 - Rotary Engines – All types
 - Diesel Engines – All types

1.5 Log book entries

In order to demonstrate compliance with these requirements it is necessary to retain detail evidence in the aircraft/engine records.

A record of the checks made, and any rectification or servicing work, must be entered and certified in the engine / aircraft log books before the engine is cleared as in satisfactory condition for continued service for its recommended or extended life. The log book entry made should also specify any restriction on further use.

When an engine is extended beyond 20% extension, the approved Maintenance Organisation (MO) or the licensed maintenance technician as applicable shall restrict the use of the aircraft in which the engine is mounted to exclusively private use by entering the following in the airframe and engine log book:

1. This aircraft / engine (state aircraft in airframe log book and engine in engine log book) must not be used for Commercial Aircraft Transport (CAT), Aerial work or Flight School training because of engine flight time / age.
2. Engine flight time and age since new.
3. Date and aircraft flight time.
4. Maintenance Organisation (MO) name and approval reference and CRS signature and stamp or the licensed maintenance technician name, license number and signature.

2.0 Maintenance programme amendments beyond recommended TBO

The aircraft maintenance programme should reflect the maintenance requirements required in Appendix 3 and their periodicity, to operate the aircraft engine beyond its recommended overhaul period. The Programme Basis shall refer to this document and therefore a document that must be checked for validity in the annual / periodic programme review.

Private aircraft owners that have an ICETRA approved maintenance programme with additional tasks for TBO extension as per ICETRA previous policy stated in the “Rule for Aircraft Maintenance Programme for aircraft which are not in commercial operation < 2730 kg.” may amend the maintenance programme as per these requirements and **submit it to ICETRA for approval**. ICETRA will not charge for this amendment approval.

Aircraft that are referred to as “Annex II” aircraft, i.e. that are under the national system and do not have ICETRA approved maintenance programme yet, may use these requirements by updating the “out-of-phase” status sheet with the inspections and notify ICETRA formally of the use of the TBO extension provision.

2.1 Engine TBO extension procedure

The maximum extension which may be allowed on engines fitted to Icelandic registered aircraft and the associated conditions are as follows:

	Aircraft used for CAT, Aerial work or Flight Schools	Aircraft used for Private Flight only (General Aviation)
Within Recommended Overhaul Period	Manufacturer's recommended overhaul period, defined in operating time and calendar time (whichever occurs first), provided the engine conforms to appropriate service bulletin/modification configuration and types of operation	
Extensions not exceeding 20% of Recommended Overhaul Period (operating time and calendar time, whichever occurs first)	Acceptable subject to compliance with Appendix 1 and the note below prior to TBO extension and subsequently at stated intervals.	
Extensions in excess of 20% of Recommended Overhaul Period (operating time and calendar time, whichever occurs first)	No further extension.	Engines may continue in service (on-condition) subject to compliance with Appendix 2 and the note below prior to TBO extension in excess of 20% of recommended overhaul period and subsequently at stated intervals.

Note:

The TBO period for an engine may be affected by the incorporation (or non-incorporation), of certain Manufacturers recommendations, or spare parts, therefore caution should be exercised in determining the **normal** TBO periods.

In the event that the inspection referred to in Appendix 1 and 2 results in rejection, a thorough engineering investigation must be carried out by appropriately approved maintenance organisation or licensed aircraft maintenance technician as applicable to establish the maintenance actions required to return the engine to an airworthy condition.

In no case shall any mandatory restrictions be exceeded, and the compliance with mandatory bulletins/modifications/inspections shall be completed at the specified times.

Appendix 1

Under the provisions of these requirements, engines that have reached the operating time or calendar time limitation of a recommended overhaul period may continue in service for a further period of operation not exceeding 20% of the recommended operating time or calendar time, whichever occurs first, subject to compliance with the following:

1. Compliance being shown with the appropriate limitations specified in limitation in this requirement.
2. Compliance being shown with any applicable Airworthiness Directive which requires compliance at engine overhaul.
3. The engine must have been installed and operated in an Icelandic registered aircraft, or in an aircraft whilst previously registered in another Member State for a period of 200 hours immediately prior to completion of the engine manufacturer's recommended overhaul period.
4. The aircraft maintenance programme amended and approved by ICETRA with the inspection tasks listed in the Appendix 3.
5. The engine being inspected in accordance with the approved maintenance programme that has been amended and approved in accordance to Appendix 3 in order to assess its condition for continued safe operation immediately prior to the increase, and subsequently at stated intervals, whichever occurs first.
6. The data obtained during the inspections being entered in the engine log book.

