SECTION 3

SERVICING

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LIST OF CHAPTERS

Note.—*A list of contents appears at the beginning of each chapter*

Chapter 1

ROUTINE SERVICING

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

General

1. The aircraft Servicing Schedule specifies the tests, minimum inspection checks and other work to be performed on the engines are defined running times; the instructions in this chapter augment the engine servicing requirements listed in the schedule. Removal and replacement of engine components is described in Vol.6A, Part 1.

Precautions

2. Before commencing work, observe the safety precautions given in A.M.O. 249/57.

3. During servicing, observe the following precautions:

(1) Before commencing work on or near an engine, ensure that the starter switch is OFF and that the l.p. and h.p. fuel cocks are CLOSED.

(2) The air intake and final nozzle must be protected by the covers provided and all apertures which are uncovered as work progresses must be suitably blanked. Transportation blanks removed from a replacement unit should be fitted to the unserviceable unit immediately it is removed.

(3) A note should be made of all tools and loose used items in the vicinity of the engine and a check made on completion of work.

(4) Before a replacement unit is fitted, it must be drained and flushed out to ensure that inhibiting oil does not mix with the fluid in the system.

(5) Only the oil specified in Leading Particulars may be used for internal lubrication of the engine and for assembling the parts which are lubricated by the oil. Oil spilled during removal of a unit must be wiped up immediately.

Caution:

[illegible] which, if [illegible] may be toxic through skin absorption. The oil is injurious to paintwork and certain types of rubber and must not be used for flushing any component not normally in contact with it.

(6) To avoid damage to rubber seals and pipe union threads, all pipes should be disconnected at their seal housing flanges. During reassembling, special care is required to ensure that each rubber sealing ring is correctly located in its groove and does not become trapped between the joint faces.

(7) Ensure that all bonding leads are refitted correctly; leads which are too slack or too tight are liable to fail.

(8) Where applicable, apply jointing compound SQ.32L (Ref.No.34B/1417) in accordance with the instructions in Vol.6A, Part 1, Sect.2, Chap.1.

(9) If disturbed during servicing operations, joint washers, sealing rings and locking devices (except spring washers) should be renewed. For all wire-locking applications use 22 S.W.G. stainless steel wire.

(10) If a unit of the fuel system has been disturbed, bleed the system as described in Vol.6A, Part 1, Sect.2, Chap.5 before attempting to start the engine.

(11) Ensure that all fuel drain holes are clear and free from obstruction.

(12) Before an engine is 'motored over' ensure that the engine covers and blanks are removed, the intake and immediate vicinity are clear of loose articles, debris, etc., that there is fuel in the aircraft tanks and that the l.p. cock is open. Disconnect the low tension (l.t.) electrical supply to the high energy ignition units.

WARNING...

The electrical energy which may be stored in the condensers of the high-energy ignition units is potentially lethal. Before handling the unit, plug or h.t. cable, disconnect the l.t. supply and wait for at least one minute to allow the stored energy to dissipate.

(13) If the aircraft has been standing for some time, fuel vapour may have accumulated in the combustion chambers. Remove the air intake and jet pipe covers and allow the engine to ventilate before attempting a start or checking the ignition systems.

(14) If the engines are to stand idle for more than a few days, apply the anti-corrosion treatment described in AP 102C-1502 to 1511-7. If this treatment has been applied, the engine must, when required, be prepared for service as described in Part 2, Sect.2, Chap.1.

Engines and engine bays

4. Examine each engine externally for evidence of fuel, oil or gas leaks, then clean down the engine. Examine the engine mountings and external components for security and all pipes and electrical leads for chafing, kinking and loose connections.

5. Local overheating of the combustion chambers may be indicated by discoloured patches on the air casing and should be carefully noted. If subsequent inspection shows an increase in the area affected, the engine should be rejected for examination. Scorching or blistering of paintwork, or sooty deposits which would indicate gas leakage may also be apparent in the vicinity of the combustion chambers; if excessive leakage is confirmed, the engine must be rejected.

Anti-icing system

6. Check the engine anti-icing system as described in Part 2, Sect.2, Chap.2.

Air flow control system

7. The air flow control system consists of the compressor air bleed valve and operating ram assembly, variable-incidence intake guide vanes and an intake guide vane operating ram. Check the system as described in Part.2, Sect.2, Chap.2.

Compressor

8. The intake guide vanes and those compressor blades which can be seen from the front of the engine should, with the aid of a strong spotlight, be examined for damage and cleanliness. The inspection procedure and limits of acceptable damage are described in Vol.6A, Part 1, Sect.2, Chap.8. On engines that are acceptable for further service, apply Rocket WD40 (34B/2244966) to the compressor blade platforms as detailed in (1) to (6).

