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2. Maintenance Requirements

1. *Microlight Maintenance*

- 1.1 Microlight Aircraft maintenance shall be the responsibility of the aircraft Operator.
- 1.2 An Inspection Authority Holder, may, upon request from the Operator, and without prejudice, inspect the aircraft and report to the Operator any maintenance aspects affecting the safety of the aircraft. All defects and deficiencies found should be listed and presented to the owner for rectification.
- 1.3 The operator is required to comply with any instructions contained in any applicable airworthiness directive issue by the Director (103.215(a)).
- 1.4 The operator shall ensure that the required instruments and equipment are fitted to the aircraft (103.221.)
- 1.5 On receipt of notice that the defects covered on the list have been rectified, the inspection Authority Holder may sign off the aircraft.
- 1.6 SAC recommends that all Microlight Operators maintain their aircraft, engines and equipment, in accordance with the Manufacturer's published Maintenance Schedules otherwise establish their own maintenance program acceptable to SAC or CAA where none exists.
- 1.7 Operators must enter all flying times, maintenance, and replacements in the aircraft logbooks within 24 hours of the event.
- 1.8 All Microlights must be presented to a person holding an Inspection Authority issued by an Aviation Recreation Organisation every 12 months for an Annual Condition Inspection (103.217(c)).
- 1.9 All Microlight helicopters are classified as Class 2 microlights.
- 2.0 Microlight Altimeters must be calibrated and checked by an authorised person if a transponder is fitted to that aircraft.
- 2.1 Transponders fitted to Microlight aircraft must be tested and calibrated as per rule 91.605(e)3
- 2.2 Floatation equipment carried must be checked as per rule 91.605(e)8

3. Microlight Inspection Authority

1. *Microlight Inspection Authority*

1.1 Qualifications

A person wishing to hold a Microlight Inspection Authority with SAC must be a client in good standing and meet the following minimum-qualifications in order of preference:

- (a) Licenced Aircraft Maintenance Engineer; OR
- (b) Engineering Trade Certificate and microlight maintenance experience; OR
- (c) Considerable experience in the maintenance and repair of microlights; OR
- (d) Experience in building, repair and maintenance of amateur-built aircraft or microlights.

1.2 Minimum knowledge requirements

- (a) A working knowledge of relevant Civil Aviation Rules 103 Subpart G.
- (b) Knowledge of standard aircraft maintenance practices, repairs to structures and fabrics. (AC43.13-I A refers).
- (c) Knowledge of materials used in microlights, their properties, equivalents and aircraft hardware.
- (d) Knowledge of propeller construction, defects, repair and balancing.
- (e) Knowledge of 2 and 4 cycle engines, carburettion, ignition, cooling, generation and installation in microlight aircraft;
- (f) Knowledge of aircraft radio and aerial installation;
- (g) Knowledge of modification procedure for microlight aircraft and effect of modifications on weight and balance, performance and structural integrity.

- (h) In-depth knowledge of the Flight Permit validation procedure, and the responsibilities of being an inspector.
- (i) Familiarity with Part 43, Appendix C, as stated in Rule 103.217(d)(2).

2. *Application Procedure*

- 2.1 Persons meeting the criteria set out above may apply to SAC for the granting of an Inspection Authority, using application form SAC Form 8.10.
- 2.2 Applicants should attach to this form any available supplementary evidence regarding qualifications or experience.
- 2.4 Applicants will be examined by the SAC Technical Officer against the qualifications and knowledge requirements on this page. Successful applicants will be placed on the next induction course.
- 2.5 The SAC Board of Directors will screen the application together with the recommendations of the Technical Officer. If approved, the Board will allocate an Authority Number to be used on all Inspections carried out by the Authority Holder.

3. *Training*

- 3.1 SAC may run engineer induction and refresher training courses as required for persons wishing to become Inspection Authority holders and for existing Inspection Authority holders.
- 3.2 SAC may also authorise an existing Inspection Authority Holder to supervise and provide on-the-job training for any new applicant.

4. Validity

- 4.1 An Inspection Authority holder will remain valid, while they maintain a current SAC annual membership, subject to the SAC Technical officer, who may at any time, require a competency check be carried out or revokes their certificate at his/her discretion.

