

**SECTION 3**

**SERVICING**

**RESTRICTED**

**SECTION 3**

**SERVICING**

**LIST OF CHAPTERS**

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

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**RESTRICTED**

(A.L.7. July. 54)

## Chapter I

### ROUTINE SERVICING

**Note.**—This chapter applies to Avon Mk. 10801 and 11401 Engine Change Units and associated Reheat Jet Pipe Avon JP. 101

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1. Servicing the engine consists of making the routine checks and inspections listed in the aircraft Servicing Schedule; only those checks which require explanation are included in this chapter. When it is found necessary to run or motor the engine over, or remove a component, reference must be made to Sect. 2, Chap. 2, of this Part and to Vol. 6, Part 1, Sect. 2, respectively.

#### WARNING

*The electrical energy which may be stored in the condensers of the high-energy ignition units is potentially lethal. It is important therefore to disconnect the L.T. supply and wait at least one minute to allow the stored energy to dissipate before handling the unit or plug H.T. cable.*

#### Precautionary notes

2. (1) Before starting work on the engine ensure that the battery master switch is OFF and that the cartridges are removed from the turbo-starter.
- (2) Fit protective covers to the air-intake and other apertures before commencing work on, or in the vicinity of the engine.
- (3) Fit blanks immediately to any apertures resulting from the removal of components or the disconnection of pipes or electrical plugs.
- (4) Examine all jointings and gland rings disturbed during servicing, and renew where

necessary. Renew all expendable locking devices such as tab washers and split pins, and use 22 s.w.g. stainless steel wire for all wire locking.

- (5) Use ground equipment when an electrical supply is required during servicing, motoring over or starting.
- (6) Bleed the fuel system before attempting to start the engine if, the L.P. fuel filter has been removed, a fuel pipe upstream of the throttle has been disconnected, the fuel tank has been drained, or air has entered the fuel system.
- (7) Ensure that the aircraft tank contains fuel and that the L.P. cock is ON before turning the engine.
- (8) Apply the anti-corrosive treatment described in A.P.4471A, Vol. 1 if the engine is to stand idle for more than a week; if this treatment has been applied the engine must be prepared as described in Sect. 2, Chap. 1 of this Part, before being put into service again.
- (9) The oil quoted in Leading Particulars for use in this engine is a synthetic product which must not be mixed with any other oil. Since the oil is injurious to paintwork and certain types of rubber, it must be used only for internal lubrication of the engine and must not be permitted to contaminate any parts which are normally not in contact with the oil. Any oil

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spilled during servicing must be carefully wiped off at once.

- (10) Thoroughly clean the engine nacelle and its vicinity on completion of work. Remove all loose parts such as nuts, locking wire and split pins.

#### Combustion chambers

3. No routine servicing is necessary apart from periodic examination for local overheating of the outer casing, gas leaks from the joints and general security of the assembly.

4. Hot spots may be indicated by discoloured patches on the air casings and these should be carefully noted and the affected area enclosed by a pencilled ring; if regular inspections then show any increase in the area affected, further investigation must be made.

#### Compressor

5. Remove the starter access panels as instructed in the relevant aircraft Air Publication. Using a strong spotlight examine the intake guide-vanes and compressor blades as far as possible for condition and cleanliness. Chapter 2 of this section illustrates various types of acceptable and unacceptable damage.

#### Engine anti-icing system

6. To test the functioning of the gate valve move the cockpit anti-icing selector to ON and check that indicator pointer on the gate valve moves to the fully open position; return the selector to OFF and check that the gate valve moves to the fully closed position. If the gate valve does not operate satisfactorily reference must be made to Part 3, Sect. 1.

#### Engine controls

7. Check the engine controls for freedom of movement and when the cowlings are removed, visually check for security and general condition.

8. The controls must be maintained with the minimum amount of backlash consistent with full and free movement. Lubricate the ball joints with grease XG-275 (*Stores Ref. 34B/222*). When checking the range of control lever movement ensure that it is limited by the stops on the engine and not by those on the cockpit quadrant.

#### Exhaust unit and turbine

9. Using a strong spotlight, visually check the L.P. turbine and exhaust unit by viewing along the jet pipe. When examining the turbine blades and nozzle guide-vanes it will be necessary to turn the engine over by hand. Damage to the turbine, evidence of overheating of the engine beyond normal operating limitations, or metal deposits in the exhaust unit, will necessitate the removal of the jet pipe for further investigation.

10. Signs of 'Alfol' lining having blown out of the exhaust unit may indicate a crack and will require further investigation. Cracks, severe rippling or distortion of the inner skin will render the unit unserviceable.

