SECTION 12.6 PISTON ENGINE CONTINUING AIRWORTHINESS REQUIREMENTS

12.6.1 INTRODUCTION

The following is the minimum required by RAAus to show that an adequate and reasonable inspection has been carried out to track the performance of an engine.

Although RAAus recommends that the engine manufacturers' overhaul schedules be followed, "On Condition" operations may be an option, unless the manufacturer specifically excludes it.

12.6.2 DEFINITIONS – FOR THE PURPOSES OF THIS SECTION

Airworthy - an aircraft engine, including its component parts, is generally defined as Airworthy when it:

a) remains as originally manufactured, or incorporates factory approved modifications; and/or

b) is overhauled at the manufacturer's specified times; and

c) is overhauled IAW the manufacturer's specifications; and

d) remains in a condition for safe operation

"On-condition" maintenance means an inspection/functional check that determines an item's performance and may result in the removal of an item before it fails in service. **It is not a philosophy of fit until failure or fit and forget.**

"On-condition" operation is not available for LSA unless the manufacturer states otherwise.

12.6.3 APPLICABILITY

Piston engines and those components necessary for the operation of the engine installed in aeroplanes and maintained in accordance with the manufacturer's schedules.

This section is not applicable to compression-ignition (diesel) piston engines using fuels other than Avgas or Mogas, or electric battery powered motors.

12.6.4 REQUIREMENTS FOR ALL AIRCRAFT

To ensure the continuing airworthiness of the engine, and those components necessary for the operation of the engine:

a) the requirements of normal servicing, in accordance with the manufacturers schedule; is to be undertaken; and

b) the requirements in Annex A & B for four stroke engines must be followed; or

c) the requirements in Annex C for two stroke engines must be followed; and

d) operating the engine "on condition" is permitted unless the manufacturer specifically excludes it.

12.6.5 REQUIREMENTS FOR AIRCRAFT USED FOR HIRE AND/OR FLYING TRAINING

Maintenance on aircraft identified in this Subsection must conducted by an appropriately accredited RAAus L2 and the aircraft weighed in accordance with the requirements of Section 10 Weight and Balance before being released to service for flight training or private hire.

Moving an aircraft from "Privately Operated" to "For Hire and/or Flying Training":

Any Factory Built 95.32 or 95.55 Aircraft which has been operating privately with an "on condition" engine, must have that engine overhauled or replaced prior to that aircraft being used for hire and/or flying training. The replacement engine must be either:

a) A factory new engine

b) A factory (or factory accredited over-hauler) overhauled engine and has a completed RACR (Recreational

Aircraft Condition Report - Tech Form 13) inspection done by an RAAus L2.

12.6.6 RECORD OF CONDITION

TECH FORM 023 – 4 STROKE PISTON ENGINE CONDITION REPORT or TECH FORM 024 – 2 STROKE PISTON ENGINE CONDITION REPORT is to be completed for all engines completing this process and affixed in the aircraft maintenance logbook.

ANNEX A - FOUR-STROKE PISTON ENGINE CONDITION CHECK

REQUIREMENT 1 – AT EACH PERIODIC INSPECTION:

a) Carry out an engine performance run to determine the engine performance.

b) For turbocharged / supercharged engines, the output parameters shall be adjusted in accordance with manufacturer's data.

c) Record engine and aircraft details and parameters achieved during the engine run on **TECH FORM 023 – 4 STROKE PISTON ENGINE CONDITION REPORT.**

d) All completed forms shall become part of the engine maintenance record.

e) For the purposes of this subsection:

   i. where possible, maximum RPM is to be attained with the aircraft stationary; or

   ii. where the aircraft manufacturer details in approved maintenance data that maximum RPM can only be achieved during take-off or climb, or the aircraft type does not permit maximum RPM to be safely obtained whilst the aircraft is stationary, an entry on the aircraft Maintenance Record sheet by the pilot in command of the maximum RPM during the last flight prior to the periodic engine inspection is acceptable data.

f) Engine run parameters to be recorded include:

   i. Take-off power shall be:

      - for a fixed pitch propeller aircraft - static RPM.
      - for a constant speed propeller, normally aspirated engine aircraft, take-off powershall be maximum RPM at a manifold pressure, not less than 2" of static manifoldpressure, or at full fine pitch for variable pitch propellers.
      - for a turbocharged/supercharged engine aircraft, take-off power shall be maximumRPM at the manifold pressure, or pitch setting as detailed in the aircraft flight manual.

   ii. With the engine at operating temperature:

      - oil pressure at idle and at take-off power; and
      - oil temperature at idle and at take-off power; and
      - cylinder head or exhaust gas temperature, if fitted, at take-off power; and
      - fuel pressure/flow at take-off power if fitted; and
      - ambient temperature and location altitude.