5. Aircraft Inspection Procedure

- 5.1 When an aircraft is due for permit revalidation, the operator shall contact an Inspection Authority Holder and ensure the aircraft is presented for inspection in a clean condition located out of the weather on firm dry ground.
- 5.2 The Inspection Authority Holder must gain the operator's permission to gain access to the inner structure for inspection purposes.
- 5.3 The Inspection Authority Holder shall carry out the Annual Condition Inspection to SAC Form 8.81. This form is used for both Class one and class two aircraft. Circle which is applicable at the top of the form.
- 5.4 If the Inspection Authority Holder finds any defects or wear that is unacceptable, these items must be listed and handed to the operator who must be advised to take action to rectify the aircraft to an airworthy state.
- 5.5 Once the Inspection Authority Holder is satisfied the aircraft is airworthy, the Annual Condition Inspection form should be signed off and a certification sticker affixed to the aircraft in a prominent place adjacent to the point of entry.
- (a) The sticker shall have the following information on it:
- (i) Aircraft Registration
 - (ii) Date aircraft is due for next Annual Inspection
 - (iii) Signature, date, and number of the Inspection Authority holder.
- 5.6 Any defects found during the Annual Condition Inspection shall be reported to SAC on SAC Form 8.9

- 5.7 Any modifications that, in the opinion of the inspector, have an adverse effect on airworthiness should be treated as a defect and reported to SAC.
- 5.8 Modifications carried out on aircraft designed under BCAR Section 'S' or Transport Canada TP10141 should be supported by written evidence from the manufacturer or designer. If the operator cannot provide supporting evidence, the modification should be treated as a defect and reported to SAC.

Note: SAC recommends that Inspectors do not carryout annual condition Inspections on their own aircraft when relinquishing for sale, due to possible contention with a new owner.

While the law does not prohibit Inspectors carrying out annual condition inspections on their own aircraft SAC feels it is advisable to have an independent inspection carried out by another SAC inspector.

4. Microlight Aircraft Modification

1. *Microlight Aircraft Modification*

For microlight aircraft accepted under other acceptable standards, refer to the standard for guidance regarding continued compliance.

Note.- *Modification of Microlight Aircraft which conform to Transport Canada Aviation TP10141E requires written approval from the kitset manufacturer to ensure continued conformity with this standard.*

- 1.1 Any Class 2 Microlight that is modified in any manner that may adversely affect the airworthiness of the aircraft shall not be flown until the modification has been assessed and accepted by the SAC Technical Officer.
- 1.2 The procedure for acceptance of any modification for aircraft not requiring conformity to a published acceptable standard is as follows-
 - (a) The aircraft owner requesting acceptance of a modification shall submit all relevant data, including photographs where possible, to the SAC Technical Officer with a request that the modification be accepted and enclosing the appropriate fee.
 - (b) The SAC Technical Officer will assess the modification, if necessary utilising qualified outside help, the cost of which will be chargeable to the aircraft owner.
 - (c) The Microlight will be inspected by the Technical Officer or an Inspection Authority Holder at the Technical Officer's request. The inspection Authority Holder or SAC Technical Officer may require a test flight programme of a specified duration before the modification is accepted.
 - (d) Where a flight test programme is specified, a Special Flight Permit will be issued for the duration of that programme by SAC. Upon satisfactory completion of the Flight Test Programme, the aircraft will be re-inspected by the Technical Officer or nominated Inspection

Authority Holder and the modification accepted or rejected.

- (e) Upon acceptance of a modification SAC will notify the owner and, in the case of a Class 2 Microlight, will re-validate the Flight Permit for a further one-year period.

Note: Aircraft owners should be advised to submit their proposed modification for assessment and acceptance before commencing modification work on their aircraft.

5. Defects

1. *Defects*

- 1.1 Details of Microlight Defects may be submitted to SAC by any operator.
- 1.2 Reports shall be made on the Defect Reporting Form SAC 8.9 contained in the Forms Section of the Manual. Defect Reports should be brief and concise, and should be submitted within 1 month of the occurrence.
- 1.3 This is a Mandatory Reporting Scheme, designed to advertise to other Microlight operators any safety related matter involving the maintenance or operation of Microlight Aircraft, or other defects that individual operators have experienced and consider it advantageous that other operators be aware of.
- 1.4 Defects reported by this method will be assessed by the Technical Officer and Board of Directors, as part of their Meeting Agenda. If warranted, SAC. will publish them in the Official Medium. In any case, a monthly summary of Reports received will be forwarded to the Director, Civil Aviation Authority.
- 1.5 Defect Report details will be recorded by SAC. and will be held by the Company Secretary. Reports will be analysed when necessary to determine trends detrimental to safety, in accordance with the procedure.
- 1.6 It should be noted that the submission of this form to SAC. does NOT absolve the operator from compliance with any requirement in the Civil Aviation Act with respect to the notification of Aircraft Accidents.

