Chapter 1
GENERAL INFORMATION AND PITOT–STATIC SYSTEM

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

Introduction

1. This section contains descriptive and servicing information for the complete aircraft instrument installations. Eleven Chapters, including this chapter, are contained within the section. Illustrations showing the location and layout of the various instrument services are included, together with routing charts for the circuits of electrically operated instruments. The routing charts will be found at the end of each chapter.

2. Electrically operated instruments bearing the same circuit code letter will generally be found under the same chapter heading.

3. Only a brief outline of the power supplies for electrically driven instruments is provided. For more detailed information reference should be made to Sect.6. Instruments forming part of the radio, radar and E.W. installations are dealt with in Sect.8, 9 and 10 of this publication.

4. This chapter provides information of a general nature, and in addition gives information on the pitot-static system and the removal of instrument panels. The location of all instrument panels and main services is shown in fig.1. Fig.2 shows a layout of the pitot-static system. All the instruments and equipment connected to the pitot-static system are illustrated in fig.3.

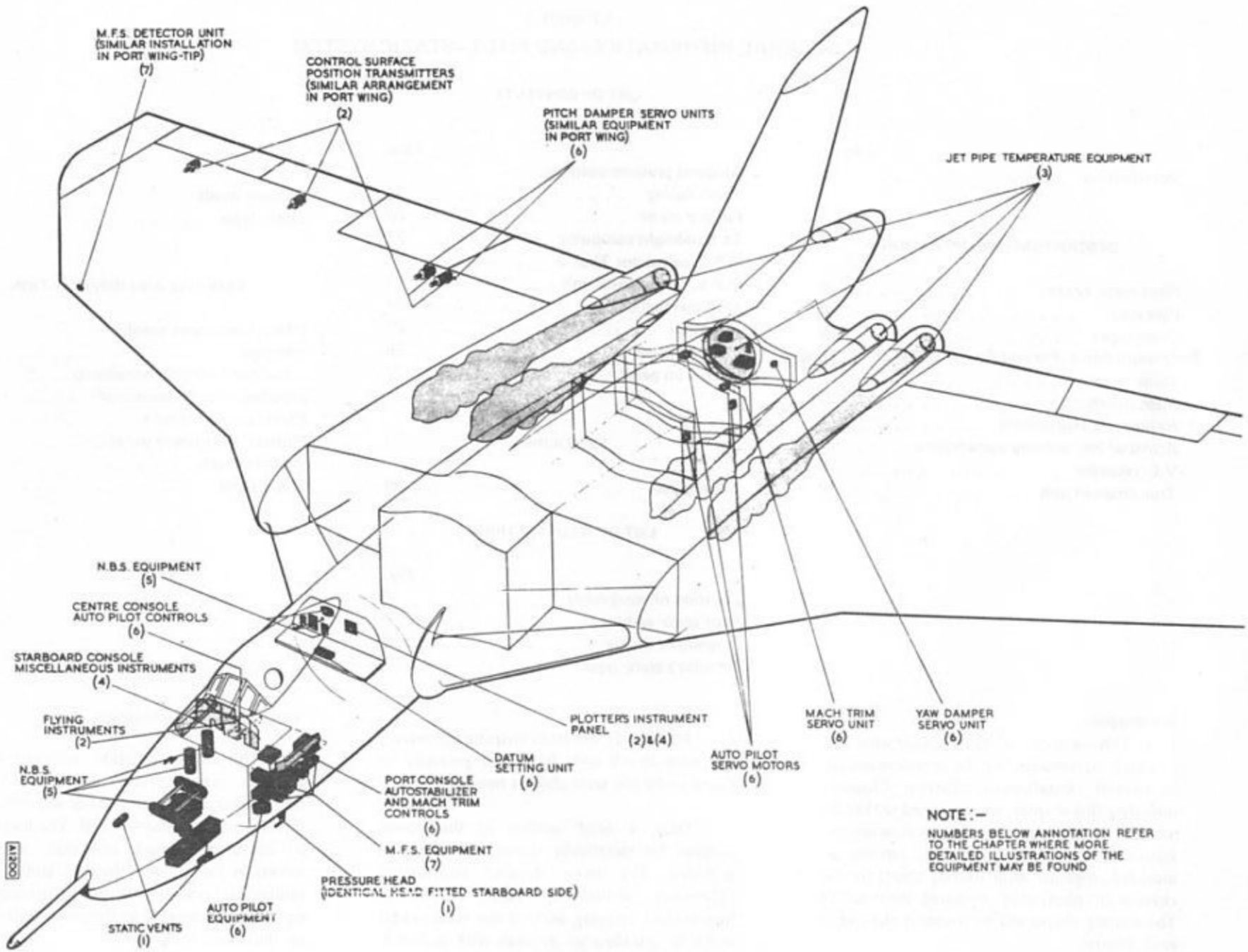

Fig. 1 Location of equipment.

DESCRIPTION AND OPERATION

PITOT-STATIC SYSTEM

5. The pitot-static installation embraces two independent systems, one port and one starboard. Light-alloy tubing is used for both the pressure and static pipe lines, with unions connecting the various pipe lengths together. Where pipes branch off for connection to components, 'T' pieces and cross pieces are fitted.

6. At convenient intervals, each pipeline in both systems is identified by labels as being either pressure or static and at numerous points throughout the system, drains are fitted to trap and remove moisture from the pipelines. Connection to the various instrument is made by short lengths of Maricon tubing, Type H, secured at each end by Type AGS 606E clips. A description of the flying instruments connected to the system will be found in Chapter 2 of this section; all the instrument services are dealt with in their respective chapters to which reference is made in the following paragraphs.

PIPE RUNS

