Chapter Twelve

MAINTENANCE SCHEDULES

Contents

THIS CHAPTER, which is applicable to both the Ghost 48 Mk. 1 and 48 Mk. 2, lists the checks that are to be made and gives their periodicities; where information is applicable to one mark of engine only, this is indicated in the text.

The method of carrying out these operations, and of carrying out any replacement, adjustment, or rectification found necessary as a result of routine servicing, is described in chapters 13 to 19 inclusive but requirements in the maintenance schedule which are considered to be self-explanatory have not been included.

Chapters 13 to 19 describe all the dismantling or removal which is necessary to carry out the examinations, the method of cleaning and examination, and, wherever possible, the extent of permissible and non-permissible wear or damage, and the subsequent reassembly or refitting. Further information regarding individual units and accessories is contained in chapters 39 to 51. Overhaul is described in chapters 22 to 37, and the permissible worn dimensions and clearances are tabulated in chapter 38.

AS ANY MAINTENANCE SCHEDULE is designed to keep the engine in a satisfactory and efficient mechanical condition, its requirements are determined largely by the local conditions under which the aircraft is housed and operated, by the duration of flight, and the power at which the aircraft is generally flown.

The schedule comprises routine attentions and periodical examinations to check adjustments, the progress of wear and tear, and also of deterioration; the last is particularly important if the engine is flown only at intervals.

No schedule compiled without reference to each operator's specific conditions can be more than an estimate of the engine's requirements, and to obtain the maximum reliability and serviceability at the minimum cost it must be modified and adjusted as experience dictates. The detail of routine checks and inspections contained in this chapter, constitutes a basic maintenance schedule to meet the first requirements, and to serve as a basis from which, for each particular case, operators can compile the most efficient schedule to meet their specific requirements.

MAINTENANCE PLANS

Maintenance of the **Ghost 48 Mk. 1 when fitted with type 4 combustion chambers,** is planned as a system of checks to be carried out as follows.

Check	*Approximate frequency*
Between flights:—	As necessary.
Primary:—	
Static	Every 48 hours when in regular use.
Ground running	Weekly when in regular use.
Check 1 inspection	Every 50 hours flying.
Check 2 inspection	Every 150 hours flying.
Overhaul	After 300 hours flying.

Maintenance of the **Ghost 48 Mk. 1 when fitted with type 5 combustion chambers,** and of the **Ghost 48 Mk. 2** is planned as a system of checks to be carried out as follows.

Check	*Approximate frequency*
Between flights	As necessary.
Primary:—	
Static	Every 48 hours when in regular use.
Ground running	Weekly when in regular use.
Check 1 and 2 inspection	Every 150 hours flying.
Overhaul	After 300 hours flying.

ENGINE ACCESSORIES

The approved period between complete overhauls covers all engine accessories except the Rotax Turbo Starter which has a 'life' of 300 fired cartridges; subject to inspection and servicing, after each 100 cartridges have been fired, as described in chapter 50.

FILTER ELEMENTS, LIFE

It is recommended that the filter elements should be replaced by new elements at the following periods.

Filter element	*Period*
Oil pressure	Overhaul.
Rear bearing air	Overhaul.
Vokes L.P. fuel (Ghost 48 Mk. 1)	Overhaul.
Tecalemit L.P. fuel (Ghost 48 Mk. 2)	Overhaul.
High pressure fuel (Ghost 48 Mk. 1)	Indefinite, provided that element is efficiently cleaned and is undamaged.
Gauze elements	Indefinite, provided that element is efficiently cleaned and is undamaged.