6. Safety Directive & Airworthiness Directive Compliance

1. General

- 1.1 From time to time CAA and SAC may issue an Airworthiness Directive or Safety Directive when it is known that a defect affecting flight safety is occurring in an aircraft. This information may originate overseas or in New Zealand based on defect reports submitted to CAA or SAC.
- 1.2 All Airworthiness Directives will originate from CAA while Safety Directives will originate from SAC or another Part 149 Organisation.
- 1.3 SAC will publish Airworthiness Directives and Safety Directives in the Official Medium.
- 1.4 It shall be the operator's responsibility to comply with an Airworthiness Directive or Safety Directive.
- 1.5 A Microlight aircraft that is not in compliance with an applicable Airworthiness or Safety Directive shall not be flown.
- 1.6 Class 2 Microlight compliance with Airworthiness Directives and Safety Directives shall be checked upon the annual revalidation of the Flight Permit.

7. Service Bulletin or Aircraft Change Assessment and Dissemination

1. General

- 1.1 SAC will approach New Zealand Manufacturers and Importers of aircraft and equipment for subscriptions for Service Bulletins or Aircraft Change Notifications.
- 1.2 Service Bulletins will be assessed by the Technical Officer and the Board of Directors, and, if warranted, SAC. will publish them in the Official Medium.
- 1.3 It shall be the operator's responsibility to comply with the Service Bulletin.
- 1.4 In the case of Service Bulletins classified as MANDATORY by the Manufacturer, Class 2 Microlight compliance will be checked upon revalidation of the Flight Permit document.

8. Microlight Type Acceptance

1. Class 1 Microlight

- 1.1 SAC is responsible for acceptance and clearance of the design. Class 1 Microlight Aircraft are not subject to a Flight Permit, but must still be registered using Form CAA 24103/02 and are subject to an annual condition inspection report.

2. Acceptance procedure

- 2.1 For the first of a new type of Class 1 Microlight, the owner must submit to the SAC Board of Directors:
- (a) sufficient documentary evidence in the form of designs or specifications that the Microlight conforms to the definition of a Class 1 Microlight; and
 - (b) a written request for acceptance, PRIOR to application to the Civil Aviation Authority for Registration.
- 2.2 The SAC Technical Officer may request an Inspection Authority Holder to physically inspect the aircraft and provide written verification of conformity of the aircraft to SAC.
- 2.3 In the case of Microlights certified in another country acceptable under CAR Part 103, the Owner must produce verification from the relevant Civil Aviation Authority or the Manufacturer that such certification exists and has been complied with.
- 2.4 Certification from the operator will be required that the aircraft is built in accordance with the Manufacturer's instructions.
- 2.5 SAC will verify conformity to the definition and confirm such verification to the operator, who should submit the SAC acceptance document along with the Registration Application to CAA.
- 2.6 Where a hang-glider wing is to be used in the group, microlight configuration verification shall be sought for the

specific wing from the Hang-Gliding and Paragliding Association as being a satisfactory combination for flight.

- 2.7 Class 1 Microlights are subject to an annual inspection of condition. SAC Form 8.81 or 8.11 (Class 1 Aircraft) is to be used for this purpose. On meeting the requirements of the inspection, a serialised Inspection Validity Sticker valid for one year will be attached to the airframe in a prominent position.

