GROUP C — ENGINE INSTRUMENTS

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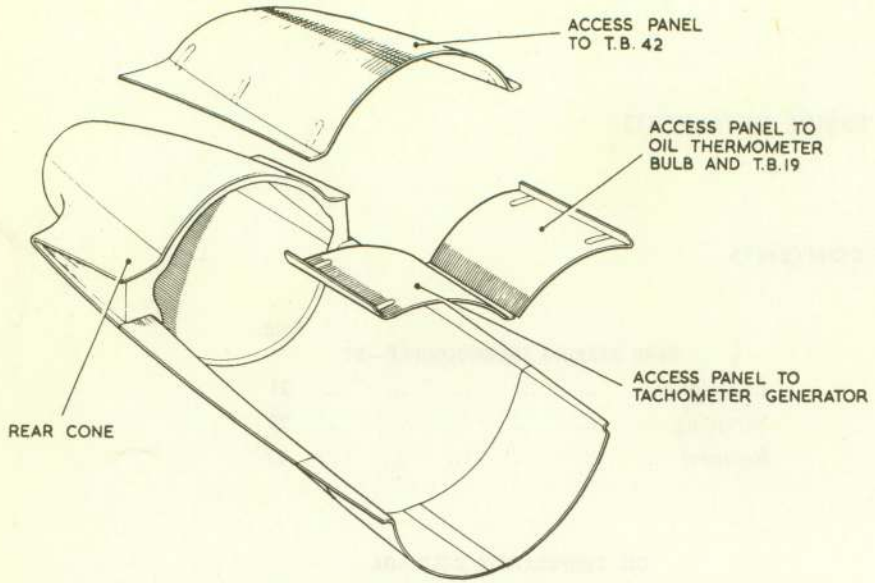
LIST OF ILLUSTRATIONS

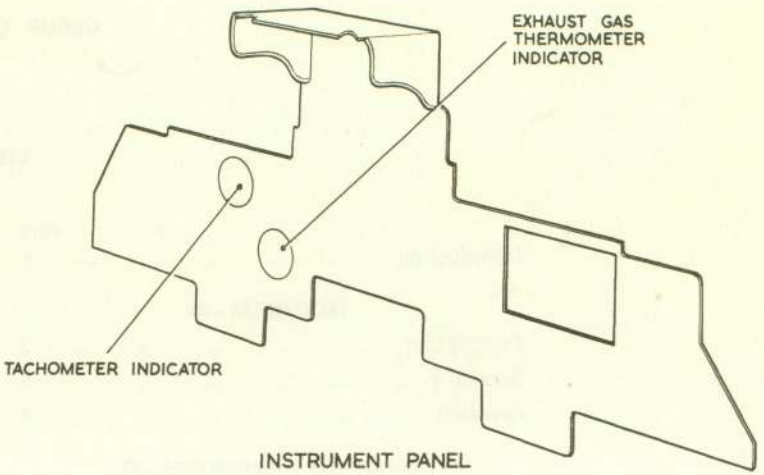
Introduction

1. The information contained in this group relates to the instruments required to show the most important engine performance data to the pilots. Each instrument operates electrically, the power supply of 24 volts d.c. being dealt with in Chap. 1, App. 1, Group A of this Section. The specialist Air Publication references listed below cover the components used.

Equipment	Air Publication
Tachometer Mk.7A	1275A, Vol.1, Sect.26, Chap.6
Exhaust gas thermometer Type B	1275A, Vol.1, Sect.17, Chap.8
Thermocouple, Foster Type 36KK/902	
Engine cylinder thermometer	1275A, Vol.1, Sect.17, Chap.7
Oil thermometer bulb Mk.3A	1275A, Vol.1, Sect.17, Chap.6



