CHAPTER 5 - EXHAUST SYSTEM

Contents

Illustrations

1. General

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A. When working on an engine, observe the precautions listed in Chap.1. Lubricants for assembling and torque loading data are also detailed in Chap.1.

2. Exhaust unit

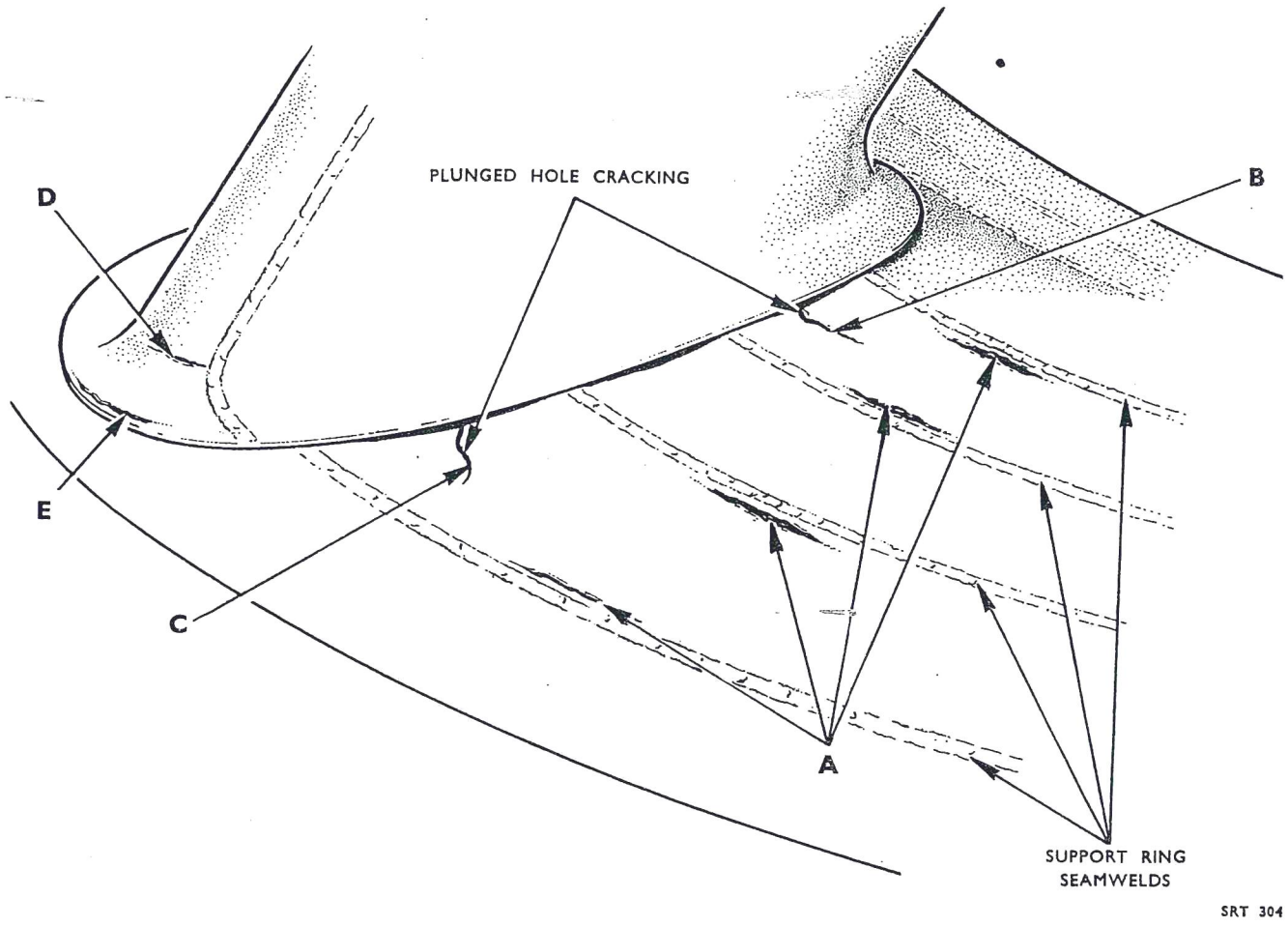
A. Inspection

(1) Enter the jet pipe as far as possible and, using a powerful spotlight, inspect the exhaust unit for cracks, rippling or dents. If the limits given in (a) to (c) are exceeded, reject the exhaust unit.

(a) Inspect the skins of the inner and outer cones.

(i) Accept small transverse cracks which are wholly contained within a weld track.

(ii) Accept cracks along or adjacent to the four outer cone support ring circumferential seamwelds (A, Fig.1) to a cumulative length (i.e. the sum of the lengths of the individual cracks) of 6.0in.



Outer cone skin and fairing - typical cracking
Fig.1

(iii) Accept cracks along or adjacent to the inner cone circumferential seamwelds, to a cumulative length of 6.0in.

