GROUP F - FLIGHT INSTRUMENTS

List of Contents

List of Illustrations

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INTRODUCTION

1. The information contained within this group concerns the flight instruments. Each instrument is briefly described together with the reference to the 1275 series of Air Publications where further information concerning the instrument may be found.

Electrically-operated instruments

2. The power supplies to all electrically-operated instruments are shown in the wiring diagrams (Sect. 5, Chap. 1) which give cable breakdown points, terminal blocks, plug and socket connections and the fuse connected to the power supply.

Illustrations

3. The illustrations in this group show the layout of pipes and drain traps for the A.S.I. system. A separate diagram is also included to indicate the correct dimensions for setting up the pressure head in its fore and aft alignment.

DESCRIPTION

A.S.I. system

4. The A.S.I. system (fig. 1) shows the layout of pipe runs from the electrically-heated pressure head in the port tail fin, to the altimeter, air speed indicator, rate-of-climb indicator, machmeter, gyro gun sight control unit (Type AL Mk. 1).

Accelerometer

5. An accelerometer Mk. 2 is fitted above the instrument panel adjacent to panel V. This instrument is used to provide a visual indication of instantaneous and maximum acceleration along the vertical axis to which the aircraft is subjected during flight. It has three pointers on a common fluorescent scale. One is a normal indicating or instantaneous pointer, while the other two register the maximum positive and maximum negative readings until re-set. A re-setting knob at the bottom left hand corner of the case is provided to re-set the maximum positive and maximum negative pointers to the position of the main pointer. The scale is calibrated from -5 to +12G in graduation of 0.2G. Further information concerning this instrument will be found in A.P.1275A, Vol. 1, Sect. 1.

Air speed indicator

6. The air-speed indicator, Type 9H* (P) is fitted to the upper centre of the main instrument panel, while on later aircraft a Smith's Type 164/AS/PC is fitted. The 9H* (P) has a fluorescent scale calibrated from 60-600 knots and like others similar in type, its principle of operation is based on the measurement of the difference between the pressure of moving air and still air at the height at which the aircraft is flying. A more detailed explanation of this instrument will be found in A.P.1275B, Vol. 1, Sect. 1. The Smith's Type 164/AS/PC has a scale calibrated from zero to 600 knots using two pointers, one showing tens of knots and the other, hundreds.

Altimeter

7. The altimeter, Mk. 20C (P), mounted on the lower centre of the instrument panel, has a fluorescent scale graduated from -1,000 ft. to 50,000 ft. This instrument is connected to the static line of the pressure head system. The instrument is contained in a one-piece plastic case with a pipe connection on the rear face. Further information appertaining to the description, testing, and tolerances permitted, will be found in A.P.1275B, Vol. 1, Sect. 2.

Artificial horizon

8. Early aircraft are fitted with the artificial horizon Mk. 3B, while later aircraft have the Mk. 4 unit. Each is an electrically-operated gyroscopic instrument which provides a continuous indication of the aircraft's attitude in roll and pitch relative to the natural horizon. The 115 volt, 400 c.p.s., 3-phase a.c. supply is provided from an inverter (Sect. 5, Chap. 1, Group X). The instruments are fully described in A.P.1275A, Vol. 1, Sect. 2. The Mk. 4 artificial horizon has a power failure indicator incorporated in the form of a flag showing OFF through a window slot in the face of the instrument. A fast erection push-switch is provided and is located at the bottom left-hand side of the instrument face.