7. Mounted in the upper nose structure at former 456 are two static vents, one each side of the fuselage. Two pipes running across the nose connect the apertures of each plate and from these pipes 'T' joints are made which connect to the port and starboard static lines. From the static vents the pipes run aft until they join the pressure lines at former 358 where the pressure heads are mounted. The two systems then pass under the pilots' floor where 'T' connections are made for supplies to the pilots' panels.

8. Both systems then continue aft until they reach former 344 where the starboard system connects to the N.B.S. calculator Type 3, the M.F.S. manometric unit and the bombsight computor. The pipe runs then continue to the crews' floor where, at former 260, the starboard system supplies the monitor panel. Also under the crews' floor at former 218 the starboard system supplies the navigator's panel and the mach trim panel. Supplies are also taken at this point from the port system to the monitor and mach trim panels.

9. From the cabin both systems continue aft until they reach the air intakes. At this point the starboard system supplies the A.M.U. and both systems pass through their respective intakes to the front spar. At the front spar the starboard system connects to the bomb fuze switch and the ground test valve. Both systems then run along the bomb bay where at bomb arch 95.967 the fatigue meter airspeed switch is fed by the starboard system. Further along the bomb bay at bomb arch 123.015 the starboard system supplies the V.G. recorder. Both systems then pass to the aft end of the bomb bay where the port system crosses to the artificial feel warning switches and the starboard system feeds the three artificial feel units.

DRAIN PIPES

10. To prevent the accumulation of water in the installation drain pipes are fitted at 20 points throughout the installation, 8 in the port system and 12 in the starboard. These sealed pipes can be easily uncoupled to allow any trapped moisture to drain from the system. The location of all drain pipes in the installation is given in fig.3.

PRESSURE HEADS

▶ (Pre and Post Mod 2442) ◀

11. Two Rosemount electrically heated ▶ pressure heads, B.Ae. Part No. 16/Z9723 (Part No. 23/Z9723 Post Mod.2442) are fitted, one ◀ each side of the fuselage undersurface at former 358. Each pressure head is mounted into a mast assembly which projects from the fuselage and holds the pressure head parallel with centre line of the aircraft. A short length of Maricon tubing connects each head to its respective pressure pipeline. Each pressure head is provided with a filament heater controlled by a switch on the pilots' panel. Details of the heating circuit will be found in Sect.6, Chap.13. A description of the pressure head will be found in A.P.112G-0102-1.