(1) Apply the Rocket WD40 (34B/2244966) from the front of the engine by means of a plastic tube approximately 24 in long and 0.125 in outer diameter, sealed at one end and a 0.030 in hole drilled 0.250 in from the sealed end. Using the drilled hole as datum, the tube is marked to allow positioning of the drilled hole above the required rotor stage to be sprayed, by a narrow strip of plastic adhesive tape, placed at the positions specified in Table 1.

Note...

The tube can be sealed by heating.

Stage	Position from drilled hole
1	3.2 in
2	6.8 in
3	10.0 in
4	13.0 in
5	15.6 in
6	17.8 in

Table 1

(2) With the drilled hole positioned vertically downwards, secure the marked tube described in (1), to the nozzle of a suitable hand spray gun. Insert the tube through the rotor and stator blades at the top dead centre position, until the mark for the stage to be sprayed is aligned with the leading edge of an inlet guide vane in the closed position.

(3) Using the hand spray gun, deliver two applications (squirts) of the Rocket WD40 (34B/2244966) downwards onto the rotor blade platforms. Repeat this process for each stage, as positioned on the marked tube. JK Mth

(4) Withdraw the tube, then turn the engine through 120 degrees. Repeat (2) and (3).

Note...

The quantity of Rocket WD40 (34B/2244966) is approximately 500 ml., most of which will drain out of the engine intake.

(5) Repeat (4)

(6) Withdraw the tube after completion of (5).

Turbine

9. With the aid of a strong spotlight, examine the low pressure turbine blades for indications of overheating and/or aerofoil edge or shroud weld cracking; refer to AP 102C-1503,1507-1, Part 3, Sect.1, Para.43 and/or AP 102C-1503,1507-6A, Part 1, Sect.2, Chap.9, Para.1 respectively. Examine the blades for indications of impact damage and traces of aluminium which may indicate compressor damage or blade failure; refer to AP 102C-1503,1507-6A, Part 1, Sect.2, Chap.9, Para.3.

If previously unrecorded acceptable impact damage is evident, examine the compressor as instructed in AP 102C-1503,1507-6A,Part 1,Sect.2,Chap.8. If there is evidence of aluminium on the turbine blades, use a fine abrasive to remove the aluminium. If the aluminium cannot be removed completely by light abrasion, reject the engine. If, during inspection of the l.p. turbine blades, cracking of the l.p.n.g.v. aerofoils is noticed, refer to AP 102C-1503,1507-6A for acceptance standards.

10. Turn the engine rotating assembly, by hand, and listen for signs of 'scuffing' or rubbing which may indicate compressor or turbine seal failure. If the noise is slight, ground run the engine and note the run-down time for comparison with that after previous ground runs or flights. An abnormally short run-down time could indicate seal breakdown.

11. If the run-down time is satisfactory, the engine may be acceptable but should be re-checked during subsequent servicing to assess the progression of the rub. If the rub is severe or the run-down time is of short duration, the engine must be rejected.

Note. . .

If the engine run-down time is of short duration with no evidence of engine malfunction, change the engine-driven auxiliary units and re-check the run-down time before deciding to reject the engine.

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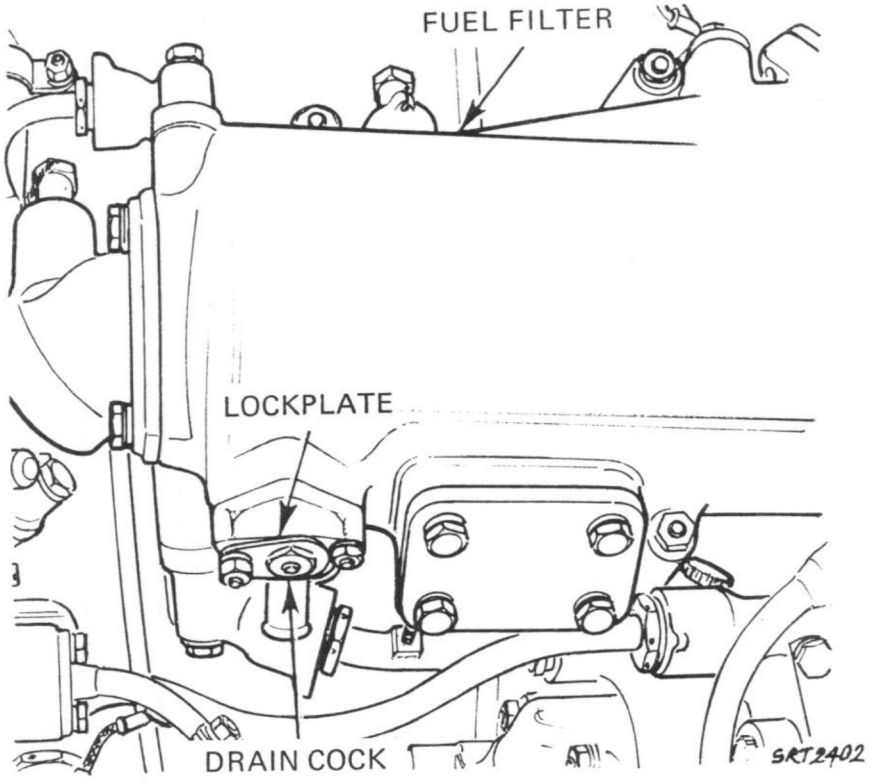


