LYCOMING ENGINES

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Process Support
Rulemaking Directorate - EASA
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Dear Sirs/Madams:

Avco Corporation, currently doing business as Lycoming Engines, has produced more than 325,000 piston aviation engines since 1929. More than 160,000 of our engines are currently estimated to be active worldwide on general aviation and special purpose aircraft. Our product portfolio consists of more than 700 FAA Part 33 (or CAR 13) Type Certificated engine models. Under our FAA and EASA Production Certificates we produce more than 1500 new engines per annum. Under our FAA and EASA Repair Station authorizations we overhaul more than 1500 engines per annum. As part of our factory engine rebuild and overhaul services, we regularly receive, tear-down and inspect used engine cores from the field.

Our product portfolio and ongoing business operations makes Lycoming Engines uniquely qualified to comment with expertise to regulatory amendments regarding "on condition" maintenance proposed in EASA NPA No. 2011-15.

Lycoming Engines hereby expresses its concerns regarding the regulatory amendments proposed in the EASA NPA No. 2011-15, which through the introduction of "Appendix XIV to AMC#2 M.A.302 (d) – Inspection to Time Between Overhauls" completely disregards the original equipment manufacturer and type certificate holder's guidance of performing full overhauls of piston engines at the stated periods. Allowing aviation piston engines, certificated under 14 CFR Part 33 and operated under 14 CFR Part 91 and 14 CFR Part 135, to be operated "on condition" with compliance only to very basic checks reduces flight safety standards.

The basic checks in the proposed amendment do not ensure the integrity of critical engine components. Furthermore, type design holder guidance on recommended or required actions up to the stated overhaul limitation are not, and never were intended to be, sufficient to extend time between overhaul (TBO). These actions or checks are part of the provisions of attaining the stated TBO without a decrement in engine reliability to perform to design intent.

Lycoming Engines' TBO periods and overhaul inspection procedures are based upon rigorous regulatory directed and company endurance testing combined with field maintenance experience. As you may be aware, the endurance testing is conducted as accelerated mission profile (AMP) testing and is based upon the "average" utilization of a Part 23 certificated aircraft operated under Part 91 or Part 135 conditions. Stated TBO in accumulated operating hours is developed directly from direct observations from AMP testing and generally identifies failure modes as a result of wear or fatigue.

Lycoming also provides TBO guidance on a calendar time basis as some critical engine components or systems will deteriorate from lack of use (time and/or environment related). The calendar time basis guidance for TBO is derived mainly from our field experience inclusive of core engine return tear-down inspections.

Adopting "on condition" practices completely ignores the basis of our stated TBO limitations and the impracticality of an operator being able to interpolate from the well understood and FAA supported type design holder assumptions for AMP and field observations. Simply stated, there is no practicable means for Part 91 and Part 135 operators to attain and process the data to support a de facto extension of TBO that the amendment would imply via "on condition" maintenance.

Every type certified Lycoming engine has been designed to meet a level of reliability for manned light aircraft, which during operation depends critically on the condition of its components. The basic inspections proposed in "Appendix XIV to AMC#2 M.A.302 (d) – Inspection to Time Between Overhauls" based solely on the monitoring of oil filters & consumption, compression checks, and power output, do not ensure that engine reliability will remain at its original design levels beyond the recommended TBO periods. The inspections stated in the amendment are not sufficient to detect component deterioration that could result in partial or catastrophic failure.

For example, none of the proposed methods will detect crack propagation in cylinder heads or other power section components. Crack propagation is governed by mean stress, alternating stress and operating temperatures, all of which are part of the presumed general aviation mission profile and the AMP conditions by which TBO is established. Operators of Part 23 aircraft equipped with Part 33 engines flying under Part 91/135 rules have no regulatory mandated reporting to the OEM or practicable engine condition monitoring tools to assess the remaining utilizable life of a component versus the AMP. Given this reality, it should be clear that the only meaningful "On Condition" criteria would be the TBO accumulated hours guidance itself, meaning that all components (external and internal) would need to be inspected in detail through means of non-destructive testing (visual, dimensional, magnetic particles, etc...) as instructed in the corresponding overhaul manuals of the engines.

Outside of the AMP based accumulated hours TBO guidance, local climate conditions, storage (outside versus hangar) conditions, extended periods of inactivity, preservation techniques employed during inactive periods, and quality and frequency of general maintenance (oil changes, inspections, etc.) all play a significant role in determining TBO calendar time limits. Once again, the proposed inspections in the amendment would be insufficient to detect the deterioration that would be a result of environmental conditions. Specifically, corrosion and stress corrosion cracking would not be detected by the methods stated.

Summarizing, extending TBO periods for indefinite time intervals without performing the in-depth non-destructive inspections called for in overhaul manuals and service publications, as proposed in NPA No. 2011-15 for components installed in privately operated aircraft with a MTOM of 2730 kg or below, may result in the exposure of engine components to operating conditions for which they may no longer be suitable, decreasing reliability versus original design intent and thus increasing the possibility of unexpected engine failures and reduced airworthiness.

Notwithstanding the detrimental impact to engine reliability and airworthiness, there are many factors affecting the assumption that a TBO extension will have a positive impact on operating costs. Specifically, if an operator chooses to operate an engine or engine component beyond the manufacturer recommended limits the ultimate cost of overhaul or replacement is likely to be greater as parts may be worn beyond repairable limits. The potential for engine failures that could keep the affected aircraft grounded will also increase. In the aggregate, Lycoming firmly believes that the additional cost will be greater than the amount saved by extending the major overhaul period using the "on condition" approach proposed in the amendment.

In conclusion, the intent of NPA No. 2011-15 to harmonize the guidelines and management of TBO extensions among the different European aviation authorities should only be executed in a manner that does not compromise engine reliability levels and airworthiness. Lycoming Engines' position is that the proposed TBO extension allowance conditions, and most significantly the inspection requirements outlined in "Appendix XIV to AMC#2 M.A.302 (d) – Inspection to Time Between Overhauls", are insufficient to ensure the airworthiness condition of critical engine components. The only practicable method is the type design holders' TBO guidance itself.

Thank you for consideration of our arguments and please contact me directly for any further discussion.

Sincerely

Michael J Kraft
Senior Vice President and General Manager
Lycoming Engines

Cc: Guido Defever / Lycoming
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