▶ 11A. With Mod.2442 incorporated, Rosemount pitot heads Type 23/Z9723 are fitted in lieu of Rosemount pitot heads Type 16/Z9723 to reduce risk of heater failure in still air conditions. ◀

STATIC VENTS

12. Two static vents are fitted in the aircraft, one each side of the fuselage at former 456. Each vent plate has two apertures with pipe runs connecting the port and starboard apertures to make two balanced static supplies as shown in fig.2. The starboard system supply pipe runs from the starboard upper aperture to the port bottom aperture. The port system supply pipe runs from the starboard bottom aperture to the port upper aperture.

INSTRUMENTS

13. The instruments mounted on the first pilot's panel are supplied from the port system and are connected as follows:-

Pressure - A.S.I. and machmeter

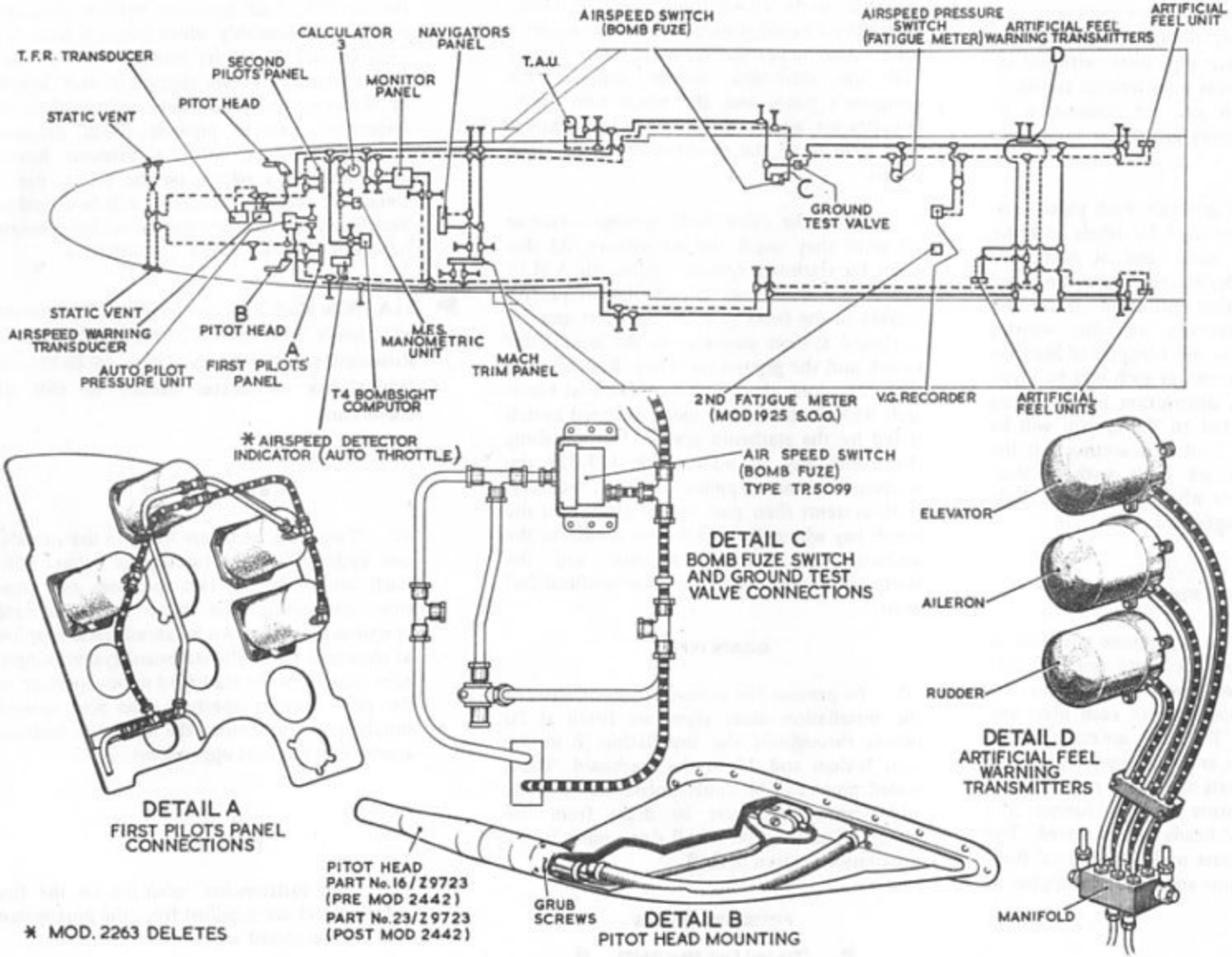

Fig. 2 Pitot-static system

▶ Mod 2442 ◀

Static - A.S.I. machmeter, altimeter and rate of climb indicator.