#### Fire extinguisher pipes

11. Visually examine the spray pipes and check that the spray holes are clear. Couple a dry compressed air supply to the alternative connection and apply an air pressure of 50 to 70 lb. per sq. in. for a period of at least one minute, checking that air is venting through all the holes. Any holes that are choked must be cleaned with a No. 60 drill (0.040 in. dia.) or 20 s.w.g. (0.036 in. dia.) steel wire.

#### Fuel filter

12. When taking a sample of fuel from the L.P. filter to check for water content and contamination, bleeding of the fuel system can be avoided by observing the following sequence of operations.

- (1) Clean the filter casing externally.
- (2) Ensure that the H.P. cock is OFF
- (3) Turn ON the L.P. fuel cock.
- (4) Switch ON the L.P. fuel pump.
- (5) Detach the drain plug lock plate and unscrew the plug (*fig. 1*) by its hexagon to allow approximately 1 pint of fuel to drain into a glass container.
- (6) Tighten and lock the drain plug.
- (7) Switch OFF the L.P. pump.
- (8) Turn OFF the L.P. fuel cock.

13. If the drained fuel contains an excessive amount of water or suggests contamination, the source of the trouble must be located and all contamination removed from the aircraft fuel system; in this case the element must be changed and the fuel system bled, as described in Vol. 6, Chap. 6.

#### Ground run

14. Before making a ground run it is important to check that the anti-icing switch is OFF. If the anti-icing switch is left ON it may promote compressor surge. Ground run the engine as described in Sect. 2, Chap. 2 of this Volume, making all the necessary checks. When the engine is shut down after ground run, check that it runs down freely and that there are no rubbing noises from the rotating assembly.

#### Igniter system

##### WARNING

*The electrical energy which may be stored in the condensers of the high energy ignition units is potentially lethal. It is important therefore to disconnect the L.T. supply and wait at least one minute to allow the stored energy to dissipate before handling the unit or plug H.T. cable.*

15. Apart from periodic checks for security and visual inspection of the H.T. lead insulation, no routine servicing is necessary on the igniter system.