Appendix 2

Engines that have complied with Appendix 1 and completed 20% extension of the recommended TBO, operating time or calendar time, whichever occurs first, may continue in service (on-condition), subject to compliance with the following:

1. The engine being installed in an aircraft which is not used for the purposes of Commercial Air Transport, Aerial Work or Flight Schools
2. Compliance being shown with the appropriate limitations specified in limitation in this requirement.
3. The engine being inspected in accordance with the approved maintenance programme in order to assess its condition for continued safe operation prior to the extension in excess of 20% of recommended TBO (operating time and calendar time, whichever occurs first) and subsequently at stated intervals, whichever occurs first.
4. The data obtained during the inspections being entered in the engine log book. A log book entry should also be made to restrict the aircraft/engine usage during this extension period to flying for the purposes of Private Flight only.

Appendix 3

Light Aircraft Piston Engine Maintenance Requirements for Operation Beyond Manufacturers' Recommended Overhaul Periods

This appendix gives requirements on the minimum additional inspections which are necessary for a light aircraft piston engine to be assessed and accepted as being in a condition that will allow operation beyond the recommended overhaul period under the terms of these requirements. Additional inspections may also be specified.

The inspections tasks must be incorporated in the aircraft maintenance programme and approved by ICETRA.

50-hours Inspection requirements: number 1, 2 and 6 below.

100-hours / yearly Inspection requirements, whichever occurs first: number 1 through 6.

Inspection and Maintenance

1. External condition: Visually inspect the engine for oozing oil and fuel before cleaning. Clean the engine and inspect the engine for obvious faults such as a cracks, corrosion, burns and overheating, broken fins of the cylinder, excessive ply in the propeller shaft. Check engine mounts, baffles and exhaust system for any signs of faults and excessive vibrations.

2. Oil system: For evidence of internal damage or wear, replace the oil filter and inspect the removed filter, oil pressure screen, magnetic plugs and oil suction screen as applicable for presence of metal particles and other debris. The quantity, shape, appearance, and condition of the particles found should be inspected for the type of material. A visual inspection and use of a magnet may help to distinguish between ferrous and non-ferrous materials.

Replace engine oil and inspect for the presence of contamination and metal particles.

3. Oil consumption: Establish that the recorded oil consumption over the previous 10 flying hours has not exceeded the manufacturer's recommendations, and to verify any abnormal oil consumption. Either situation is cause for further investigation.

4. Cylinder compression check: Carry out a cylinder differential compression check in accordance with the manufacturer's latest instructions, and establish if the results are satisfactory for continued service.

5. Engine Performance check: Carry out a satisfactory maximum static RPM engine Performance power check in accordance with the manufacturers' requirements or a satisfactory timed power climb against flight manual figures. Before running the engine at high power the normal operating temperatures should be obtained (not the minimum temperatures specified for operation) and during the test careful watch should be kept on oil and cylinder temperatures to prevent the appropriate limitations being exceeded. Power check is to be taken after completion of any inspections or repairs to the applicable engine.

-In addition record and compare to manufacture specification

- Oil pressure at idle and take-off power
- Oil temperature at idle and take-off power
- Cylinder head or exhaust gas temperature at take off power
- Left / Right Magnetos drop

6. Servicing

If the engine proves to be suitable for further service, a number of servicing operations will normally be due, in accordance with the approved Maintenance Programme. Unless carried out previously these operations should be completed before the aircraft /engine is returned to service.

CRS: Issue a certificate of release to service in the engine log book certifying that the provisions set out in the maintenance programme have been complied with and that the engine is in a satisfactory condition for continued service.

In addition:

Owners / Operators may in addition consider the following inspection that is however not considered mandatory for the use of this TBO requirements for example with interval from one to five years i.e.:

Inspect the interior of each cylinder for scoring of the cylinder bores, pitting of piston crown, cracking and corrosion, erosion or distortion of valve seats, and general condition. This inspection can be performed by borescope through the spark plug holes or removal of cylinders

Inspect the internal condition, crankshaft etc. for satisfactory condition by removal of at least two diagonal opposing cylinders or the crankcase covers, removal of magnetos and visual inspection of crankcase interior and accessory gear interior for corrosion.