A duplicate set of these instruments is installed on the second pilot's panel, which is supplied by the starboard system. Short lengths of flexible Maricon tubing connect the supply pipes to the panels which are provided with anti-vibration mountings.

NAVIGATOR'S INSTRUMENTS

14. An airspeed indicator and an altimeter are mounted on the plotter's instrument panel at the navigation station. The panel is anti-vibration mounted and connected to the starboard system by Maricon tubing.

ARTIFICIAL FEEL WARNING TRANSMITTERS

15. Three of these units are mounted at former 225 on the starboard side of the bomb bay. The three units are supplied from a distribution block which is connected to the port pitot-static lines. Maricon tubing is used for connecting the units, and drain pipes are provided at the distribution block. The transmitters are used in connection with the artificial feel failure warning system further details of which will be found in Sect.6, Chap.10.

V.G. RECORDER

16. The V.G. recorder is fitted on the aft face of the starboard side of bomb arch 123 in the bomb bay. A pressure and static supply is fed from the starboard system and controlled by a 4-way cock mounted alongside the recorder. The recorder can be isolated from the supply by turning the cock to 'OFF'. Further information on the V.G. recorder is given in Chap.4.

TRUE AIRSPEED UNIT

17. The True Airspeed unit (T.A.U.), Ref.No. 6B/3013, is mounted below the starboard air intake. Further details may be found in Chap.5 of this section.

AIRSPEED PRESSURE SWITCHES

Bomb fuzing

18. The airspeed pressure switch, Type TP.5099, associated with the bomb fuzing is mounted at the starboard side of the bomb bay aft of the front spar.

19. The switch is connected to the starboard pitot-static system as shown in fig.2 and forms part of the bomb fuzing and release circuit described in Sect.6. Further details will also be found in Chap.5 of this section.

Fatigue meter

20. The airspeed pressure switch, Ref.No. 6A/8165, associated with the fatigue meter is mounted in the bomb bay adjacent to bomb arch 95.967, and is connected to the starboard system. Further details of the fatigue meter will be found in Chap.4 of this section.

T4 BOMBSIGHT COMPUTOR

21. This computor which operates in conjunction with the T4 bombsight is connected to the starboard system and is located beneath the first pilots' floor. Further information on the T4 bombsight will be found in Chap.5. Post Mod.2256, the computor is removed.

N.B.S. CALCULATOR TYPE 3

22. This calculator is located beneath the second pilot's floor between formers 316 in. and 330 in. and is connected to the static side of the starboard system. Further details of the calculator will be found in Chap.5.

M.F.S. MANOMETRIC UNIT

23. The M.F.S. manometric unit is part of the Smith's Military Flight System and is located under the first pilot's floor. The unit is connected to the static side of the starboard system. Further details will be found in Chap.7.

ARTIFICIAL FEEL UNITS

24. Three artificial feel units are situated at the aft end of the bomb bay and fed from the starboard system via flexible tubing. The units are linked to the flying control rods and their action is controlled by actuators operating in conjunction with transmitter units which are sensitive to airspeed. Further information on the artificial feel units will be found in Sect.6, Chap.10.

AUTOPILOT

25. The Mk.10A or 10B autopilot installed under the pilot's floor between formers 358 and 372 is supplied with pressure and static from the port system. The Mk.10A and 10B autopilots are described in Chap.6 and Chap.9 respectively.