NOTE: The limits given in (ii) and (iii) above apply to only those seamwelds which are intersected by the exhaust unit fairing soleplates. Cracking at any circumferential seamweld not contained within the axial length of the fairing soleplates is not acceptable.

(iv) Cracks may emanate from the plunged holes adjacent to the fairing support tube sleeves and extend circumferentially under the soleplates (B, Fig.1). Accept two cracks per hole provided that there is no axial propagation (C, Fig.1) and that they do not encroach within 0.250in of a circumferential seamweld, and that any individual crack is not longer than 1.0 in.on the inner cone or 2.0in on the outer cone.

(v) Accept rippling of the inner cone skin, provided that the height of the crests is not greater than 0.050 in. above the normal surface of the skin and there are no cracks.

(vi) Accept rippling of the outer cone skin, provided that the height of the crests is not greater than 0.125 in. above the normal surface of the skin and there are no cracks.

(b) Inspect the fairings and soleplates. Accept cracks in the fairing adjacent to the soleplate weld (D, Fig.1), and across the leading and trailing edges of the soleplates (E, Fig.1), provided that they are not longer than 0.625in.

(c) Inspect the insulation casing.

(i) Accept isolated instances of sheared rivets.

(ii) If there is an area of sheared rivets (indicative of outer cone support ring failure), reject the exhaust unit.

B. Removing

(1) Remove the engine from the aircraft as described in the appropriate aircraft Air Publication.

NOTE: Five setscrews are fitted in the exhaust unit flange; only the top one, which is a blanking setscrew to prevent possible gas leakage from the top extractor hole should be removed.

(2) Apply penetrating oil or kerosine to the exhaust unit retaining stud ends to facilitate removal of the retaining nuts.

(3) Unlock and remove the top setscrew from the exhaust unit flange.

(4) Bend back the locking tabs and unscrew the retaining nuts, leaving the top nuts until last; discard all tabwashers and remove the fire extinguisher rail.

(5) Fit suitable setscrews to the four extractor holes positioned at 90° intervals from the top centre position of the flange.

(6) Support the weight of the exhaust unit, remove the top retaining nuts and tabwashers and with the aid of the extractor screws withdraw the unit from the locating spigot.

C. Replacing

(1) Before replacing the exhaust unit, inspect the retaining studs in the nozzle box flange; renew any which are damaged and/or fractured.

NOTE: Three different lengths of studs are used to secure the unit; ensure that any new stud fitted is identical to that removed.

(2) When fitting a new stud, use engine oil as lubricant.

(3) Torque tighten the stud to 35 to 40 lbf.in. to achieve the correct projection given in the following table.

Table 1

Stud length (in)	Projection	
	Minimum (in)	Maximum (in)
1.025 to 1.035	0.625	0.685
1.125 to 1.135	0.725	0.785
1.225 to 1.235	0.825	0.885

(4) If it is not possible to remove broken studs, the exhaust unit may be refitted provided that:

(a) There are not more than 6 broken studs

and

(b) There are at least three serviceable studs between any two broken studs

and

(c) There are not more than two broken studs in any group of 12 consecutive studs.

(5) If the number of broken studs which cannot be renewed exceeds the limits specified in (4)(a) to (c), the engine must be rejected. Mth

(6) Apply engine oil to the exposed threads of all retaining studs.

(7) Ensure that the extractor screws are removed from the exhaust unit flange. Fit the exhaust unit, correctly aligned, over the nozzle box studs; fit the fire extinguisher rail and new tabwashers, then the retaining nuts.

(8) Tighten the nuts to the torque load specified in Chapter 1.

(9) Fit the blanking screw and new tabwasher to the top extractor hole.

(10) Install the engine in the aircraft as described in the appropriate aircraft Air Publication.

D. Serviceability check

(1) When the jet pipe has been coupled up to the exhaust unit, run the engine as instructed in AP 102C-1512 to 1517-1, Part 2 and check for hot-air leaks from the exhaust unit/jet pipe joint. Accept a hot-air leak if the back of the hand can be held 6.000 in from the exhaust unit/jet pipe joint at governed rev/min.

3. Jet pipe and final nozzle

A. Inspection

(1) Examine the jet pipe inner skin for cracks, particularly in the vicinity of the circumferential and longitudinal seamwelds. On Hunter aircraft only, examine the front and rear stiffeners, port and starboard, at the rear mounting bracket locations.

(a) Cracking of the inner skin is unacceptable.

(b) Transverse cracks within the circumferential seamwelds are acceptable, provided the cracks are contained within the weld tracks and terminate not less than 0.025 in. from the edges of the weld.

(c) Cracking in or from the longitudinal seamwelds is unacceptable. Porosity features in the seamwelds are acceptable.

(d) On Hunter aircraft only, cracking in the circumferential stiffeners adjacent to the mounting bracket bolt holes is acceptable provided there is no more than one crack adjacent to each of the outer, i.e. top and bottom, bolt holes.