3. Class 2 Microlights

- 3.1 CAA is responsible for acceptance and clearance of the design of Class 2 Microlight Aircraft but may delegate the pre-certification inspection from time to time to SAC.
- 3.2 Class 2 Microlights are subject to a Microlight Flight Permit document, which is issued for the life of the aircraft, and revalidated annually by an inspection of the aircraft conducted by an Inspection Authority Holder.
- 3.3 No person shall fly a class 2 Microlight aircraft unless a valid flight permit has been issued.
- 3.4 Any changes of engine or propeller different to the details printed on the flight permit deems that permit invalid and the aircraft must not be flown until a new flight permit has been issued.
- 3.5 A Microlight Flight Permit may only be issued if the aircraft has had Registration Marks allocated by CAA as described in this Manual, has been inspected for Conformity with the Type Design, and the standard of workmanship checked as satisfactory by an SAC Inspector.
- 3.6 The Microlight Flight Permit document must be carried on the aircraft at all times, in a place accessible for inspection.
- 3.7 Class 2 Microlight aircraft are required to complete an Annual Condition Inspection Annually. This inspection is carried out by an Inspection Authority Holder to SAC Form 8.8
- 3.8 On meeting the requirements of the inspection a serialised Inspection Validity Sticker valid for one year will be attached to the airframe in a prominent position.

- 3.9 Inspection Authority Holders should have to hand such information pertaining to the Microlight Aircraft or Rotorcraft being inspected as SAC may issue from time to time.
- 3.10 Microlights must have a certificate of registration under part 47 CAA rules and meet basic low performance and momentum parameters acceptable to the director.
- 3.11 Endurance testing is required for new Microlight aircraft. The time period is based on how it was constructed. See (CAA rule 103.211).
- 3.12 After the endurance testing the pilot in command must enter the appropriate details as per (CAA rule 103.213) in the aircraft logbook.
- 3.13 Placards required on class 2 Microlight aircraft include:
- Certificated or design gross weight which ever is lesser.
 - Maximum and minimum payload for the aircraft.
 - Passenger warning – “This aircraft does not require an airworthiness certificate”

9. Hanglider Towing Aircraft

1. *Aircraft equipment and requirements.*

- 1.1 The Microlight aircraft must be equipped with a towing installation enabling the tow pilot to release the tow rope at any time, comprising a tow hook and attachment assembly which meets the aircraft design standard.
- 1.2 The towing aircraft must have a rear vision mirror
- 1.3 The towing aircraft must have a tow line which has a weak link incorporated at the tow plane end with a breaking strength of not more than a 100kgs.
- 1.4 The hang glider must be equipped with a quick release mechanism for hang glider pilot activation with a simple and positive releasing action with tow rope loads of up to 100kgs rearward from the tow hook within a cone of 45 degrees upwards, 30 degrees downwards and 30 degrees sideward.

10. Engine On Condition escalation program

1. General

On condition maintenance is a preventative process that allows deterioration of components by monitoring those components for their continued compliance with a required standard. The continued satisfactory operation of the structure or component may be determined by inspection, operation, or examination in-situ without detailed dismantling. The necessity to service, recondition, overhaul, or repair is made dependent on the condition.

On condition maintenance should include the assessment of pilot monitored performance, functional checks, and scheduled maintenance, and use circumstantial servicing's to carry out opportunity assessments of components. The circumstantial assessments result from other component failures, routine component replacement due to life limitations, and from accidents.

Note: 'Circumstantial' is understood in this context to be 'unscheduled event-driven maintenance'.

For Part 103 aircraft this program makes provision for aircraft engines and their associated components to continue operation beyond manufacturer's recommended TIS or calendar life provided they can be shown to be performing to previously established performance or wear limits.

It also provides for engines without a manufacturer's maintenance schedule or TIS/calendar life limits to enter the program and be maintained and monitored to a common set of standards across the Part 103 fleet.

2. Authorising IAs

2.1 SAC will appoint Authorising IAs who may inspect and sign off engines to enter this program. They will also specify the routine maintenance schedule and performance and wear limits appropriate to the engine. These Authorising IAs must have the confidence of the Part 149 organisation, and proven experience with the engine types they sign off. They are the gatekeepers into this program.

The **aircraft operator** may then operate the aircraft, following the specified maintenance schedule, measuring and recording the performance/wear measurements.

3. Annual Inspection of On Condition program

3.1 Following entry to an 'On Condition' program, the aircraft must continue to be subjected to an **annual inspection** by an IA, who must be satisfied from the maintenance records and by direct inspection that all necessary maintenance has been carried out and the engine performance/wear is within the specified limits and can reasonably be expected to perform to specification for the next maintenance period.

4. Insurance considerations

4.1 Some insurers may require that the manufacturer's maintenance schedule be strictly followed, or may impose a premium or excess for engines operating under an on-condition program beyond manufacturer's limits. It is advisable to check with your insurer before entering this program.