ENGINE ACCESS PANELS



INSTRUMENT PANEL

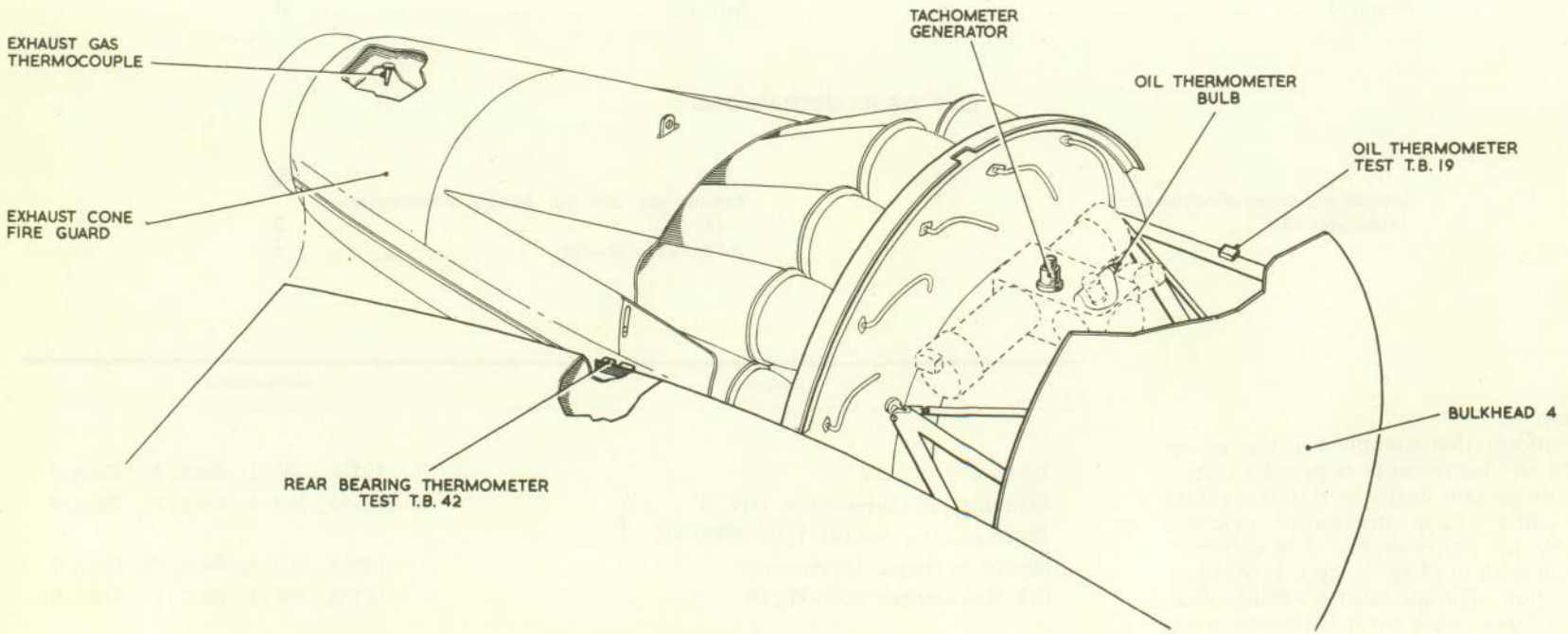


Fig.1. Location and access of components

TACHOMETER

Description

2. The tachometer system is used to indicate to the pilots the speed of rotation of the impeller shaft of the engine, and is a self-contained electrical system.

3. The system comprises a three-phase a.c. generator, fitted to the upper gear box of the engine, the output of which drives a three-phase a.c., self-starting, synchronous motor which forms the indicator, and is mounted on the instrument panel.

4. The indicator motor moves two pointers, via a magnetic drag-element, over a suitably calibrated scale. The range of the indicator is from zero to 20,000 R.P.M., the outer pointer indicating "thousands" and the inner pointer indicating "tens of thousands" of R.P.M. The generator is driven at a quarter engine speed.

Servicing

5. This particular tachometer system is described in the specialist Air Publication listed in para. 1.

6. The Appendix 1 to the specialist Publication mentioned above contains the standard serviceability test for the system.

Removal

7. The indicator is easily removed once the instrument panel has been lowered (Gen. Inf., para. 8 of this Chapter).

8. The generator is secured to the engine upper accessories gear box by three 0·25 in. bolts and spring washers. These must be removed, and the electrical cables disconnected, before the generator can be disassembled from the gear box.

9. When refitting the generator, apply a thin coating of jointing compound to both the generator and gear box faces, fit the packing shim and mount the generator, complete with the leather coupling, to the gear box. Before tightening the three securing bolts, ensure that the driving pins are properly located in the holes of the leather coupling; if necessary, the impeller may be turned to facilitate engagement of the generator driving pins to the gear box drive.

