

File No. 13/227/63-AI(2)

EFFECTIVE : FORTHWITH

Subject : **'On-Condition' Maintenance of reciprocating Engines (Piston Engines).**

1. APPLICABILITY :

This part of Series 'D' of CAR lays down the procedure which shall be followed by all operators, including private aircraft operators (and engines overhauling agencies) of piston engines to ensure continued airworthiness of such engines.

2. BACKGROUND :

Experience gained so far with operation and maintenance of piston engines has revealed that it is possible to predict the impending failures of such engines if vital operating parameters are monitored closely and regularly. Thus, corrective action can be taken in time which would impressively reduce, if not eliminate, serious incidents resulting from in-service malfunction/failure of engines and will consequently enhance safety in aircraft operation.

3. SCOPE :

By following the procedure laid down hereunder (in para 5), operators can operate piston engines upto the 'lives' (TBO) prescribed by the manufacturers straight away (subject to such in-service inspection as may be specified by DGCA) and even beyond provided the calendar period limits (reference CAR Series 'S' Part II) are not exceeded. However for operating engines beyond manufacturer's laid down TBOs, prior concurrence of Regional Airworthiness Office shall be necessary. Policy and procedure of an individual operator in this regard shall have to be spelt out in operator's Maintenance System Manual.

4. DEFINITIONS :

4.1 'On-Condition Maintenance' means accomplishment of repetitive (i) visual inspections or (ii) physical measurement or (iii) 'in situ'/bench/test, etc., to determine the continued serviceability of the components, on which such maintenance is performed, without having to dismantle them completely and before such components fail or reach a critical stage in their operation.

4.2 "Alert value" means maximum deviation from the normal operating limit but within the allowable operating range,

which shall not cause malfunction to an extent where aircraft safety is in jeopardy.

5. PROCEDURE :

5.1 Every operator shall maintain a continuous record of the following engine parameters (as applicable), in graphical form (preferable, if feasible) or tabulated form, in respect of each piston engine operated by him:-

- (a) Revolutions per minute (static)
- (b) Manifold pressure
- (c) Oil pressure
- (d) Oil temperature
- (e) Oil consumption (average figure computed over a period of operation).
- (f) Cylinder head temperature
- (g) Cylinder compression figure
- (h) Condition of engine oil screen (pressure and suction) with regard to metal/sludge accumulation
- (i) Condition of spark plug electrodes (for lead fouling, fuel fouling, oil fouling and unusual wear)
- (j) Such other parameters as may be decided by the DGCA

These parameters must be recorded under stabilized conditions during periodical ground "run up".

5.2 The operators shall require engine overhauling agencies to provide a life record in the engine log book of all such parts of engine which are having stipulated fatigue lives. It shall be the responsibility of the overhauling agency to mention the fatigue lives of the components in the engine log book. And it shall be the responsibility of an operator to ensure that an engine is not operated to an extent where the fatigue lives of components fitted in it are exceeded. It shall also be the responsibility of an engine overhauling agency to report to Regional/Sub-Regional Airworthiness Office promptly, in writing, all "life limiting features" observed by it during the overhaul of an engine/engine accessories.

5.3 The parameters shall be recorded/plotted after every 50 hours or so of engine operation (the exact period will be decided by an operator in consultation with Regional Airworthiness Office) and average figure obtained during this period shall be utilised for the purpose of recording.

5.4 Every parameter shall have an alert value which will be fixed in consultation with Regional Airworthiness Office. ALERT VALUES ARE FOR REFERENCE ONLY TO INDICATE THAT CORRECTIVE MAINTENANCE ACTION IS NECESSITATED. ALERT VALUES ARE NOT ACCEPTANCE LIMITS.

5.5 Regional/Sub-Regional Airworthiness Offices shall be informed promptly, in writing by operators whenever alert

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- values are reached or abnormal conditions are observed along with the corrective maintenance action proposed to be taken.
- 5.6 All mandatory modifications shall be embodied as stipulated.
- 5.7 Engine operating limits, as prescribed by the manufacturer/DGCA shall not be exceeded.
- 5.8 Maintenance System Manual shall spell out the corrective maintenance action which shall be taken when alert values are reached or an abnormal condition, is observed.
- 5.9 Engine accessories, including propellers, may follow maintenance programme (including fixation of TBOs) independent of the engine. The maintenance programme in this regard shall also be spelt out in Maintenance System Manual. The consolidated maintenance and operational records of such accessories (having lives independent of engine life) shall be maintained separately in a register or in log cards.
- 5.10 Engine overhaul records in respect of all but particularly failed engines shall be preserved at least for 5 years by overhauling agencies, for scrutiny and reference, if necessary.
- 5.11 Officers of Regional/Sub-Regional Airworthiness Offices may, during their spot checks, inspect the parameter monitoring record of the operators. If operators do not maintain monitoring records, as stipulated in para 5.1, or fail to observe requirements (as applicable to them) of paras 5.2 to 5.9, the Incharge, Regional/Sub-Regional Airworthiness office, may require immediate withdrawal of the affected engine from service.
6. CAR series 'D' Part III dated 1-1-1968 will stand canceled with effect from 1-5-1978.

Sd/-
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Director of Airworthiness
for Director General of Civil Aviation