5. Routine maintenance requirements

5.1 All engines must be under a routine maintenance schedule as specified by the Authorising IA, with key items being measured, inspected, adjusted or replaced at periodic intervals.

5.2 These items will typically be consumables and components that wear with time and use (oil, fluids, filters, plugs, points, rubbers, hoses, valve clearances, etc). The intervals for each component should be selected such that inspections and replacement will occur well before the expected life of each component.

5.3 These schedules will typically cover 25/50/100 hour checks as well as annual items.

5.4 If a manufacturer's maintenance schedule exists, it must be used as a basis.

Appendix 1 lists some prototype routine maintenance schedules. These are indicative only- more detailed schedules will be developed by SAC as required.

5.5 If a component is scheduled for replacement, but on inspection shows no sign of degradation and can reasonably be expected to

perform to specification for the next inspection interval, it may be returned to service.

- 5.6 Maintenance activities, measurements and refit/replace decisions must be recorded in the engine log for review by the IA at annual inspection time.

6. Components with finite life

- 6.1 Components identified by the manufacturer as having a finite life must be replaced as specified, unless there is a manufacturer's approved test which monitors performance or wear and can reliably detect or predict the onset of accelerated degradation or failure. Such tests and exclusions must be documented in the on-condition maintenance schedule.

7. Establishing baseline performance

- 7.1 The condition of an engine can be reliably monitored by identifying critical parameters and wear points, and tracking them through the life of an engine to detect and predict any impending degradation or failure.
- 7.2 The routine maintenance schedule should identify those critical parameters and their wear limits appropriate to the engine installation, and those measurements be recorded in the engine maintenance log.
- 7.3 In most cases the engine manufacturer will have published performance parameters and critical wear limits- these must be used where available.
- 7.4 It is recommended that these baseline measurements be taken from new to establish a robust baseline and history of engine performance.
- 7.5 For older engines the preceding 100 hours of measurements will be used to establish baseline performance. If such data is not available, the baselines should be established from similar aircraft/engine/propeller installations.

Appendix 2 lists some prototype baseline performance parameters and wear limits. These are indicative only- more detailed schedules will be developed by SAC as required.

8. Entering the 'on condition' program

The Authorising IA is the gatekeeper into the program.

To enter the program the Authorising IA must-

- 8.1 review the maintenance history
- 8.2 perform a thorough 100 hour level inspection of the engine
- 8.3 satisfy him/herself of the airworthiness of the engine and its components
- 8.4 specify the appropriate maintenance schedule and performance/wear limits for the engine
- 8.5 check conformance to those specified performance/wear limits and if acceptable, sign the engine off to enter the program using the On-Condition Approval form
- 8.6 Record in the aircraft and engine logbook that the engine is now running on-condition
- 8.7 affix a decal in clear view of the passenger stating "WARNING - The engine in this aircraft is running on-condition in accordance with the SAC On Condition Maintenance Programme"
- 8.8 a copy of the On-Condition Approval form and the specified maintenance schedule and performance/wear limits must be kept with the engine logbook, with a copy sent to SAC and one held by the Authorising IA.

9. Commercial operations exclusion

- 9.1 Aircraft used for hire or reward, including private aircraft placed on line for casual use, are excluded from this program. Private or club owned aircraft operations only.

10. Engines with undocumented history

An aircraft engine that has an unknown or poorly documented maintenance history must first be assessed on its present condition and reliability before entering the program.

The steps required are - The Authorising IA must

- 10.1 review the maintenance history (if available)
- 10.2 perform a thorough 100 hour level inspection of the engine

- 10.3 satisfy him/herself of the airworthiness of the engine and its components
- 10.4 specify the appropriate maintenance schedule, performance/wear limits for the engine
- 10.5 authorise an endurance test schedule as per 103.211

On completion of the endurance testing the Authorising IA must:

- (i) repeat a thorough 100 hour level inspection of the engine
- (ii) check conformance to the specified performance/wear limits
- (iii) and if acceptable, sign the engine off to enter the program

11. Remaining in the 'on condition' program

11.1 An engine will remain in this program provided the maintenance logbook carries the following evidence -

- (i) The On-Condition Approval form signed-off by an Authorising IA
- (ii) a routine maintenance program and performance/limits specified by the Authorising IA
- (iii) all such routine maintenance has been carried out
- (iv) all such routine performance/wear measurements have been logged
- (v) a current annual inspection has been signed off by an IA
- (vi) the aircraft owner remains a member or client of SAC