Checking for fuel contamination
Fig.1

Exhaust unit and jet pipe

12. With the aid of a strong spotlight, examine the exhaust unit and jet pipe casings for signs of rippling and cracking; limits of acceptance are described in Vol.6A, Part 1, Sect.2, Chap.4.

13. If there are signs of severe overheating the jet pipe should be removed for further examination and the turbine blades examined as described in para.9.

Engine controls

14. Lubricate the control-rod ball-joints with grease XG-295 (Ref.34B/9423152); check for freedom of movement over the full range of operation, ensuring that the lever movement is limited by the stops on the engine and not by those on the cockpit quadrant.

Fuel filter

15. To prevent air entering the fuel system when taking a fuel sample from the low pressure (l.p.) filter, proceed as follows:-

    (1) Ensure that the h.p. cock is closed, open the l.p. cock, and switch on the tank fuel pump.

    (2) Remove the drain cock lockplate (Fig.1), turn the drain cock anti-clockwise and drain the fuel into a suitable container.

    (3) Close the drain cock and refit the lockplate.

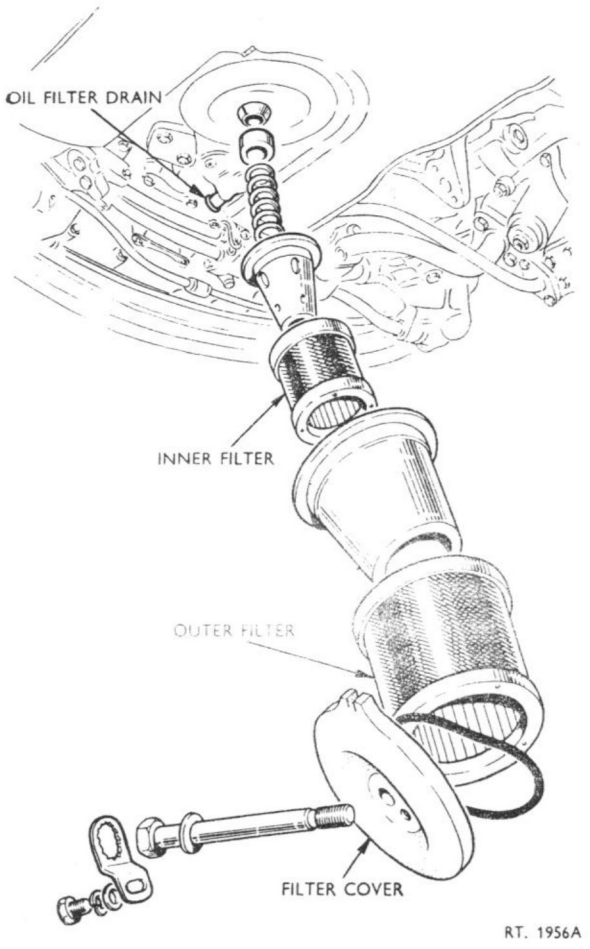
    (4) Switch off the tank fuel pump.

    (5) Close the l.p. cock.

16. If the sample contains dirt or has an excessive water content, locate and rectify the source of contamination and clean the aircraft fuel system. Renew the filter element and bleed the engine fuel system as described in Vol.6A, Part 1, Sect.2, Chap.5 before running the engine.

Igniter plugs

17. Observe the WARNING and precaution (para.3 (12) and (13) respectively) and check the operation of each individual igniter plug by disconnecting the low tension lead from each ignition unit in turn, pressing the RELIGHT button and listening for the discharge 'crack' across the plug gap.