REQUIREMENT 2 - AT INTERVALS NOT EXCEEDING 100 HOURS.

a) Carry out a cylinder leak check in accordance with:

   i. The procedure(s) published by the engine manufacturer; or

   ii. In accordance with Annex B – Four Stroke Piston Engine Cylinder Leak Check, where data from the engine manufacturer is not available.

b) Record the results of each cylinder leak check and / or inspection on **TECH FORM 023 – 4 STROKE PISTON ENGINE CONDITION REPORT**

REQUIREMENT 3 - AT INTERVALS AS PUBLISHED BY THE ENGINE MANUFACTURER:

a) Oil change

   i. Replace the engine oil and engine oil filter.

b) Engine oil filter, visible oil pressure indicators and screen inspection - At each oil change and oil filter replacement, if applicable:

   i. All engine oil and engine oil filter replacements, including those carried out in the period between the aircraft periodic inspections, shall include inspecting the engine oil pressure filter, oil pressure screen, if fitted; and

   ii. If applicable, inspecting the oil suction screen, for evidence of metallic particles, shavings, or flakes; and

   iii. If metallic particles or shavings are discovered, take corrective action, where necessary.

c) Engine oil uplifts - At each oil addition and at each aircraft periodic inspection:

   i. Record all oil uplifts; and

   ii. Review oil usage records and take corrective actions, where necessary.

   iii. For the purposes of Subsection 3.3.1 Oil uplifts are oil that is added to the engine between servicing; and

   iv. The amount of oil added is to be recorded on Tech Form 121 Daily Flight Record.

REQUIREMENT 4 – REVIEW DATA

a) In order to assess the engine condition, review all data recorded in requirements 1, 2 and 3 of this Annex; and

b) Engines that fail the condition check required by this Annex, (such as, but not limited to: poor leakdown result, poor compression, poor performance, rough running) are to be repaired or overhauled prior to further use.

c) Only airworthy engines are to be placed in service.

ANNEX B - FOUR-STROKE PISTON ENGINE CYLINDER LEAK CHECK

INTRODUCTION

To effectively monitor the continuing airworthiness of a piston engine in service, certain maintenance actions should be carried out to establish the condition of the engine.

Those maintenance actions should not only establish the condition of the engine at the time of the maintenance, but also establish a level of trend monitoring.

The trends can then be used to plan maintenance in a pro-active manner, rather than in a reactive manner.

A prime factor in piston engine trend monitoring is the cylinder leak check. A cylinder leak check should be carried out at specified intervals to establish and monitor the condition of the engine cylinders.

The procedure should not only establish the rate of cylinder leakage but also the source of the leakage. For example, whilst a level of dynamic leakage past the piston rings may be acceptable, any static leakage past a valve seat or from the head to barrel joint renders that cylinder unserviceable.

The cylinder leak check, using the differential pressure test method, must be carried out:

a) For aircraft used only in private operations – by the owner (holding a Level 1 Maintenance Authority) or a Level 2 Maintenance Authority holder.

b) For aircraft used for hire or flying training - by a Level 2 Maintenance Authority holder.

LEAK RATES ACCEPTABLE

Manufacturer published data for acceptable tolerances for static engine leak limitations must be observed. Notwithstanding this statement of requirement, static leaks are not permitted from the cylinder barrel, cylinder barrel to head joint, cylinder head, or the inlet and exhaust valve to seat seals.

In the absence of engine manufacturer data differential leak rates of less than 25% are acceptable.

A differential leak rate of more than 25% will require maintenance action. The maintenance required is:

a) Better than $\frac{50}{80}$: the engine may continue in service subject to recording the results of the cylinder leak check in the maintenance logbook and listing as maintenance required; and

b) oil consumption shall be monitored in accordance with approved maintenance data at intervals not to exceed 50hrs time in service; and

c) a cylinder leak check shall be carried out at intervals not to exceed 50 hours' time in service until rectification of the excessive differential leak rate is carried out.

d) A differential leak rate of less than $\frac{50}{80}$ requires rectification before further flight is permitted.

ANNEX C - TWO-STROKE PISTON ENGINE CONDITION CHECK

REQUIREMENT 1 – AT EACH PERIODIC INSPECTION

a) Carry out an engine performance run to determine the engine performance.

b) Record engine and aircraft details and parameters achieved during the engine run on **TECH FORM 024 – 2 STROKE PISTON ENGINE CONDITION REPORT**

c) All completed forms shall become part of the engine maintenance record.

d) For the purposes of this subsection:

   i. where possible, maximum RPM is to be attained with the aircraft stationary; or

   ii. where the aircraft manufacturer details in approved maintenance data that maximum RPM can only be achieved during take-off or climb, or the aircraft type does not permit maximum RPM to be safely obtained whilst the aircraft is stationary, an entry on the aircraft maintenance release by the pilot in command of the maximum RPM during the last flight prior to the periodic engine inspection is acceptable data.

e) Engine run parameters to be recorded include:

   i. Take-off power shall be:

      - for a fixed pitch propeller aircraft - static RPM.

   ii. With the engine at operating temperature:

      - cylinder head or exhaust gas temperature at take-off power;
      - fuel pressure/flow (where fitted) at take-off power;
      - ambient temperature and location altitude.

REQUIREMENT 2 – REVIEW DATA

a) To assess the engine condition, review all data recorded in Requirement 1 of this Annex; and

b) Engines that fail the condition check required by this Annex, following defect rectifications in accordance with the manufacturers' recommendations, are to be overhauled; and

c) Only airworthy engines are to be placed in service.