12. Maintenance documentation

12.1 All maintenance documentation must be recorded and retained in a maintenance logbook.

Such documentation must include-

- (i) The On-Condition Approval form signed-off by an Authorising IA
- (ii) the routine maintenance program and performance/wear limits specified by the Authorising IA
- (iii) all maintenance actions and decisions
- (iv) all annual inspection sign-offs

It is recommended that as well as recording the performance/wear measurements in the maintenance log, they should be recorded on a graph with the limit clearly marked. This helps to track performance and predict the onset of failure.

Appendix 3 shows some sample performance/wear graphs.

To facilitate such record keeping SAC will provide logbook inserts with the appropriate routine maintenance schedules, program entry sign-off records, performance/wear limit logs and graphs, and annual inspection forms with fields for recording performance/wear measurements.

13. Issue/defect reporting

- 13.1 The owner and the IA must report to SAC any significant issues or defects found on engines under this program.

14. SAC organisation responsibilities

- 14.1 Provide and maintain routine maintenance schedules for various specific and generic engine types.
- 14.2 Provide and maintain performance/wear limits or various specific and generic engine types.
- 14.3 Appoint and equip Authorising IAs.
- 14.4 Educate and advise members and IAs.
- 14.5 Review defect reports and issues.
- 14.6 Monitor and assess the on-condition program.

15. Authorising IA responsibilities

- 15.1 Gate-keeping entry sign-off into the program.
- 15.2 Specify appropriate routine maintenance schedules and performance/wear limits.
- 15.3 Report issues back to SAC.

16. IA responsibilities

- 16.1 Annual inspections and review of performance/wear limits.
- 16.2 Sign-off for continuation in the program.
- 16.3 Report issues back to SAC.

17. Aircraft owner responsibilities

- 17.1 Maintain the engine in accordance with the specified routine maintenance program
- 17.2 Monitor and record performance/wear limits as specified.

17.3 Report issues back to SAC and IA

Appendix 1 Sample routine maintenance items

- These are indicative only- more detailed schedules will be developed by SAC as required.
- If a manufacturer's schedule exists, it should be used as a basis.
- For specific installations, add or remove inspection items as appropriate.
- If a component is scheduled for replacement, but on inspection shows no sign of degradation and can reasonably be expected to perform to specification for the next inspection interval, it may remain in service.
- * inspect
- R replace

2-stroke engines

ITEM	25hr	50hr	100hr	Ann.	Comment
Spark-plugs	*	R			
Air filter	*				
Gearbox oil	*		R		
Rotary valve oil	*		R		
Belt tensions	*				
Throttle cables	*				
Propeller bolts/tracking	*				
Coolant	*		R		
Fuel filter		*			
Decarb piston/head		*			
Carb idle/balance		*			
Piston rings		*			
Fuel pump		*			
Carb rubber boots				*	
Head/exhaust bolts				*	
Rubbers, hoses, mounts				*	

4-stroke engines

ITEM	50hr	100hr	500hr	Ann.	Comment
Magnetic plugs	*				
Air filter	*	R			
Spark-plugs	*	R			
Fuel filter	*	R			
Engine oil/filter	R				
Belt tensions	*				
Carb rubber boots				*	
Rubbers,hoses, mounts				*	

Appendix 2 Sample baseline parameters and limits

- These are indicative only more detailed tables will be developed by the Part 149 organisations.