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MAINTENANCE SCHEDULE

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	Refer to chapter
GENERAL	
1. Immediately the aircraft has landed and the engine stopped, and at all times when the engine is not running, dust covers must be fitted to the air-intakes and the propelling nozzle.	—
2. Note the run-down time whenever the opportunity arises. This should not normally be less than a minute or two. If the time is less than one minute and if there is no slight swing back as the impeller stops, investigate the reason.	9
3. At all times, except when they are required to be ON for specific checks, ensure that the H.P. fuel cock is SHUT, the L.P. fuel cock (*Ghost 48 Mk. 1*) is OFF, and that any master or safety switches are in the OFF position.	—
4. After any disconnection of the fuel system it must be bled prior to starting.	8
5. Before starting the engine remove the air-intake and propelling nozzle covers and ensure that the air-intakes are clear.	—
6. Where a chapter reference is given in the right-hand column of this schedule, the necessary information will be found in that chapter; where the method of carrying out a check is self-evident no entry has been made in the 'Refer to' column.	—
BETWEEN FLIGHTS	
1. Ensure that the air-intake and propelling nozzle covers are in position.	—
2. Examine the pilot's report, or ask the pilot for details of any defects encountered during the flight.	—
3. Remove spent turbo-starter cartridges and, when applicable, leave breeches open to cool; when operating under freezing conditions, unload, clean, and reload the breeches immediately the engine is shut-down.	9, 50
4. Examine the exterior of the engine bay cowling for signs of fuel or oil leaks.	—
5. Examine the leading edge of the impeller vanes for damage, and examine the air-intakes and ducts leading to the impeller.	17
6. With the exhaust cone in situ, using a suitable spot light, examine the turbine blades for any signs of damage or distress.	17
7. Re-load the turbo-starter, if required.	9, 50
8. Ensure that all cowling panels and inspection doors are correctly fitted and securely attached.	—
PRIMARY	
1. Ensure that the air-intake and propelling nozzle covers are in position.	—
2. Examine the pilot's report, or running log for the previous day's running, for details of any defects.	—
3. STATIC	
3.1 Visually examine the combustion chamber outer casings, in situ, all pipe joints, and the welding of all sheet-metal work including the brackets securing accessories and units such as the L.P. fuel filter, as far as can be done without dismantling any part.	16, 17, 51
3.2 Check oil level in sump and replenish as necessary.	9
3.3 Ensure that the union nuts at each end of each ignition cable, and the igniter plug or screen tube, are tight. Functionally check the ignition equipment; audibly check that each igniter plug is operating.	15, 47
3.4 Ensure that the turbo-starter breeches and breech cap contacts are clean and free from carbon.	9, 50
3.5 Examine the impeller and the air-intakes and ducts leading to the impeller.	17
3.6 With the exhaust cone in situ, using a suitable spot light, examine the turbine blades for any signs of damage or distress.	17
3.7 Examine the engine externally for damage and security of fittings.	—
3.8 Check the engine bay cowling for cleanliness. Any abnormal signs of free fuel or oil must be investigated during the subsequent ground run.	—
3.9 Ensure that no tools or rags are left lying about the engine or its cowling; particularly examine the air-intake ducts.	—
4. GROUND RUNNING	
4.1 Remove the air-intake and propelling nozzle covers, and fit wire-mesh debris guards to the air-intakes.	—

	Refer to chapter
4.2 Start engine and check as follows:	9
4.2.1 Allow engine to idle for about two minutes. During this time a careful inspection should be made to ensure that there are no gas, fuel, or oil leaks ; pay particular attention to all fuel and oil pipes and their connections.	
4.2.2 Slowly increase r.p.m. watching for any signs of gas, fuel, or oil leaks and listening for any unusual noises, until governed speed is reached. Check governed speed and jet pipe temperature at full throttle. *Ghost 48 Mk. 1 only,* check operation of fuel pump isolating valve—r.p.m. should increase to the setting of the higher governor—and whilst isolated, examine the fuel pipes and connections downstream of the control valve assembly for leaks ; return the isolating switch to the OFF position.	14, 9
4.2.3 Throttle back to a convenient r.p.m. and make a general inspection for gas, fuel, and oil leaks.	51
4.2.4 Throttle back to idling r.p.m. Check the slow-running speed when the throttle lever is in the fully SHUT position. Make a general inspection for gas, fuel, and oil leaks. *Ghost 48 Mk. 1 only,* recheck operation of fuel pump isolating valve—there should be a definite increase in r.p.m.—and whilst isolated, examine the fuel pipes and connections upstream of the control valve assembly for leaks ; return the isolating switch to the OFF position.	14, 9
4.2.5 SHUT the H.P. fuel cock and time the run-down.	9
4.2.6 Refit the air-intake and propelling nozzle covers.	—
5. Recheck the oil level and replenish the sump as necessary.	9
6. Reload the turbo-starter breeches, if required.	9, 50
7. Ensure that all cowling panels and inspection doors are correctly fitted and securely attached.	—