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Removing the pressure oil filter
Fig.2

Pressure oil filter

18. Remove and examine the pressure oil filter (Fig.2) for evidence of foreign matter: if evident, further examination will be necessary and reference should be made to Part 3, Sect.1. Service the filter as instructed in sub-para.(1) to (5).

Note...

To determine whether non metallic foreign matter in the filter is from a damaged rubber seal or merely stray particles of jointing compound, remove the particles from the filter and attempt to smear them on a sheet of clean white paper. If blue marks appear on the paper, indicating that the particles are jointing compound, wash the filter in trichloroethylene to remove all traces of the compound, dry the filter, and immerse it in clean engine oil before refitting. If it is established that the particles are rubber, reject the engine.

(1) Remove the filter drain cock lockplate and partially unscrew the drain cock (Fig.2); collect the oil in a suitable container.

(2) Remove the lockplate from the filter cover central retaining bolt; unscrew the bolt and remove the filter and cover assembly.

(3) Wash the components in filtered kerosine, then immerse the filter elements in clean engine oil.

(4) Clean the joint faces, then renew the filter cover sealing ring. Replace the filter assembly, locating the slotted portions of the cover with the stud on the sump casing and tighten the central retaining bolt to the torque load specified in Vol.6A, Part 1, Sect.2, Chap.1; refit the lockplate.

Caution. . .
When applying the torque load to the central retaining bolt, the figure specified must not be exceeded as cracking of the filter cover may result with serious consequences to the engine.

(5) Tighten and lock the filter drain cock, then replenish the oil sump as described in para.20.

19. After initial running of the engine, check the filter cover joint and the drain cock for signs of leakage.

Oil system replenishment

20. The oil sump is replenished by a pressure rig which is attached to the oil filler connection show in Fig.3. Check the oil level sight glass to determine the quantity of oil required; the amount necessary to raise the level from LOW to FULL is approximately 2 pints.

21. The oil level must be checked between 10 and 20 minutes after stopping the engine, otherwise a false level will be indicated on the sight glass. If the sump has been drained, replenish to the FULL mark on the sight glass, motor the engine (Part 2, Sect.2, Chap.2) and recheck when the engine has stopped; 'top-up' if necessary.

Note. . .
To ensure accuracy when oil level readings are taken to check the oil consumption of an engine, the readings should always be taken after the same elapsed time from engine shut-down e.g. 10 minutes; in this way the engine oil system conditions will be similar, and the readings taken comparably accurate.