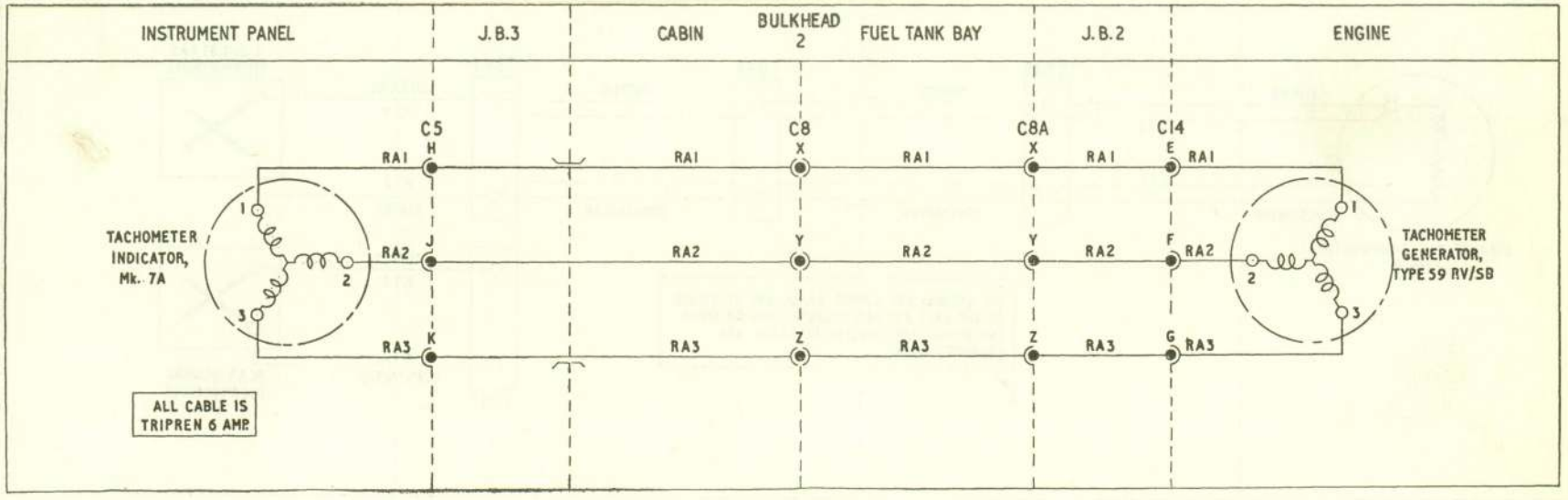


Fig. 2. Tachometer—RA

EXHAUST GAS THERMOMETER

Description

10. To record the temperature of the engine exhaust gas, a thermocouple is situated in the top of the rear cone so that it is in the direct path of the exhausting gas.

11. With the change of temperature of the thermocouple metals, an e.m.f. is generated which is applied to the coil of a milli-voltmeter calibrated from zero to 800 degrees centigrade. This constitutes a self-contained electrical system.

Servicing

12. Both the indicator and thermocouple are described, together with servicing information, in the specialist Air Publication listed in para. 1.

Note . . .

It is essential that the correct connections are made between the thermocouple and the compensating leads, and between the compensating leads and the indicator. For this purpose, the chromel lead of the thermocouple and the copper lead of the compensating leads are flattened at their ends and are colour-coded red or green. The remaining leads are colour-coded blue. The copper lead should be connected to the positive terminal of the indicator.

13. A.P.1275T, Vol. 1, Sect. 4, Chap. 6 contains a detailed test of the system whilst installed in the aircraft, using the exhaust gas thermometer test set, Stores Ref. 6C/966.

14. The test described in that Publication deals with the compensating leads and thermocouple, a measurement of 3·6 ohm ± 0·05 ohm, being given. Of this, 2·68 ohms, ± 0·03 ohm, comprises the thermocouple resistance while 0·92 ohm, ± 0·02 ohm, comprises the compensating leads resistance. Both these values are those obtained at 20 degrees centigrade.