MONITOR PANEL

26. This panel which forms part of the auto-stabilization system is installed under the aft end of the crews' floor on the starboard side between formers 232 in. and 268 in. A pressure and static supply is fed to the panel from both the port and starboard pitot-static

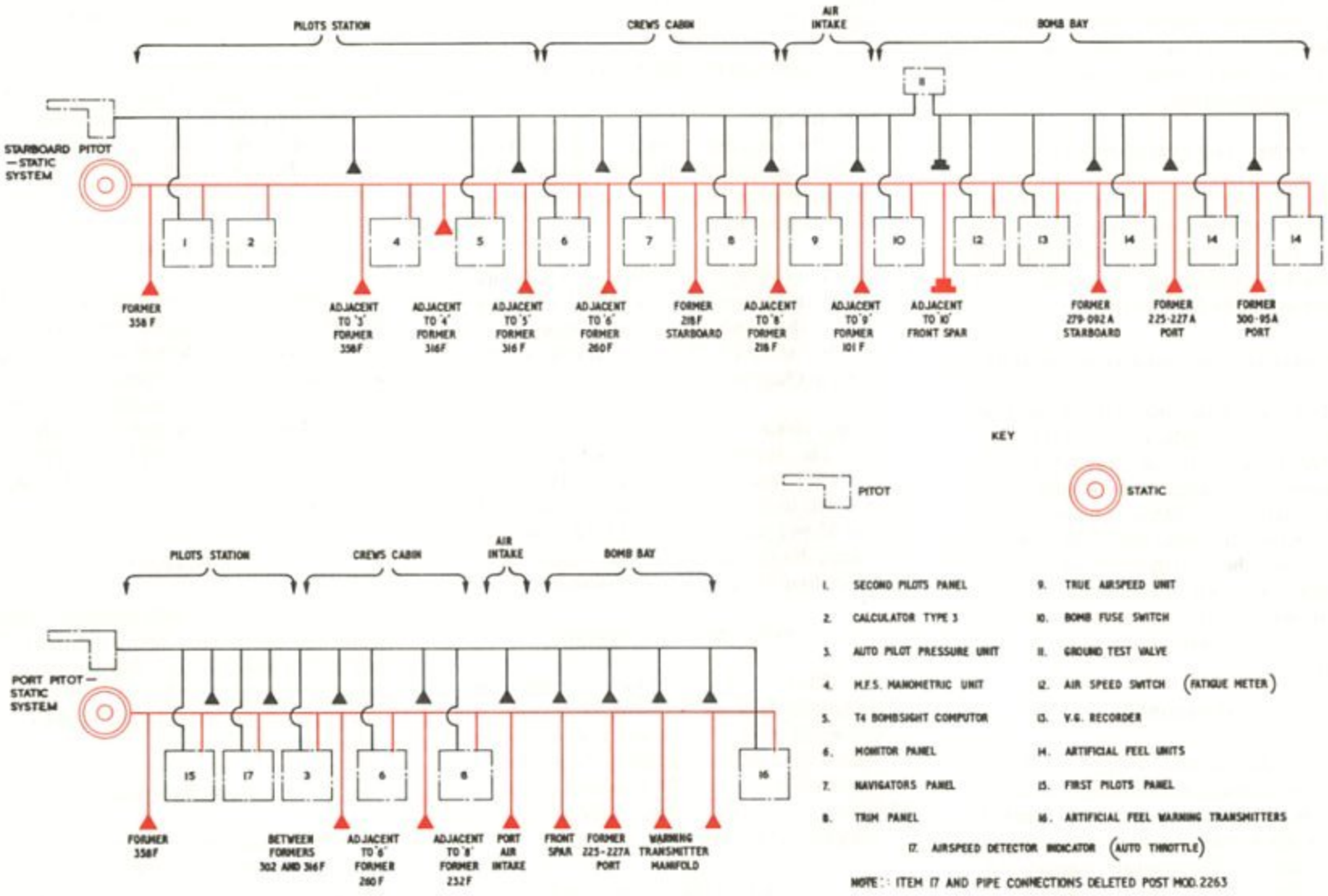

Fig.3 Diagram of drains

systems. Further details of the auto-stabilisation system will be found in Chap.6 of this section.