(e) If cracking occurs adjacent to the inner bolt holes, or if more than one crack occurs at any bolt hole, the jet pipe must be rejected.

(2) Rippling of the jet pipe inner skin is acceptable provided that, the height of the crests is not greater than 0.050 in above the normal surface of the skin.

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(3) Deterioration of the 'Alfol' foil (as indicated by 'blowing' from the rear of the jet pipe).

(a) On Mk.109 engines, deterioration of the 'Alfol' foil is unacceptable and must be renewed.

(b) On Mk.122 engines, deterioration of the 'Alfol' foil is acceptable.

B. Remove the jet pipe assembly

(1) The method of removing the jet pipe and final nozzle assembly depends upon the features of the aircraft in which the e.c.u. is installed. Refer to the appropriate Air Publication for detailed instructions.

C. Renew the 'Alfol' insulating foil

(1) If it has been necessary to remove the outer skin and 'Alfol' foil, the refitting procedure is as follows:

(a) Check the fit of the outer skin segments as it is important that they seat satisfactorily on the jet pipe.

(b) Remove the outer skin segments from the jet pipe.

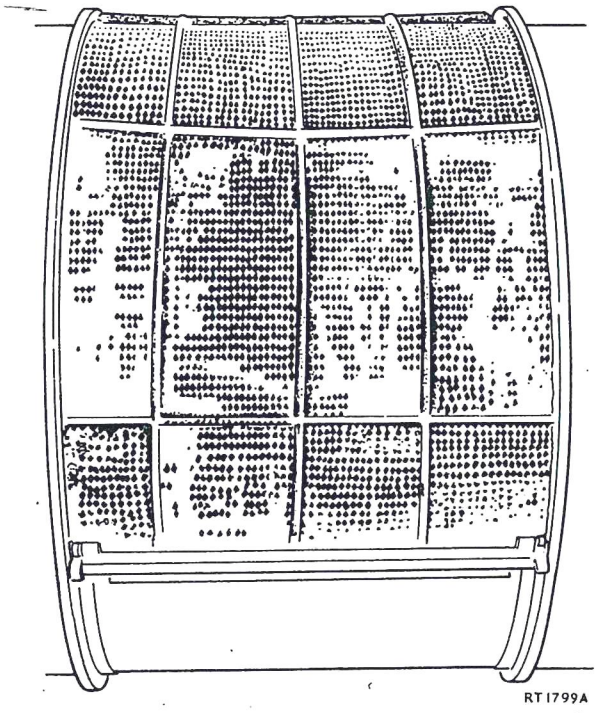

Fig.1 Positioning of insulation wire

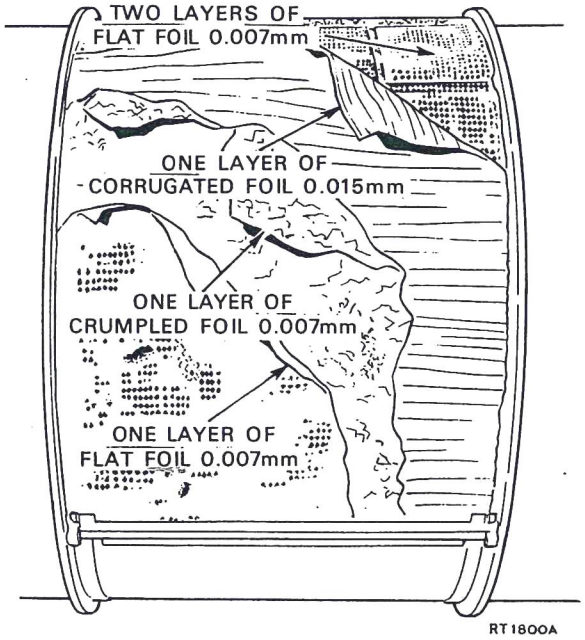

Fig.2 Layers of foil

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(c) Lay two layers of flat foil 0.007mm. thick around the jet pipe and secure them with 'Nichrome' wire coil, 22 S.W.G. The wire must first be wrapped with foil 0.015mm. thick, and laid over the flat foil circumferentially and crosswise (fig.1).

(d) Add one layer of corrugated foil 0.015mm. thick, then one layer of crumpled foil 0.007 mm. thick and finally one layer of flat foil 0.007mm. thick (fig.2).

(e) Place the sealing cups on the pitot, pressure and the thermocouple adapters.

(f) Fit the outer skin segments and secure them with the hinge pins, then insert split pins through the locking collars.

(g) Fit the thermocouple, the pitot and the pressure connections to the relative adapters on the jet pipe, and lock the connections to the lugs on the outer skin segments with 22 S.W.G. locking wire.

D. Install the jet pipe assembly

(1) The method of installing the jet pipe and final nozzle assembly depends upon the features of the aircraft in which the e.c.u. is to be installed. Refer to the appropriate aircraft Air Publication for detailed instructions.

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