16. To ascertain if the igniters are functioning

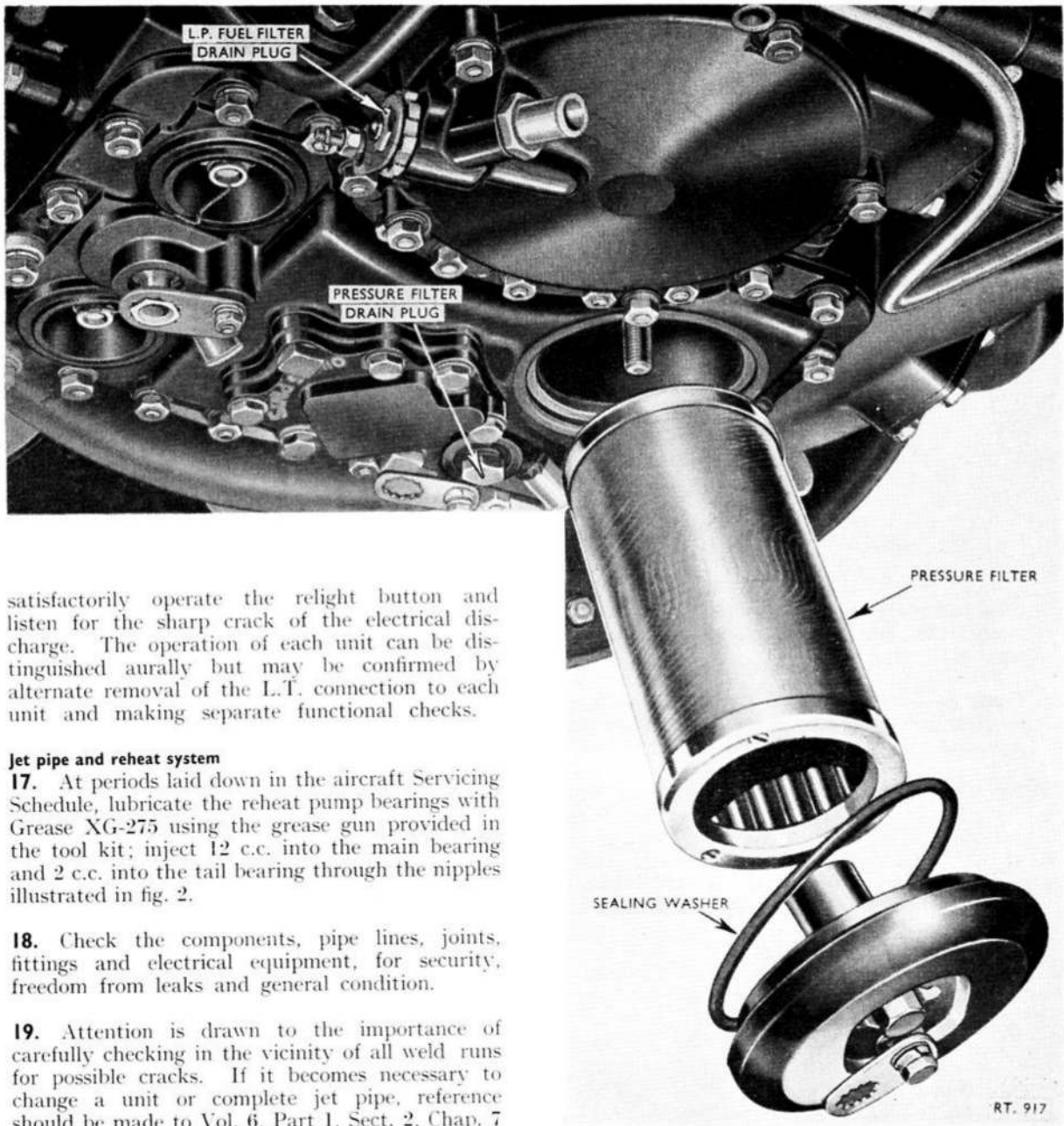


Fig. 1. Oil filter removal and fuel filter drain plug

satisfactorily operate the relight button and listen for the sharp crack of the electrical discharge. The operation of each unit can be distinguished aurally but may be confirmed by alternate removal of the L.T. connection to each unit and making separate functional checks.

#### Jet pipe and reheat system

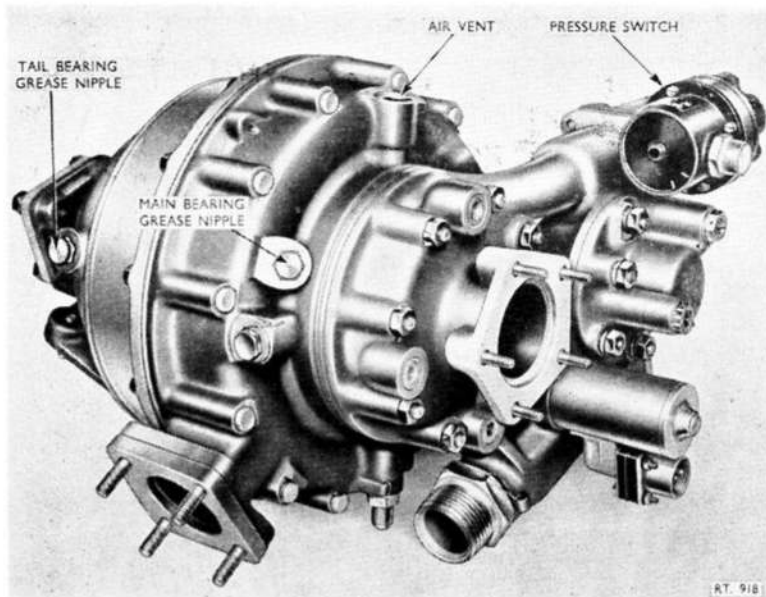
17. At periods laid down in the aircraft Servicing Schedule, lubricate the reheat pump bearings with Grease XG-275 using the grease gun provided in the tool kit; inject 12 c.c. into the main bearing and 2 c.c. into the tail bearing through the nipples illustrated in fig. 2.

18. Check the components, pipe lines, joints, fittings and electrical equipment, for security, freedom from leaks and general condition.