	Refer to chapter
CHECK 1	
1. Ensure that the air-intake and propelling nozzle covers are in position.	—
2. Examine the pilot's report, or running log, for details of any defects.	—
3. Check the engine bay cowling for cleanliness. Any abnormal signs of free fuel or oil must be investigated during the subsequent inspection and ground run.	—
4. Remove engine from airframe.	7
5. Clean the engine externally.	—
6. *Ghost 48 Mk. 1 only,* remove the H.P. fuel filter bowl and drain out any sediment, examine the element and refit the bowl.	14
7. Drain any sediment out of the L.P. fuel filter casing through the drain plug which is provided.	14
8. Examine the impeller vanes for cracks or damage.	17
9. Remove the fireguard and exhaust cone assembly and examine all welding.	18
10. Examine the turbine blades, in situ, for signs of burning or damage.	17
11. Check the bolts which secure the turbine shroud to the nozzle shroud, and the nozzle shroud to the discharge nozzles, for tightness, and locking.	17
12. Check the clearance between the tips of the turbine blades and the turbine shroud. The clearance must not be less than 0·055 inch at any point when the engine is cold.	17
13. Remove, dismantle, and examine all combustion chambers.	16
14. Remove the complete burner assembly from each combustion chamber and examine. Care must be taken to retain the adjusting washers fitted with each burner with their respective assemblies to ensure that the correct burner protrusion is maintained on re-assembly. Remove any accumulation of carbon from the assembly without dismantling ; **IMPORTANT, this operation must be carried out in such a manner as to ensure no damage to the burner atomiser face.** *Ghost 48 Mk. 2,* ensure that the biased burners are refitted in the correct positions.	14
15. Examine and functionally check the igniters, ensure that the union nuts at	8, 45, 47

	Refer to chapter
each end of each ignition cable and the igniter plugs or screen tubes are tight.	
16. Examine the nozzle blade assembly, in situ, for general condition.	17
17. Examine the discharge nozzle assembly for condition.	17
18. Examine the centre casing for cracks at the longitudinal welds and at the flange attachments.	17
19. Examine the deflector vanes, in situ.	17
20. Examine the gasket between the diffuser casing and the rear-bearing air-cooling pipe, and renew if necessary.	—
21. *Not applicable to Ghost 48 Mk. 1, pre-mod. 431,* remove and clean the front-bearing oil-feed restrictor.	13
22. Inspect the engine generally for damage and security of fittings, look particularly for signs of cracks in all accessory mounting brackets, and examine all pipes for chafing and fret marks.	51
23. Check the turbo-starter cut-off plate for freedom.	50
24. Re-install the engine into the airframe.	6
25. Connect 0-100 lb. per sq. in. pressure gauge T.79300 to the connection on the top wheelcase so that the oil pressure may be checked during the subsequent ground run.	13
26. Carry out the Ground Running Check as detailed on pages 2 and 3, and, in addition, check the oil pressure at maximum continuous r.p.m. and the delivery of the rear bearing metering pump at 3000 r.p.m. *Ghost 48 Mk. 1, pre-mod. 431 only,* also check the delivery of the front bearing metering pump.	9, 13

CHECK 2

Repeat the complete Check 1 inspection and in addition:—

1. *Ghost 48 Mk. 1 only,* clean the H.P. fuel filter element.	14
2. Remove the oil pressure filter and examine for debris.	13