MACH TRIM PANEL

27. The mach trim panel is installed under the aft end of the crews' floor on the port side between formers 218 in. and 232 in. and forms part of the auto-stabilization system. Pressure and static supplies from both pitot-static systems are fed to the panel. The auto-stabilization system is described in Chap.6 of this section.

SERVICING

28. Whenever the installation is suspect, or any part of the system has been disturbed, the leak tests laid down in A.P.1275A, Vol.2, Leaflet A9 should be carried out. During adverse weather conditions it may be necessary to dry out the system in accordance with the instructions given in A.P.1275A, Vol.2, Part 1, Leaflet A10.

DRAIN PIPES

29. At the intervals stated in the servicing schedule, or whenever it is suspected that moisture has accumulated in the system the drain pipes and plugs should be removed and the system allowed to drain. All drains throughout the system are readily accessible, many being located adjacent to the equipment supplied.

PRESSURE HEADS

30. The pressure heads should be examined to ensure that the pitot orifices are free from obstruction. It is important that no sharp metal tool be used in clearing the orifices since enlargement or burring of these will render the pressure heads unserviceable.

31. Functional testing of each pressure head should be carried out by switching on the appropriate control switch on the pilot's starboard console and checking that the pressure head begins to warm up. The head should be switched off immediately it becomes too hot to hold with the naked hand otherwise the element may be damaged through overheating in still air.

32. When the aircraft is not required for flight, protective covers should be placed over the pressure heads. Full servicing instructions for the pressure heads, B.Ae. Part No. 16/Z9723 (Part No.23/Z9723, Post Mod.2442) will be found in A.P.112G-0102-1.

STATIC VENTS

33. The apertures should be examined for freedom from obstruction and the plates checked for security of attachment. When the aircraft is grounded the vents should be blanked off by means of the rubber plugs which are part of the aircraft equipment.

34. It is essential that extreme care and attention be exercised when disconnecting the instruments or removing their associated panels. Gyroscopic instruments are particularly sensitive and easily rendered unserviceable by jarring. Removal instructions for individual instruments are given under the chapter heading where the instrument is described.

REMOVAL AND INSTALLATION

PILOTS' INSTRUMENT PANELS

Removal

35. The pilots' centre panel is secured at each side by two brackets from each of the 1st and 2nd pilots' flight instrument panels. The four fastening studs must first be unscrewed to release the centre panel before the other two panels can be removed.

36. When the centre panel is released, the two flight instrument panels can be detached from the anti-vibration mountings by unscrewing the three fastening studs in each case.

NOTE . . .
To prevent possibility of fracture, chafing and misalignment of pitot-static tubing behind the two flight instrument panels, both pitot and static connections should be disconnected and blanked off before the instrument panels are removed.

2nd pilot's flight instruments

37. Should difficulty be experienced in the removal of any of the instruments on the 2nd pilot's flight instrument panel, the following procedure is recommended:-

(1) Remove the nut and bolt securing the 2nd pilot's rudder pedal adjustment knob (the nut and bolt are located immediately behind the knob).

(2) Remove the adjustment knob from its tube.

(3) At the support brackets behind the instrument panel, disconnect the two pitot-static pipes clipped to the flexible rubber tubing. (These operations will allow the panel to be released without obstruction).

(4) Remove the two bolts securing the centre instrument panel and swivel the panel downwards to its full extent. At this stage it is important that a suitable strain cord be used to take the weight of the panel.

(5) Remove the attachment bolts from the 2nd pilot's panel and withdraw the panel to a convenient position, ensuring that no undue strain is placed on the cables and connectors. The instruments should now be accessible for disconnection and removal.

Installation or reconnection

38. When the flight instrument panels are being installed or reconnections are being made on the panels, ensure that the pitot-static connections are made as follows:-

(1) 1st pilot's panel

Pitot connection – straight 3 in. long pipe
Static connection – curved 5 in. long pipe (see fig.4)

(2) 2nd pilot's panel

Pitot connection – straight 3 in. long pipe
Static connection – straight 2.5 in. long pipe

(3) Ensure that Maricon tubing is secured by the correct clips (28E/1222181)

(4) Ensure that Hellerman strapping lightly secures the pitot-static Maricon tubing to the transverse member on each side of the control column to prevent sagging.