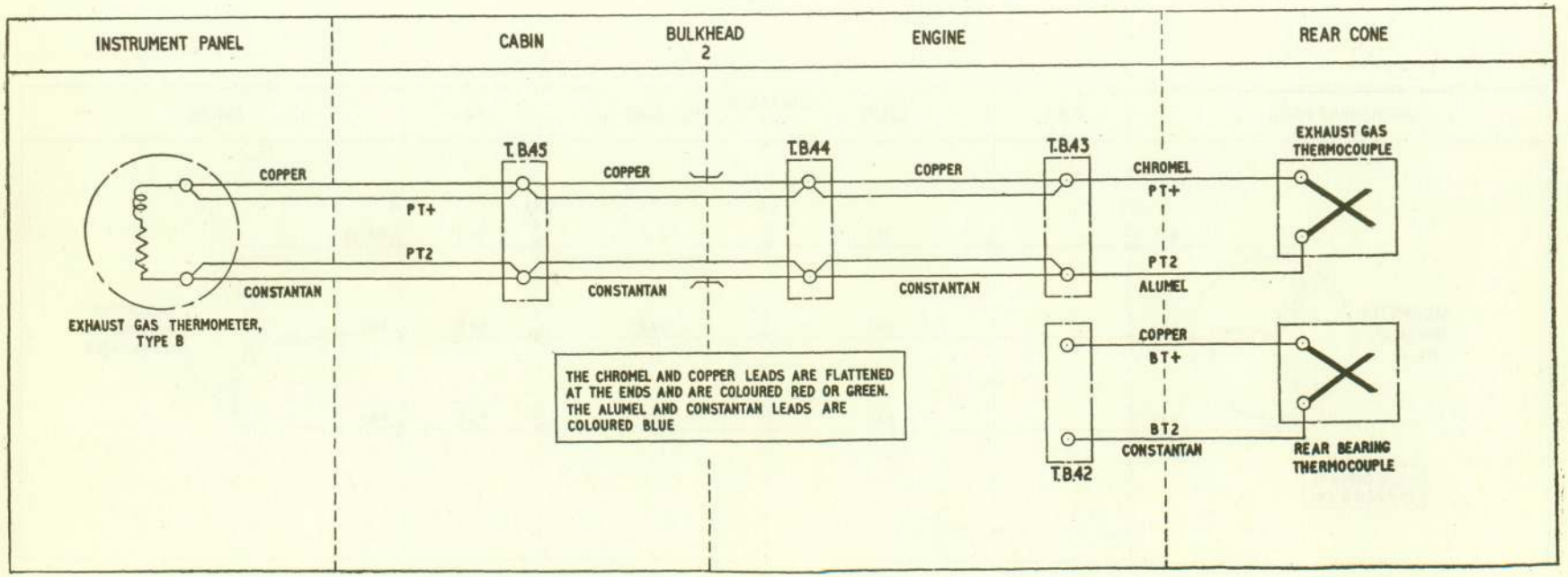


Fig. 3. Exhaust gas and rear bearing thermometers—PT, BT

15. If the 3·6 ohms reading, taking into account the normal tolerance and that allowed for by the ambient temperature being other than 20 degrees centigrade, is not obtained, then the thermocouple should be tested from T.B.43, and the reading of 2·68 ohms, ± 0 03 ohm, should be obtained. If this figure is unobtainable the thermocouple should be renewed. The test should be carried out using a suitable test meter, the connections between meter and thermocouple being as tight and secure as possible.

Removal

16. Removal of the indicator will be self-evident when viewed on the aircraft, the instrument panel being first lowered (Gen. Inf., para. 8 of this Section). When the indicator has been removed, the two terminals should be shorted with a piece of wire to damp the pointer movement.

17. When fitting an indicator, the pointer should be set, with the indicator open-circuited, to the ambient temperature of the panel location for the indicator. This temperature may be assessed by fastening a standard thermometer, using plasticine, to the panel location and leaving it for about one hour before setting the equivalent thermometer reading on the indicator. Adjdustment is afforded by a screw in the face of the indicator.

18. To remove the thermocouple, which should only be done after it has been proved unserviceable, the rear cone must first be removed (Sect. 4, Chap. 1 of this book).

19. Disconnect the thermocouple leads at T.B.43 at the starboard wing rib 1 location. Remove the top of the exhaust cone fireguard in conjunction with the engine tradesman, as follows:—

(1) Remove the two fireguard extensions from the fireguard by releasing the two Dzus fasteners on each extension.

(2) Remove the locking pins and release the six latch clips which clamp the two halves of the fireguard together.

(3) Carefully lift the top half of the fireguard clear of the engine and unclip the thermocouple lead from inside the lower half of the fireguard.

(4) Unscrew the union nut securing the thermocouple to the exhaust cone and remove the thermocouple, complete with its cable, from the aircraft.

20. When refitting the thermocouple, the reverse of the previous instructions apply, ensuring that the threads of the thermocouple are treated with anti-seize grease D.T.D.392 or Whitmore's Compound No. 5 to prevent seizure.

REAR BEARING THERMOCOUPLE

Description

21. A thermocouple is fitted at the rear bearing location of the engine. It is manufactured of copper and constantan, the leads of which terminate at T.B.42 on the starboard wing rib 1 in the engine bay.

22. This completes the circuit as wired in the aircraft, and affords a basis for checking the rear bearing temperature during engine ground running checks.

Servicing

23. The thermocouple, when connected to a test-indicator by suitable compensating leads, forms an engine cylinder thermometer system which is described in the specialist Air Publication listed in para. 1.