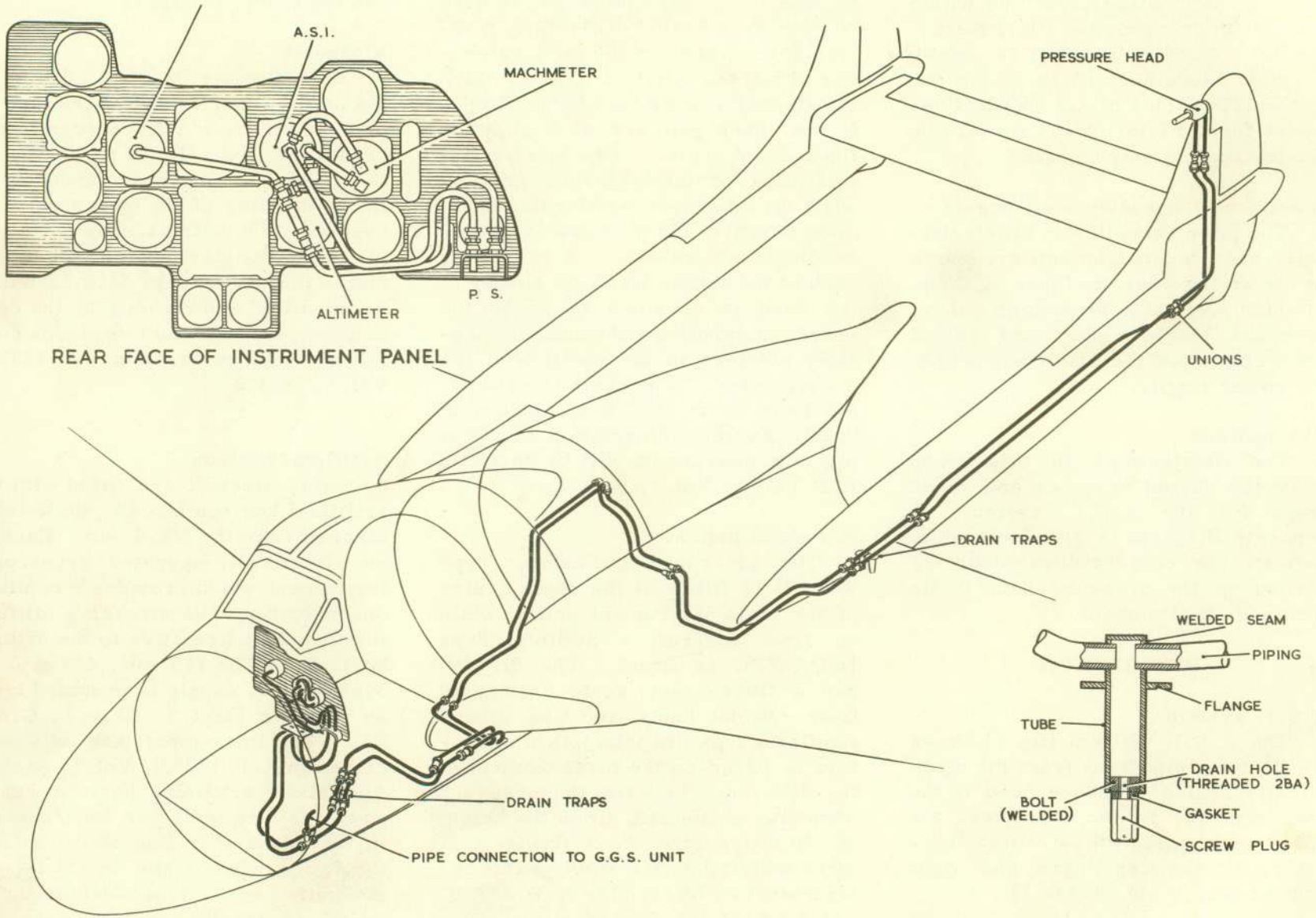

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Fig. 1 A.S.I. system

RESTRICTED

WARNING...

This switch must only be operated during straight and level flight and/or shallow climbs or dives. A false climb or dive attitude will be indicated if the switch is pressed during acceleration or deceleration in the fore and aft plane, while a false indication of straight and level flight will result if the switch is pressed during a banked turn.

Cabin altimeter

9. The cabin altimeter, Mk.18, is located on the lower right of the instrument panel and has a fluorescent scale calibrated from 10,000 to 40,000 ft. This instrument indicates approximate altitudes in order that the pilot may regulate his oxygen supply accordingly. At altitudes of approximately 9,000 ft. and under, the indicator pointer will normally be pointing downwards; but when the aircraft has reached an altitude of approximately 10,000 ft. the pointer commences to rotate in a clockwise direction, and as the height increases, will continue to rotate up to a maximum of 40,000 ft. Further information is contained in A.P.1275B, Vol. 1, Sect.2.

E2A compass

10. The E2A compass is fitted together with the deviation card holder, to the port side of the cabin. This compass is of the miniature type for use in an emergency, or as a standby for checking the accuracy of the GM4F gyro compass. The compass card is graduated every 10 degrees, thus it is necessary for intermediate values to be estimated. This is considered sufficient to enable the compass to be read within the accuracy expected from a compass of this type. The E2A compass has built-in correctors to compensate for coefficients B and C only. Further information may be obtained from A.P.1275B, Vol.1, Sect.3.

GM4F compass installation

11. The installation of the GM4F gyro-compass equipment is shown in fig.2; the interconnection of units being also shown in fig.2. The GM4F compass combines the functions of a directional gyro and magnetic compass operating from an electrical supply of 115 volts, 400 c.p.s.3-phase a.c. A full description of the equipment is given in A.P.1275B, Vol.1, Sect.3. The supplies to this installation are shown in Chap.1, Groups F and X.

