- CHAPTER 12 -

POWER UNIT

12.1 Description

12.1.1 The standard Chipmunk DHC-1 (Chapter 1.1) is powered with a single de Havilland Gipsy Major 1C or Major 10-3 four cylinder, four stroke, poppet valve, in-line, air cooled, inverted, normally aspirated, engine developing 136/142 BHP at sea level, full throttle 2400 rpm.

12.1.2 The tractor propeller is fixed pitch, wood or metal, direct drive, rotating in a counter-clockwise (left hand) direction. The wooden propeller is to de Havilland Drawing No. CP.3298-18, diameter 78.8 inches, blade angle 18° at 0.75 R. The Fairey metal propeller has a diameter of 6 ft. 9 in. and a pitch of 5.34 feet.

12.1.3 The engine mount is a conventional welded steel tube frame structure attached to the front fuselage at four points where the longerons intersect the firewall. The engine is attached to the mount with four conical rubber shear mounts which permit freedom of movement and reduce the transmission of vibration.

12.1.4 The engine cowling is formed in four removable panels:

a) Nose section containing the cooling air inlet.
b) Bottom panel, which is slotted for the exhaust manifold and may contain a scoop for generator cooling air.
c) Starboard side panel containing the carburetter air intake scoop and the oil cooler air exhaust duct.
d) Port side panel contains the oil cooler air intake scoop and may have openings for carburetter flooder control and fuel pump priming lever.

The two side panels are hinged at the top centre line and open upwards providing full access to the engine. Stay struts are provided to support the cowling panels in the open position. These panels are secured when closed by means of hand operated spring loaded fasteners, two on each panel.

The engine cooling air is exhausted by way of an annular space formed between the rear of the cowling panels and the fuselage.

The forward end of the fuselage consists of a stainless steel firewall complying with all the requirements of the Air Registration Board of Great Britain.

12.1.5 Fuel and Oil Specifications are given in Chapters 7.1.2. and 7.2.2., respectively.

12.2 Engine Performance (For limitations see Chapter 4.5)

12.2.1 Power Output

Condition	RPM	Altitude	BHP	Fuel Consumption IG-Hr	Litres/hr
Full Throttle take-off	2400	S.L.	136/142	11.25	51
Maximum continuous cruising	2300	S.L.	138	10.75	49
Maximum weak mixture cruising	2300	3750 ft. (1140 m)	120	8.5	38.5
Recommended economical cruising power	1900/2100	S.L.	76/100	6.4	29

12.2.2 Oil consumption will range from 4.5 pints (2.55 litres) per hour at full throttle to 2.0 pints (1.1 litres) per hour at economical cruising power.

12.3 Accessories and Equipment

12.3.1 The Major 1C and Major 10-3 are equipped with dual fuel pumps, dual oil scavenge pumps, screened or unscreened ignition harness and a 12 or 24 volt direct cranking electric or hand starter. K.L.G. spark plugs, Type V12 or V.12-2 are fitted.

12.3.2 In addition to the above the Major 10-3 may be equipped with a generator (Rotax B1804), a vacuum pump (Plessey B3 or B3X) and air compressor (Heywood SH6/2) or hydraulic pump (Lockheed Mk.V or VI).

12.3.3 An automatic carburetter air intake control is coupled with the throttle linkage in such a manner as to provide protected warm air from within the cowling for the carburetter at throttle settings corresponding to approximately 1850 rpm or less. Above this speed, free outside cold air is used.

12.4 Operating Procedure

12.4.1 Starting the Engine - See Chapter 4.1.4

12.4.2 Warming Up - See Chapters 4.1.2, 4.1.3

12.5 Maintenance and Repair of Engine

12.5.1 Low Oil Pressure may be due to any of the following causes, the cure for which is obvious. Insufficient oil in tank, air leaks in suction pipes, suction or pressure or scavenge oil filter choked, stuck release valve, choked pressure gauge pipe, or defective pressure gauge.

12.5.1 (cont'd)

Unsatisfactory lubrication in extremely cold weather due to using oil of too heavy a grade. Correct grades for different conditions are quoted above. If the engine has been standing out in the cold for any length of time and a heavy grade of oil is in use, preheating the oil is an advantage under extreme conditions. It may be advisable to reduce ventilation of the crankcase and oil tank in order to keep the oil at a reasonable temperature.

12.5.2 For detailed instructions on the maintenance and repair of the engine and accessories, reference should be made to the Gipsy 1C or Major 10 Engine Handbook, issued as a separate publication.