19. Attention is drawn to the importance of carefully checking in the vicinity of all weld runs for possible cracks. If it becomes necessary to change a unit or complete jet pipe, reference should be made to Vol. 6, Part 1, Sect. 2, Chap. 7 and the relevant aircraft Air Publication. Make the following checks on the jet pipe:—

- (1) Check the nozzle eyelids manually for freedom of movement and security, also for distortion and dents in the inner and outer skin. If the dents are deeper than 0.25 in. try to remove them by normal methods. If this proves impractical replace the jet pipe.
- (2) Visually inspect as much as possible of the outer skin of the jet pipe for cracks and distortion. Any signs of overheating on the outer skin may indicate possible cracking of the inner skin and further investigation should be made.
- (3) Examine the spring finger shield by looking
- under the suction lip, if there is any distortion or breaking up of the fingers, remove the suction lip; if a total of more than five fingers are cracked or missing the pipe must be replaced.
- (4) Using a strong spotlight carefully check the inner skin for cracks and severe rippling. If rippling is deeper than 0.375 in. or if the pipe is cracked it should be replaced.
- (5) Check for small cracks along the short weld runs of the inner casing suspension straps; these weld runs are visible as small longitu-

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**Fig. 2. Reheat-pump lubrication points**

dinal indentations situated close to the final nozzle. Any cracking will necessitate replacement of the pipe.

- (6) Check the burner stabilizer support straps for security and cracking. Renew the straps if damaged.
- (7) Check the diffuser cone and stabilizer ring for cracks and distortion, if severe remove the respective unit.
- (8) Check the main burner for security and cracks, if any of the burner stub pipes are damaged the unit must be replaced.
- (9) If any damage has resulted to the pilot burner, it may be replaced as a separate unit.

**20.** The security and mounting of the jet pipe should be checked as described in the relevant aircraft Air Publication.

**Oil filter and strainers**

**21.** The pressure filter is drained by partly unscrewing the plug adjacent to the filter; this is illustrated in fig. 1. Release the locking plate, then unscrew the central retaining nut and withdraw the cover and filter.

**22.** Examine the filter carefully and if an excessive amount of foreign matter or metal is found, investigate further, making reference to Part 3, Sect. 1. Wash the filter assembly in clean kerosine

and if the system is not to be refilled immediately, immerse the assembly in clean engine oil before replacement.

**23.** Clean the joint faces and examine the sealing ring between the filter cover and the element; renew as necessary. Replace the filter assembly, turning the cap so that the square in the filter cover registers with the squared portion on the centre bolt. Tighten the centre nut to a torque load of 90 lb. in., refit the locking plate and tighten the filter drain plug.

**24.** The three sump oil strainers should not be disturbed during normal servicing but if it becomes necessary to drain the sump completely, this may be done as described in Vol. 6, Part 1, Sect. 2, Chap. 8.

**25.** After initial ground run, check the filter cover joints and drain outlets for leaks.

**Oil sump replenishment**

**26.** Only oil to the Specification quoted in Leading Particulars must be used, and para. 2, item (9) must be observed when handling this oil.

**27.** The oil sump has a capacity of 17 pints, and a filler neck extension together with a cap and dipstick is provided on the port side of the sump for replenishment. The sump should be filled up to the mark on the dipstick with the engine cold. Details concerning the filler neck extension are given in the relevant aircraft Air Publication.

## Chapter 2

### FIELD ACCEPTANCE STANDARDS

**Note.**—This chapter applies to Avon Mk. 10801 and 11401 Engine Change Units

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#### Compressor blades

1. Small burrs or bruises on the leading or trailing edge of the rotor or stator blades, as shown in fig. 1 and 2, may be accepted up to any number provided that none occur within 0.250 in. of the root fillet radius. The engine should be rejected if:—

- (1) A piece of blade is likely to break away (fig. 3).
- (2) Any rotor blade is indented or torn to a chordal depth of more than 0.125 in. on the leading or trailing edges (fig. 4 and 5).

- (3) Any stator blade (including inlet swirl vanes) is indented or torn to a chordal depth of more than 0.200 in. on the leading or trailing edges; fig. 6 shows damage at the limit of acceptance in this category.

- (4) Any rotor or stator blades are indented or torn within 0.500 in. of the root fillet radius.

2. If the blade damage is acceptable to the foregoing standards, but is accompanied by abnormal vibration or handling qualities, or an unusually short run down time, the engine should be rejected.