2-stroke engines

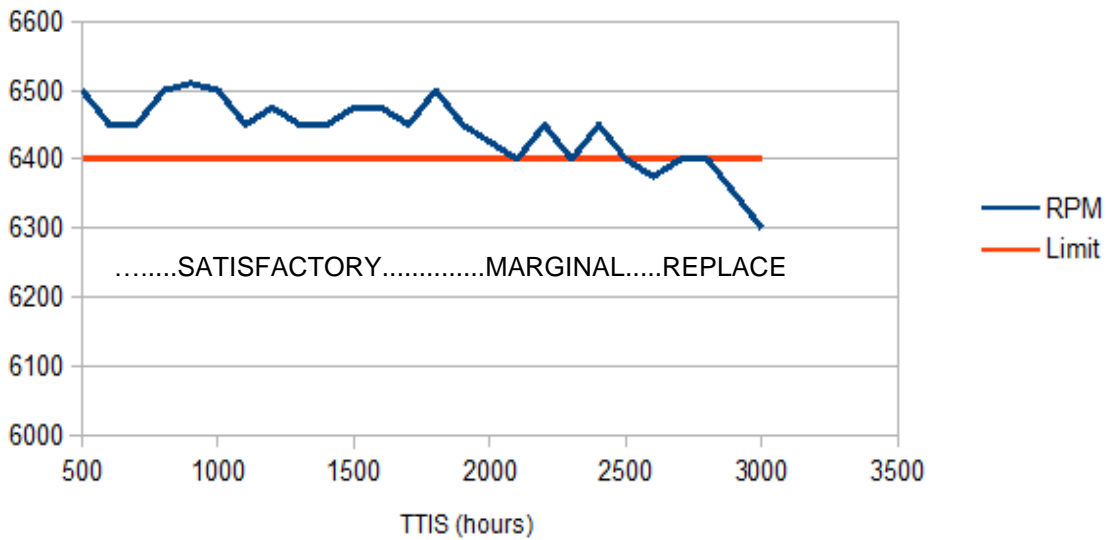
ITEM	LIMIT	Comment
Static WOT RPM	>90% of baseline	Indicates engine delivering expected power
Piston end-play	>0.008mm	Rotax specified big end/crank-pin wear limit
Compression test	<90% of baseline	Indicates cylinder/ring seal/wear
Gearbox backlash	>110% of baseline	Crankshaft locked, measure at prop tip

4-stroke engines

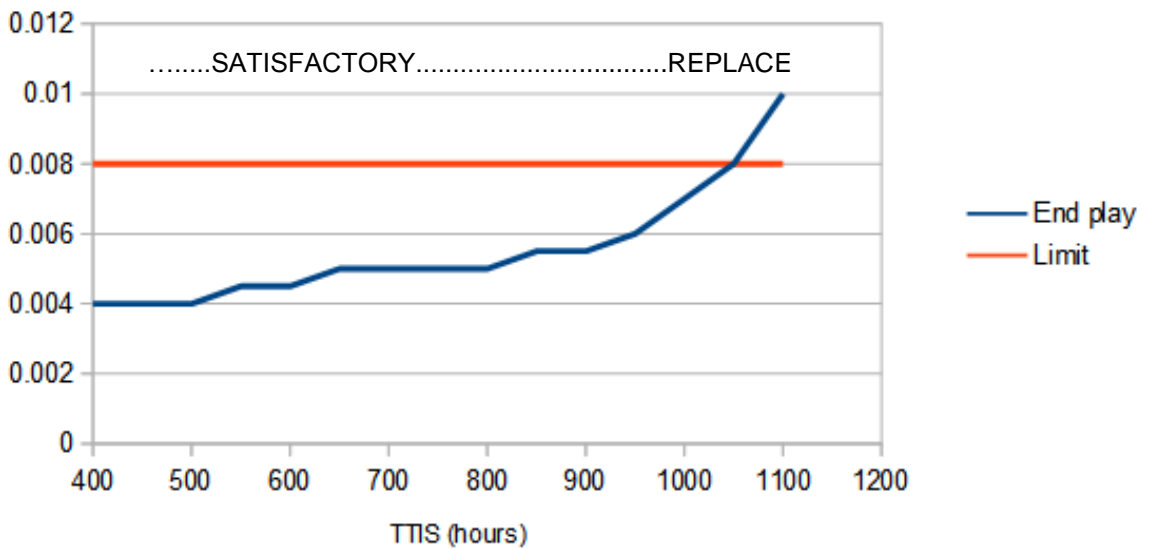
Static WOT RPM	<90% of baseline	Indicates engine delivering expected power
Leak-down or Compression test	<90% of baseline	Indicates cylinder/ring/valve seal/wear
Oil filter inspection	evidence of metal	Indicates internal wear
Magnetic sump plugs	evidence of metal	Indicates internal wear
Oil pressure @ cruise	<90% of baseline	Indicates internal wear/oil pump performance
Oil consumption	>110% of baseline	Indicates internal wear
Fuel pressure @ WOT	<90% of baseline	Fuel pump performance
Gearbox backlash	>110% of baseline	Crankshaft locked, measure at prop tip

Appendix 3 Performance and wear monitoring graph examples

WOT RPM log



2-stroke piston end play



11. Electric Propulsion Aircraft

1. **General**

Electric aircraft offer a number of environmental and performance benefits. The use of high voltage batteries to power transport is becoming more popular on the road and in the air.