Machmeter

12. The machmeter Type 1B is located on the port side of the instrument panel and gives a continuous indication of the ratio of true air speed of the aircraft to the speed of sound. The instrument is connected to the A.S.I. system illustrated in fig.1. It has a fluorescent dial calibrated from 0.5 to 1.0 and is fully compensated for changes in ambient temperature. Further information concerning the machmeter will be found in A.P. 1275B, Vol.1, Sect.1.

Pressure head

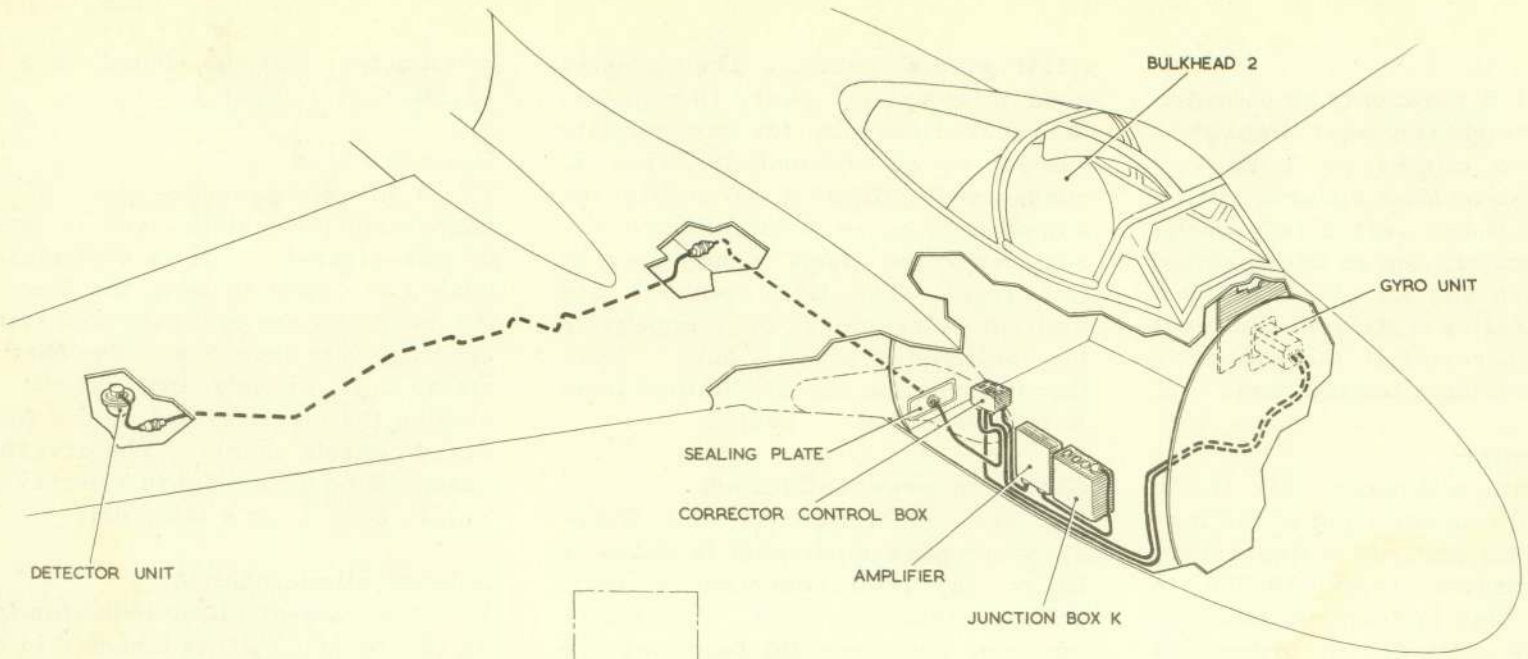
13. A Mk.8Q pressure head of the concentric pitot static type is fitted to this aircraft. It is electrically heated in order to keep the front of the head and the pressure and static openings free from ice. The heating element is brought into circuit by closing the toggle switch on the starboard console panel. The pressure head will be described in A.P.1275B, Vol.1, Sect.1, at a later date.