12.6 Propeller and Spinner

12.6.1 The propeller hub is keyed to the crankshaft and retained by a hub nut which also contains the spinner mounting stud. The propeller is bolted to the hub flanges by 8 bolts which also compress the propeller between the front and rear hub flanges.

12.6.2 The spinner is retained on the mounting stud by means of a washer, slotted nut and split pin. A spinner fairing is attached to the propeller hub to blend the spinner nose into the lines of the engine cowling. Should the necessity of flying without spinner nose arise, it is important to first remove the long stud which may otherwise break off in flight.

12.7 Maintenance and Repair of Wooden Propeller

12.7.1 If a wooden propeller is supplied it should be inspected daily for damage to the blades, complete adhesion of the fabric covering and the security of the brass sheathing. Loose fabric can be doped down using a clear dope. If the fabric is broken it may be repaired by means of a doped on patch providing the wood beneath the fabric is undamaged. If the brass sheathing becomes loosened the propeller should be removed and repaired.

12.7.2 At each 30 hour inspection the spinner nose should be removed and the propeller hub bolts checked for tightness. This is particularly necessary in the case of new propellers. The nuts should be evenly tightened to avoid throwing the propeller out of line but not over-tightened to crush the wood of the hub.

12.7.3 The track of the blade tips should also be checked at this time. The maximum allowable difference between the track of the two blade tips is 3/32 inch.

12.7.4 The two drainage holes in each tip sheath must be kept clear at all times.

12.7.5 Repairs should be carried out only by an approved propeller repair organization.

12.7.6 To remove spinner nose:

a) Remove 800/SP1 (1/16) split pin, 800/SN1 (6MM) slotted nut, 800/PW4 washer and spinner washer, Part No. 0583.
b) Spinner nose, Part No. 0584, can now be removed.

12.7.7 To remove propeller without hub:

a) Remove the spinner nose.
b) Remove the four AGS784/2B split pins and AGS748/B (2BA) slotted nuts retaining the crankshaft front nut locking plate and remove the locking plate, Part No. 1900-39/1.
c) Remove the propeller hub nuts locking plate, Part No. 1900-40/1.
d) Remove the eight propeller hub nuts, Part No. 2100-15/3, twenty-four shrinkage washers, Part No. 1900-16/2. Three of these washers are fitted under each nut.
e) Remove the propeller hub front plate, Part No. 1900-35/2.
f) Remove the eight AGS245-13 (2BA) round head screws and AGS 160/C washers which secure the spinner fairing to the spinner attachment plate and remove the spinner fairing, Part No. 0585.
g) Remove the propeller, Part No. CP.3298-18.

12.7.8 To remove the propeller complete with hub:

a) Remove the spinner nose.
b) Remove the four AGS 784/2B split pins and AGS 748/B (2BA) slotted nuts retaining the crankshaft front nut locking plate and remove the locking plate, Part No. 1900-39/1.
c) Remove the crankshaft front nut fitting assembly, Part No. 0581.
d) Remove propeller, complete with hub, from the crankshaft.

12.8 Maintenance and Repair of Metal Propeller

12.8.1 Where applicable the procedure described above for the wooden propeller should be followed. A seriously damaged aluminum alloy propeller should be repaired only by the manufacturer or an authorized repair agency. Minor surface dents, scars, nicks, etc. do not constitute serious damage and may be removed by field personnel.

12.8.2 Blades bent in face alignment may be cold straightened if the bend does not exceed values ranging from 18° at the tip to 0° at the root. After straightening, the affected portion of the blade should be etched and thoroughly inspected for cracks and other flaws. Blades with bends in excess of this amount are classified as "seriously damaged". (12.8.1)

12.8.3 Scratches and suspected cracks should be given a local etch and examined with a magnifying glass. The metal around minor dents, cuts, scars, scratches, nicks and the like should be removed to form a shallow saucer shaped depression. With the exception of cracks it is not necessary to completely remove the defect. If the required depression exceeds 0.1 inches in depth, 0.4 inches in width, 1.0 inches in length, the propeller should be rendered unserviceable. Raised edges should be carefully rounded and smoothly finished with No. 00 sandpaper. It is not permissible to peen down the edges of any defect.

When the removal of defects on the tip necessitates shortening a blade, the opposite blade should be treated in the same fashion and the propeller balance checked.

12.9 Oil Separator

On Major 10 installations which incorporate a vacuum pump, a Pesco Oil Separator has been fitted to the exhaust side of the pump. Exhaust air from the separator is discharged into the air stream, while the waste oil is piped to the collector box.