Irish Aviation Authority The Times Building 11–12 D'Olier Street Dublin 2, Ireland www.iaa.ie Safety Regulation Division	Údarás Eitlíochta na hÉireann Foirgneamh na hAmanna 11–12 Sráid D'Olier Baile Átha Cliath 2, Éire Rannán na Rialachán Sábháilteachta	AAM No. 12 Revision: 02 Date: 08.04.24	IAA

Title: Piston Engine Overhaul Periods for EASA light aircraft subject to Part ML

Advisory Memoranda are provided for information purposes only and must not be misconstrued as formally adopted Acceptable Means of Compliance (AMC) or as Guidance Material (GM).

1. Introduction

Since the introduction of Part ML, the following aircraft not listed in the air operator certificate of an air carrier licenced in accordance with Regulation (EC) No 1008/2008 are subject to EASA Part ML rules;

(a) Aeroplanes of 2,730kg maximum take-off mass (MTOM) or less;

(b) Rotorcraft of 1,200 kg MTOM or less, certified for a maximum of up to 4 occupants;

(c) Other ELA2 aircraft.

These aircraft's Aircraft Maintenance Programmes (AMP) are either approved by a Continuing Airworthiness Management Organisation (CAMO) or Combined Airworthiness Organisation (CAO) or Owner-declared by the owner. **As such, this AAM should no longer be referenced in the AMP, but may be used for guidance.**

Some AMPs approved by the IAA prior to the introduction of Part ML refer to the technical content of this AAM. Those AMPs may continue to use the technical content of this Memorandum. As such, only the Appendix of this AAM remains published for reference.

As Part ML came into effect on 24th March 2020 and the IAA no longer approved AMPs for affected aircraft after this date.

1 Appendix I

Maintenance Requirements for Piston Engine Operation beyond Manufacturers' Recommended Time Between Overhaul (TBO)

This appendix provides criteria on the inspection items needed for the extension of TBO^R of a piston engine. It is recommended that these items be carried out annually on any engine which is operating beyond TBO^R.

A piston engine that has reached the end of its recommended overhaul interval issued by the Design Approval Holder (DAH) or the declarant of a declaration of design compliance may be expected to have suffered some wear to cylinders, pistons, valves, bearings and other moving parts, but an engine that has been carefully operated and maintained may still be in a condition suitable for a further period of service.

1. Many factors affect the wear that takes place in an engine. The most important of these include: the efficiency of the air intake filter; the techniques used in engine handling, particularly during starting; the quality of the fuel and oil used in the engine; and the conditions under which the aircraft is housed when not in use. Conditions of operation are also relevant; the length of flights; the atmospheric conditions during flight and on the ground; and the type of flying undertaken. Many of these factors are outside the duties of the maintenance personnel, but meticulous compliance with the approved maintenance programme and any instructions provided in the form of service bulletins or recommendations issued by the DAH or the declarant of a declaration of design compliance will undoubtedly help to prolong the life of an engine.

2. The inspections and tests that may be necessary to assess the condition of an engine are detailed in the following paragraphs. Alternative inspections/tests that would provide equivalent information or findings may be proposed.

3. Inspection and maintenance

A number of items included in the normal scheduled maintenance of an engine may be repeated to determine the condition of an engine at the end of its normal overhaul period, and additional inspections may also be specified.

3.1 External condition

The engine should be examined externally for obvious defects such as a cracked crankcase, excessive play in the propeller shaft, overheating and corrosion, which would make it unacceptable for further use. Special attention should be drawn to the cables, plugs, connectors and sensors of engines equipped with electronic control systems regarding improper mounting, shaving, worn contacts, and other kind of damage. Worn or damaged parts have to be repaired/replaced according to the instructions issued by the DAH or the declarant of a declaration of design compliance. External tubes and houses should be checked and if necessary, replaced in accordance with the instructions issued by the DAH or the declarant of a declaration of design compliance.

3.2 Internal condition

Significant information concerning the internal condition of an engine may be obtained from an examination of the oil filters and magnetic plugs, for metal particle contamination. These checks may be sufficient to show that serious wear or breakdown has taken place and that the engine is unacceptable for further service.

3.3 Oil consumption

Since the oil consumption of an engine may have increased towards the end of its normal overhaul period, an accurate check of the consumption over the last 10 flying hours would show whether it is likely to exceed the maximum recommended consumption defined by the DAH or the declarant of a declaration of design compliance, if the overhaul period were to be extended.