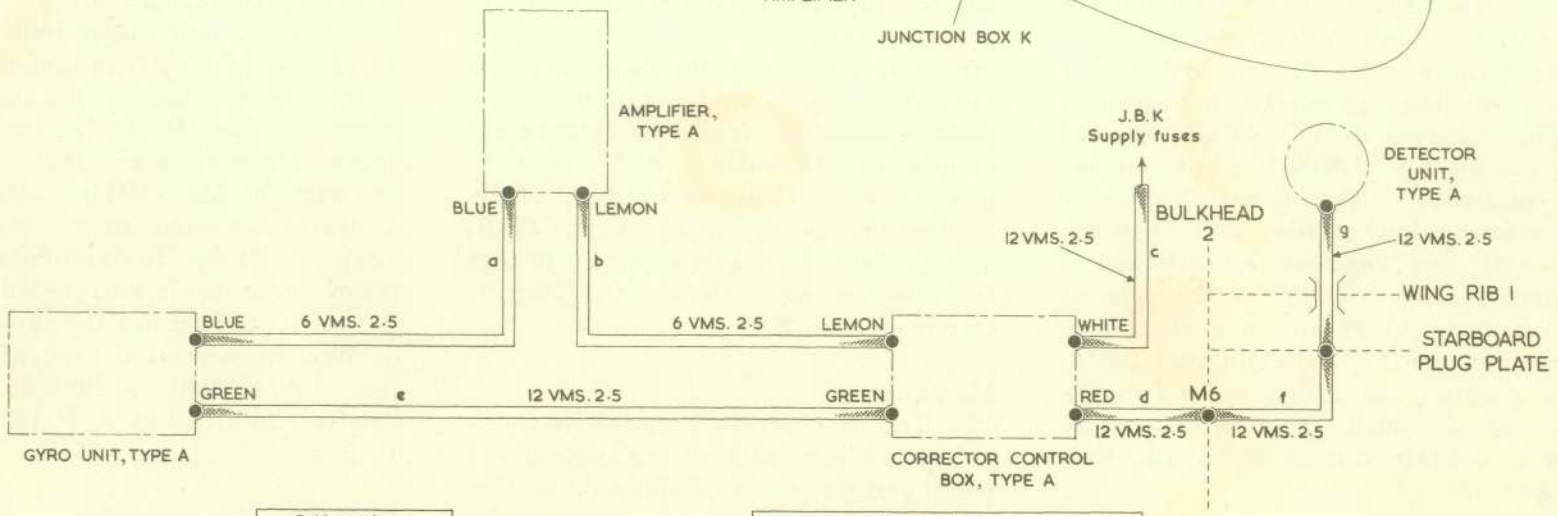
Rate-of-climb indicator

14. The rate-of-climb indicator Mk. 3A (P) or Mk.3 (P) is mounted in the centre at the top of the instrument panel. The Mk.3A (P) has a linear scale, whereas later aircraft are fitted with the Mk.3 (P) indicator having a dial graduated to a logarithmic scale. These instruments have a fluorescent scale calibrated from 0-40,000 ft. to register the rate of climb or descent when the aircraft departs from level flight. A further description is contained in A.P.1275A, Vol. 1, Sect.1.

Turn and slip indicator

15. The turn and slip indicator Mk.2 is an electrically-operated instrument and is mounted on the lower centre of the main instrument panel. Its purpose is to indicate the lateral attitude of the aircraft, in straight flight and the direction and rate of turn of the





Cables a,b,c	
Pin	Core colour
A	Red
B	Blue
C	Green
D	Yellow
E	White
F	Black

Cables d,e,f,g			
Pin	Core colour	Pin	Core colour
A	Red	G	Brown
B	Blue	H	Mauve
C	Dark green	J	Orange
D	Yellow	K	Pink
E	White	L	Light green
F	Black	M	Natural

Fig.2. GM4F compass installation and wiring

aircraft about the vertical axis. The instrument also indicates to the pilot any tendency of the aircraft to side-slip or skid, i.e. perform other than a correctly banked turn. A flag-type power failure indicator is fitted and is visible through an aperture in the dial. The flag gives no indication that the power is on, but the word OFF appears when the speed of the gyro wheel is such that accurate turn indications are no longer provided. Further information will be found in A.P.1275A, Vol.1, Sect.2.

SERVICING

General

16. The servicing procedure for the various instruments is contained in the relevant Air Publications mentioned throughout the text. The instruments should be periodically inspected for signs of damage or deterioration and where necessary the appropriate remedial action must be carried out. Generally the in-situ servicing of instruments is confined to the following:-

(1) All electrical connections to instruments must be clean and secure. The insulated covering and screening of the supply cable must not be damaged or frayed.

(2) The glass face must be clean and free from cracks; if it is necessary to remove the damaged glass, it must only be carried out by an authorized person.

(3) Fluorescent markings must not be chipped or discoloured.