22. Remove the oil filler cap by turning it anti-clockwise and withdrawing it from its

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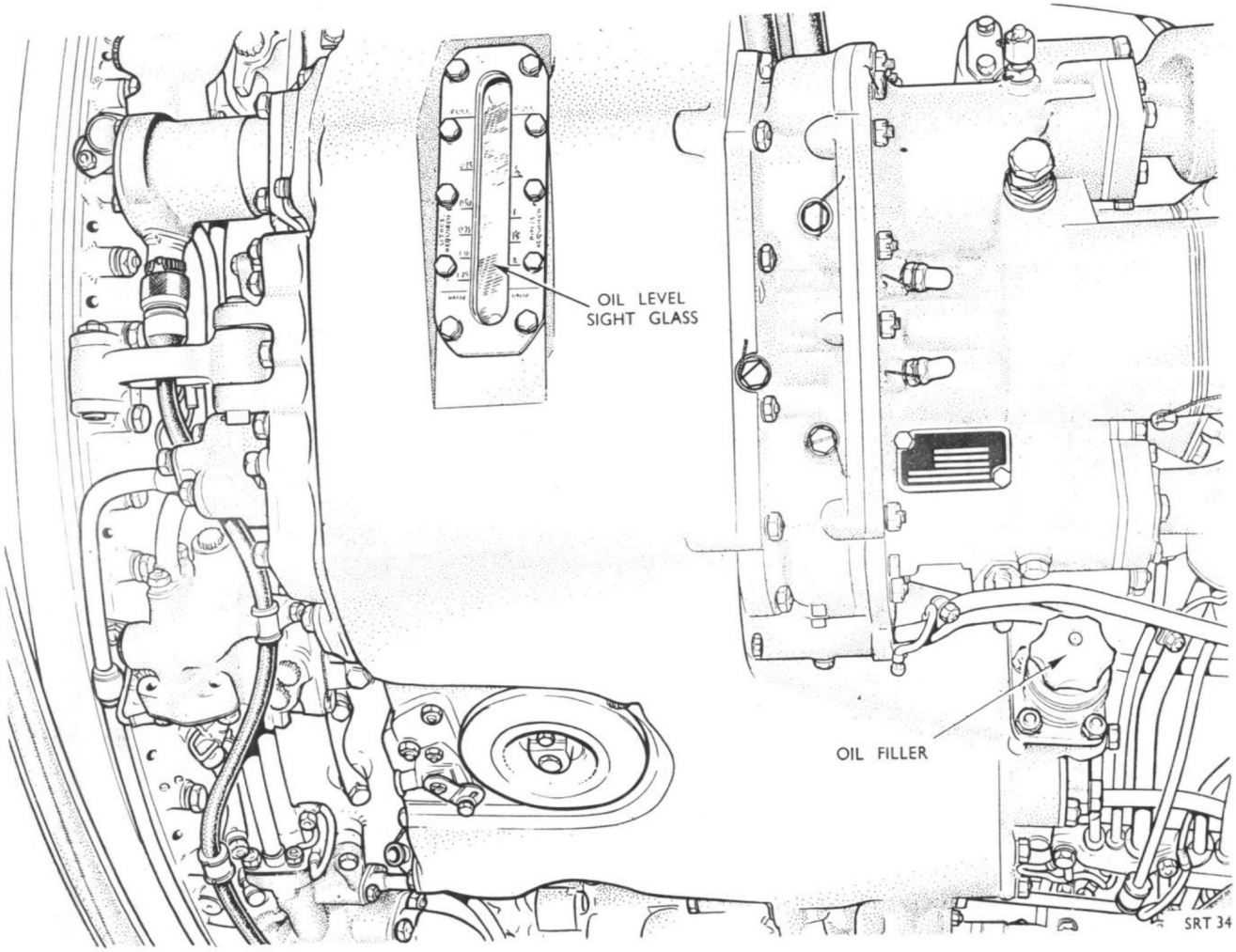

Fig. 3 Oil system replenishment

bayonet connection. Ensure that both connections are clean, then fit the pressure rig bayonet adapter to the oil filler connection; operate the rig until the correct level is shown on the sight glass.

23. Disconnect the rig, wipe up any spilled oil and replace the oil filler cap. If the amount of oil required suggests high consumption or if the sump level tends to increase during engine running, refer to Part 3, Sect. 1.

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Chapter 2

FIELD ACCEPTANCE STANDARDS

This chapter DELETED, information now contained in Vol.6A, Sect.2, Chap.8.

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Chapter 3

INSPECTION FOR DAMAGE AFTER SHOCK LOADING

Note.—*This chapter applies to Avon Mk. 20301 Engine Change Units and Associated Jet Pipes*

LIST OF CONTENTS

GENERAL

1. Shock loading of an engine may generally arise from three sources:—

(1) Crash damage

(2) Hangar handling damage

(3) Damage in transit

The following paragraphs are intened to serve as a guide in deciding whether an engine is fit for further service. The final decision as to the serviceability must, of course, depend on the nature of the damage and the particular circumstances.

2. The engine may be accepted providing damaged accessories or external parts can be replaced (*Vol.* 6, *Part* 1, *Sect.* 2) and that no damage has been transmitted through them to parts of the main engine structure.

3. A check must be made of all pipes and electrical leads for damage and ingress of dirt.

4. The engine sump, the fuel flow control unit and the fuel-cooled oil cooler should be particularly examined for cracks which would permit oil or fuel leaks, and it may be advisable to apply a chalk test to these parts.

5. If the main structure has not been damaged the engine need not be stripped provided that debris has not entered the engine to such an extent that the intake guide vanes or compressor blades have been damaged. If any damage is found, reference should be made to Chap. 2 of this section for the acceptance standards. Any debris which may have entered the compressor must be removed before any attempt is made to run the engine.

6. The intake guide vanes and ram should be checked for freedom of movement over the whole range, and the engine for full freedom of rotation.

7. If the engine is found to be unfit for ground running it should be inhibited as described in A.P.4471A, Vol. 1.

8. Any surface damage to magnesium or aluminium castings should be treated as described in A.P.4471A, Vol. 1.

GROUND RUN

9. The engine must be given a ground run to check handling and performance; during the run down at the end of the ground run listen for any ususual noise such as gear whine or compressor or turbine rub, as these will indicate distortion or malalignment. Part 3, Sect. 1, ' Running Defects ' should be consulted if any faults are noted during the ground run.

10. Finally examine all filters for traces of foreign matter.