3.4 Compression check

Piston ring or cylinder wear, or poor valve sealing could, in addition to increasing oil consumption, result in a significant loss of power. A cylinder compression check should be carried out in accordance with the instructions issued by the DAH or the declarant of a declaration of design compliance. The usual method of checking engine compression is the differential pressure test. In this test a regulated air supply (normally 560 kPa (80 lbf/in^2)) is applied to each cylinder in turn and a pressure gauge is used to record the actual air pressure in the cylinder. Since some leakage will normally occur, cylinder pressure will usually be less than the supply pressure and the difference will be an indication of the condition of the piston rings and valves. By listening for escaping air at the carburettor intake, exhaust and crankcase breather, a defective component may be located. It is usually recommended that the differential pressure test is carried out as soon as possible after running the engine.

4. Power output of aeroplane engines

The power developed by an aeroplane engine after initial installation is established in the form of a reference engine speed, which is recorded in the appropriate logbook so that a comparison can be made during subsequent power checks. The reference engine speed is the observed engine speed obtained using specified power settings and conditions corrected, by means of graphs supplied by the engine DAH or the declarant of a declaration of design compliance, to the figure which would be obtained at standard sea-level atmospheric temperature and pressure; changes in humidity do not produce large changes of power and are ignored for the purpose of establishing a reference engine speed or subsequently checking engine power. Power checks should be corrected in the same way.

4.1 Power checks

The majority of light aeroplane piston engines are air-cooled and rely on an adequate flow of air for proper cooling of the cylinders. This condition can only be obtained during flight and ground runs should therefore be as brief as possible. Cooling can be assisted by facing the aircraft into wind, but high wind conditions must be avoided when making power checks, as they will significantly affect the results obtained. 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.

4.1.1 Normally-aspirated engines are tested at full throttle and, where a controllable-pitch propeller is fitted, with fully fine pitch selected. The changes in barometric pressure affecting engine power are considered to be balanced by changes in propeller load, so that only temperature correction is necessary. This correction factor may be obtained from a graph supplied by the engine DAH or the declarant of a declaration of design compliance. (if not provided by the DAH, Leaflet 70-70 Piston Engine Overhaul – Correcting Engine Test Results of CAA UK CAP 562 could be used). The observed full throttle speed multiplied by the correction factor will give the corrected speed.

4.1.2 Although normally-aspirated engines are often fitted with variable-pitch propellers, the engine speed obtained at full throttle is usually less than the governed speed and the propeller remains in fully fine pitch. With supercharged engines, however, the propeller is usually governed to a constant speed at high power settings and small changes in power will not affect engine speed. The power of a supercharged engine is, therefore, checked by establishing a reference speed at prescribed power settings.

a) Since a supercharged engine is run at a specified manifold pressure regardless of the atmospheric pressure, corrections must be made for both temperature and pressure variations from the standard atmosphere.

b) The procedure is to run the engine until normal operating temperatures are obtained, open up to maximum take-off manifold pressure, decrease power until a fall in engine speed occurs (denoting that the propeller blades are on their fine pitch stops), then throttle back to the manifold pressure prescribed by the DAH or the declarant of a declaration of design compliance and observe the engine speed obtained.

c) The correction factor to be applied to the observed engine speed of a supercharged engine may be obtained from graphs supplied by the engine DAH or the declarant of a declaration of design compliance.

4.1.3 Although the engine speed obtained during a check of engine power is corrected as necessary for atmospheric temperature and pressure, no correction is made for humidity, ambient wind conditions or instrument errors and, consequently, the corrected engine speed is seldom exactly equal to the reference speed even if the engine condition is unchanged. However, engine power may usually be considered satisfactory if the corrected speed obtained during a power check is within 3 % of the reference speed.

4.1.4 If it is not possible to assess power deterioration by means of a power check (e.g. due to fitting a different propeller), a rate-of-climb flight test should be carried out.

5. Power loss

If the power check (paragraph 4) or normal engine operation reveal an unacceptable loss of power or rough running, it may be possible to rectify this by carrying out certain normal servicing operations or by replacement of components or equipment. The replacement of spark plugs, resetting of tappets or magneto contact breaker points, or other adjustments to the ignition or carburation systems, are all operations that may result in smoother running and improve engine power.

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 (paragraph 6), these operations should be completed before the engine is returned to service.

7. Logbook entries

A record of the checks made, and any rectification or servicing work, must be entered and certified in the engine logbook before the engine is released to service for its recommended or extended service life. The logbook entry made should also specify any restriction on further use (e.g. May not be used for Commercial Air Transport).

8. Maintenance programme amendments

The AMP should comply with the requirements of the applicable regulations. This may include the provisions for TBO extension and the additional maintenance tasks required with their periodicity to operate the aircraft engine beyond its recommended overhaul period.