(4) Leakage tests of the A.S.I. system should be carried out in accordance with the instructions contained in A.P.1275B, Vol.2, Part 1.

Note...

Before servicing electrically-operated instruments, the aircraft must be rendered electrically safe as described in Sect.5, Chap.1 under the heading General Information.

Accelerometer

17. The accelerometer is of robust construction and requires little servicing under normal conditions. The instrument must not be dismantled for cleaning or other adjustment as this will necessitate re-calibration for which special test equipment will be required. Unless this equipment is available, the instrument must be returned to stores for replacement. Full testing and re-calibrating procedures are contained in the relevant Air Publication mentioned previously in the text.

Air speed indicator

18. Apart from general inspection of the air speed indicator, particular attention must be paid to the glass being sound, and the fixing and locking devices being secure. No leakage must take place. Minor servicing cannot be carried out in the aircraft and such being the case, a defective air speed indicator must be removed and a serviceable one fitted in its place.

Altimeter

19. The altimeter should be checked periodically for accuracy and it should be noted that usually, if an instrument needs adjusting by more than ± 50 ft., it has sustained some damage. In such circumstances therefore, a check should be made on its accuracy. The instrument must not be opened; a faulty altimeter must be returned to the appropriate Maintenance Unit.

Artificial horizon

20. No repairs can be carried out on a defective artificial horizon. The instrument must be replaced by a serviceable one and the old one returned to the appropriate Repair Depot. The in-situ servicing of this instrument is confined to the general instructions laid down in para. 16. The standard serviceability test for the Mk.4 unit is given in the Appendix 1 of A.P.1275A, Vol.1, Sect.2.

Cabin altimeter

21. No routine servicing is required on this altimeter, but the calibration should be checked if at any time the serviceability of the instrument is suspect. Sudden or violent changes of pressure should not be applied.

Standard serviceability tests are laid down in the relevant Air Publication.

E2A compass

22. Little servicing can be carried out on this instrument apart from checking its general condition and rigidity of mounting. A faulty unit must be replaced immediately.

GM4F compass installation

23. Servicing instructions for the equipment comprising this installation are contained in A.P.1275B, Vol.1, Sect.3.

Machmeter

24. The tests to be applied to this instrument and the tolerance permitted are given in Appendix 1 of A.P. 1275B, Vol.1, Sect.1.

Pressure head

25. The electrical tests for the pressure head are laid down in Chapter 1 of this section. The pressure head should be inspected periodically and all dirt removed. Foreign matter in the static slots, drain holes and pressure holes must be removed with a soft brush. All cables and connections must be sound and all fixing and locking devices must be secure. If after the above servicing, a pressure head is still defective, it must be removed and a serviceable one fitted. On the Mk.8Q pressure head, the two screws retaining the cable gland are not to be adjusted. Whenever the aircraft is parked, the pressure head must be protected against dampness and the effects of the weather.

Rate-of-climb indicator

26. Prior to installation, at the routine servicing periods, or at any other time when the serviceability of the instrument is suspect, it must be subjected to the tests specified for the Mk.1C (P) rate of climb indicator given in Appendix 1 to Chapter 8 of A.P.1275A, Vol.1, Sect.1.

Turn and slip indicator

27. Whenever the serviceability of the instrument is suspect, it must be subjected to the tests specified in the Standard serviceability Test in Appendix 1 to Chapter 8 of A.P.1275A, Vol.1, Sect.2. No other servicing of the instrument is either necessary or permissible between reconditioning periods.

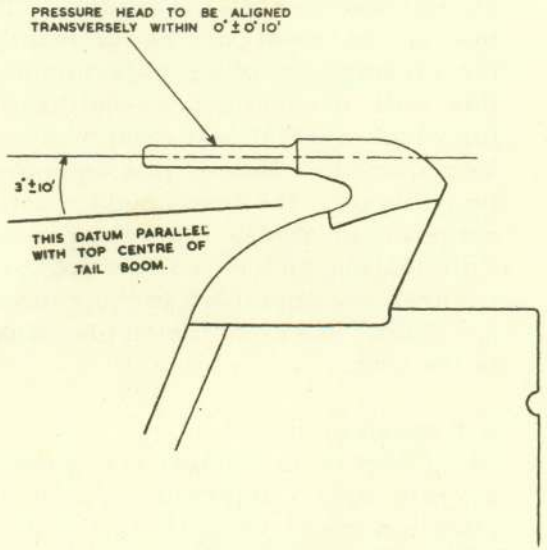


Fig. 2. Pressure head alignment