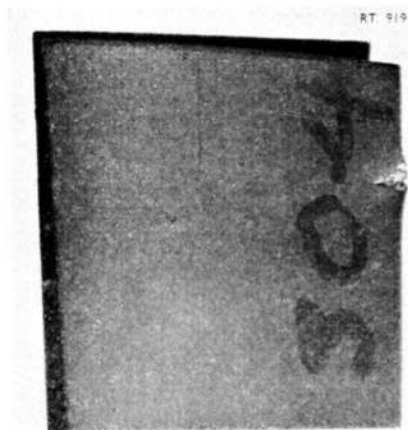


Fig. 1. Rotor blade—acceptable bruise damage

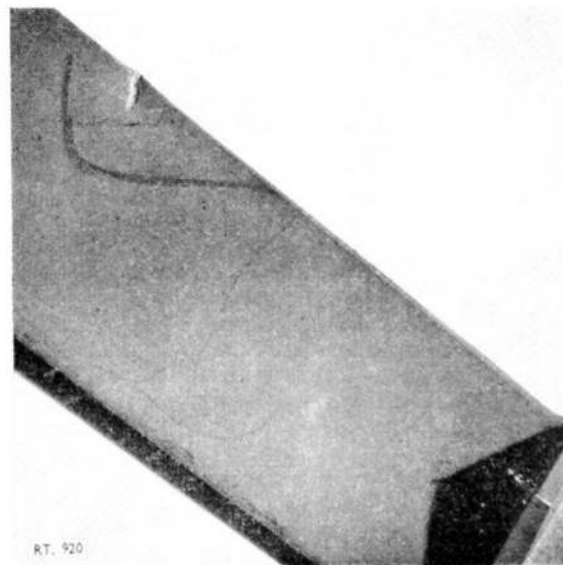


Fig. 2. Rotor blade—acceptable bruise damage

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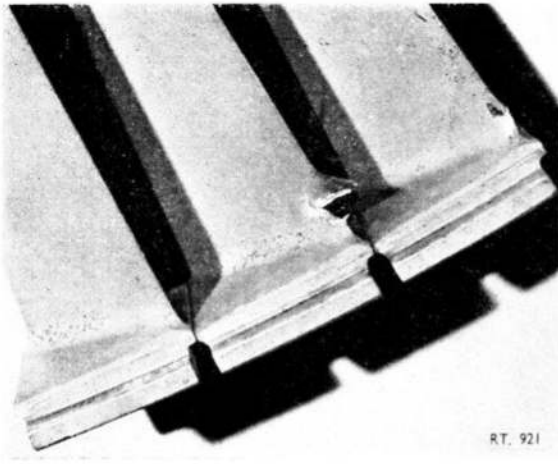


Fig. 3. Stator blade—unacceptable damage



Fig. 4. Rotor blade—acceptable damage

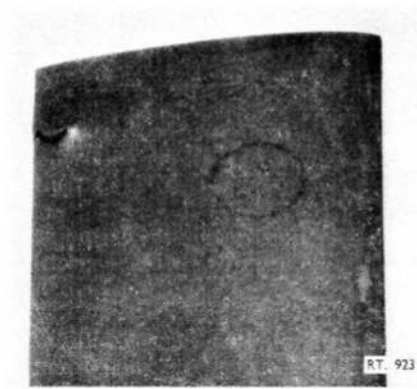


Fig. 5. Rotor blade—unacceptable damage

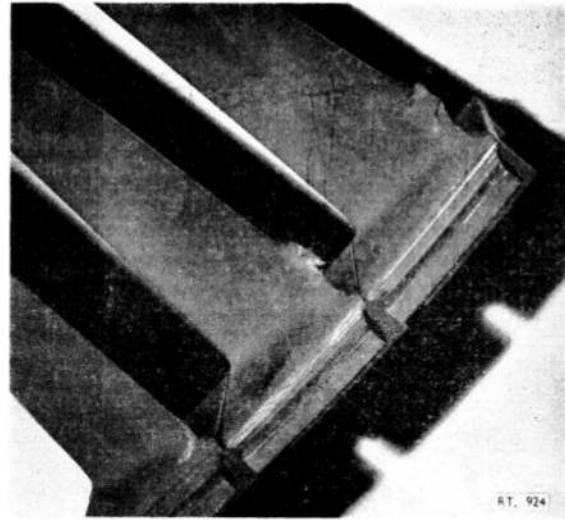


Fig. 6. Stator blade—damage at the limit of acceptance

## Chapter 3

### INSPECTION FOR DAMAGE AFTER SHOCK LOADING

**Note.**—This chapter applies to Avon Mk. 10801 and 11401 Engine Change Units

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#### General

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

- (1) Crash damage.
- (2) Damage in transit.

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

2. Damage to accessories or external parts of the engine may be accepted provided these 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 should be made of all pipes and electrical leads for damage and ingress of dirt particularly the ram pressure pipe to the B.P.C., and the stand pipe for the Bleed Valve Control Unit.

4. Provided that debris has not entered the engine to such an extent that it has damaged the intake guide-vanes or compressor blades, it need not be stripped unless the main structure has been affected.

5. The intake guide-vanes should be checked for full and free movement and the engine for freedom of rotation.

#### Ground run

6. 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 unusual 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.

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

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