It is essential that the operator understands how to correctly check, monitor, charge and maintain these batteries in order to operate safely.

1.1 The electric Aircraft has 3 main parts to the propulsion system:

1. Motor. This is a sealed unit usually requiring no maintenance.
2. Controller. This is a sealed unit usually requiring no maintenance.
3. Battery. This is a sealed unit usually requiring no maintenance.

But all parts require careful handling and monitoring

1.2 Always follow the Manufacturer's Instructions.

1.3 The Aircraft Operator/Pilot in command should familiarise themselves with the manufacturer's training around battery management and safety procedures.

The SAC Flight Training Manual, Sec 4 - Aircraft Technical has an Electric Propulsion section covering required operational knowledge and flight training requirements.

A Type rating is required by a suitably qualified Instructor.

Use SAC Form 8.19 High Performance Type Rating assessment Sheet.

Also, for further information the Pipistrel Electro Aircraft training course can be found at www.pipistrel-online.com

1.4 SAC Inspection Authority holders should be familiar with the aircraft manufacturers maintenance procedures before carrying out an annual Inspection on Electric Aircraft.

The Inspector should make contact with the SAC Technical Officer prior to performing their first inspection on any Electric Aircraft for current maintenance information and other relevant procedures.

2. **Lithium Batteries**

2.1 The following **must** always be complied with to remain safe:

- (i) Only use OEM approved batteries
- (ii) Only use OEM approved charging infrastructure

- (iii) Do not charge in the rain
- (iv) Only charge after a visual inspection of the batteries, charger and connectors to ensure they are not damaged
- (v) Only charge within approved ambient operating temperatures
- (vi) **If a battery pack has been damaged do not fly!**

2.2 *State of Charge*

- (i) **Do not** keep a battery charged above 80% of State of Charge (SOC) for more than 5 days. Either perform a flight or run the motor to discharge the battery to the recommended 50-80% percent SOC for storage.
- (ii) To prolong battery life, it is not recommended to discharge the battery below 20% state of charge. The healthy range is usually considered to be between 20-80%.
- (iii) After a period of no-flying activity, it is recommended to perform a full charge 24 hours before actual flight.
- (iv) During long periods not using the aircraft, it is required to perform a **“Rest charge”** once every 90 days. Rest Charge mode charges the battery to a level, optimum for storing the aircraft.

2.3 *Safe Charging*

While charging the battery packs, certain precautions should be taken.

- (i) Always have a suitable fire extinguisher nearby.
- (ii) Don't charge your battery packs unattended. You should monitor whether your battery is excessively heated or even inflated.
- (iii) Never charge physically damaged or inflated batteries.
- (iv) Always charge in a fire safe area.

2.4 *Battery Fires*

Lithium batteries offer several advantages in comparison with other types of batteries. However, due to the sensitive chemistry of the batteries they are also highly flammable.

While battery fires are rare, they can happen quickly and will cause a lot of damage.

To avoid any potentially dangerous situation you should always follow the manufacturer's procedures for charging battery packs.

Refer to the manufacturer's instructions and familiarise yourself with the sequence and monitor temperatures regularly.

3. **In the event of Fire in Flight**

- (i) Set master switch to OFF.
- (ii) Open slide windows and set all ventilation devices to ON for adequate breathing. Keep in mind that oxygen intensifies fire.
- (iii) Perform side-slip (crab) manoeuvre in direction opposite the fire.
- (iv) Perform emergency landing out procedure.

4. **Conclusion**

- Always store batteries in an isolated area, away from flammable and combustible materials.
- Always charge with an appropriate charger designed for the battery.
- Always follow the manufacturer's instructions for charging and discharging rates.
- Never over charge.
- Never over discharge.
- Never use a disfigured or inflated battery pack.
- Never use a battery pack that has visible damage (dents, cracks, etc).
- Never charge a battery pack unattended.
- Never disassemble or reconfigure a damaged battery pack.

Most accidents involving batteries are the result of not following one of these rules. Understand the charger you're using and follow the manufacturer's guidelines and they will serve you well. Fly safely.