24. To measure the rear bearing temperature, connect an engine cylinder temperature indicator, Mk. 1 (Stores Ref. 6A/1305) to T.B.42 using a Type A compensating lead (Stores Ref. 6A/841), connecting the copper leads together, and to the positive terminal of the indicator. The copper leads are identified with a red sleeve, while the constantan leads are identified with a blue sleeve.

25. The overall continuity resistance of the compensating leads and the thermocouple, is 2·0 ohms, ± 0·05 ohm. Of this, 0·25 ohm constitutes the resistance of the thermocouple installed in the aircraft, and 1·75 ohms constitutes the resistance of the test compensating leads.

26. Before connecting the indicator to the compensating leads, remove the shunt, which is fitted across the indicator terminals to damp the pointer movement, and set the pointer to read the ambient temperature. This may be ascertained by an ordinary mercury-in-glass thermometer.

Removal

27. Removal of the thermocouple is a major item of work which does not come within the scope of this publication. The method is described, however, in the publication dealing with the engine, A.P.4121C.

OIL TEMPERATURE BULB

Description

28. Provision is made for checking the temperature of the engine oil during engine ground running checks. A thermometer bulb is fitted in the engine oil system at the top of the engine accessories gear box, the cable connections from the bulb terminating at T.B.19 fitted to the port top engine bearer.

Servicing

29. The bulb forms part of a Mk. 2 thermometer system, described in the specialist Air Publication listed in para. 1.

30. To check the oil temperature, connect an oil thermometer, Mk. 2A (Stores Ref. 6A/2238) to T.B.19, as shown in fig. 4.

Removal

31. The bulb is screwed into a threaded inlet of the oil system, and is removed by unscrewing the bakelite end-piece, withdrawing the two-pin plug from the bulb and unscrewing the bulb from the oil system inlet.

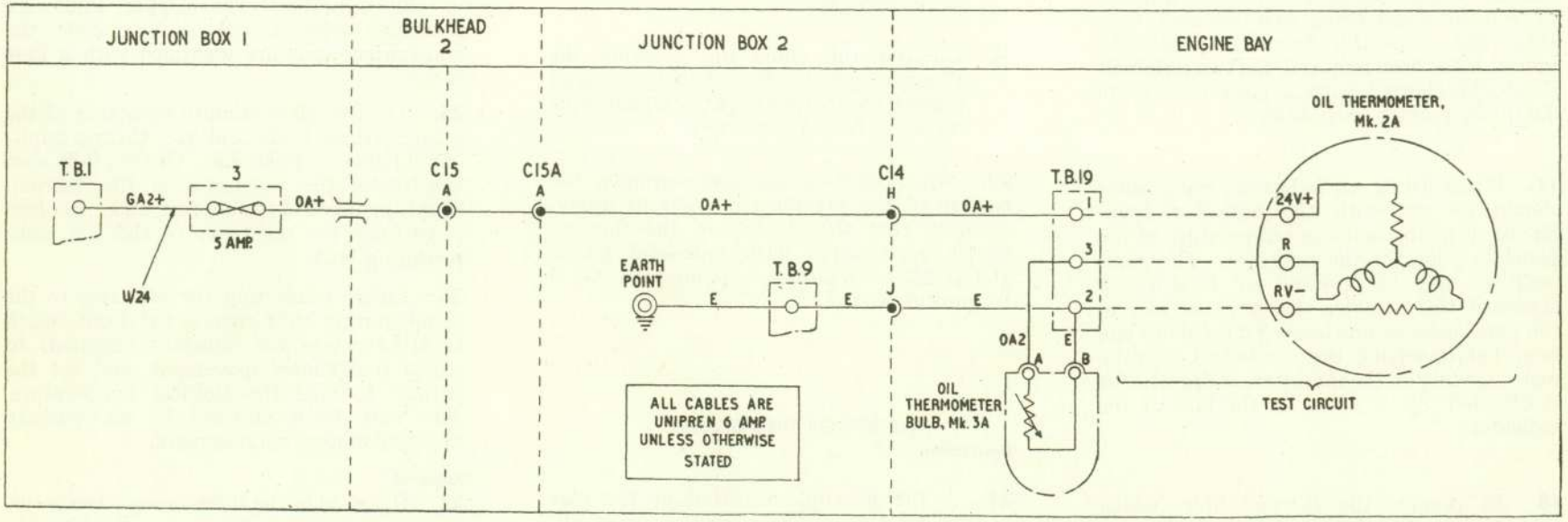


Fig. 4. Oil thermometer—OA

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