NOTE . . . .

(1) Cases have occurred where incorrect positioning of bonding clips has restricted elevator rod movement forward of the instrument panels. To prevent this, carry out operations (5) to (7) and read in conjunction with Sect.3, Chap.4, fig.3.

▶ *(2) Cases have occurred of fouling of the aileron control lever by cables behind the 2nd pilot's instrument panel. To prevent this, carry out operations (8) to (10).* ◀

(5) Locate the rudder transverse control rod, Part No. 1/R4359 connecting 1st and 2nd pilots' controls, also interconnecting links. Part No. 1/R4434, between control columns and elevator controls.

(6) Examine the bolts securing

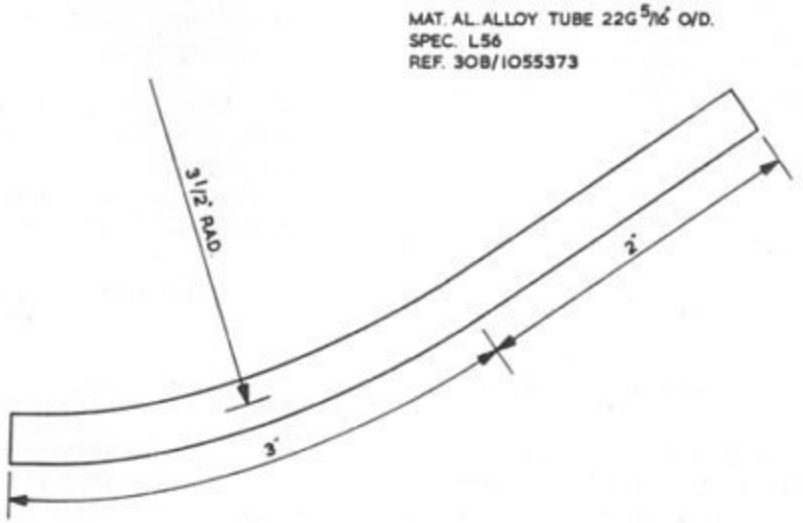

Fig.4. First pilot's static pipe

bonding clips fitted to items in (5) and ensure that bolts are fitted at T.D.C. and B.D.C. respectively Reposition where required.

(7) Ensure that fouling between bonding clips does not occur when control columns are moved in the elevator sense.

▶ (8) Ensure that the cable looms to the annunciator and the total fuel flow meter are secured to a saddle clip fitted around the 2nd pilot's director horizon. These cables, together with those to the beam compass must also be held with a 'P' clip attached under head of bolt securing top of housing Part No. 4R-3574.

(9) Ensure the redundant plugs and cables to both the 1st and 2nd pilots' director horizons are secured to cable looms with Hellerman strapping and the looms strapped at 1.5 in. intervals.

(10) Carry out a physical check behind the 1st and 2nd pilots' instrument panels throughout full aileron, elevator and rudder control movement, and ensure no cable fouling occurs.

(11) On completion, carry out full pitot-static leak checks and SNCO's independents. ◀

Flying control checks

39. When airframe tradesmen are servicing the flying controls and checking control movement, the following procedure is recommended as a precaution against fouling and chafing at the two flight instrument panels.

(1) Move the panel to its limits about the anti-vibration mountings to ensure there is no fouling between pipes or electrical cables and the structure.

(2) Ensure no load is placed on any connection or unit under full deflection of the panel.

(3) Ensure there are no signs of chafing on any instrument case, pipe or electrical cable.

PLOTTER'S INSTRUMENT PANEL

40. The plotter's instrument panel is fixed to the plotter's main panel by four brackets on resilient mountings. Access to the back of the instrument panel is gained when the main panel is unscrewed at the top and lowered. When the necessary instrument services have been disconnected the instrument panel can then be unbolted from the resilient mountings and removed.

PRESSURE HEADS

41. When it is necessary to remove a pressure head, the recommended procedure is as follows:-

(1) Remove the sixteen screws securing the pitot head mast to the fuselage.

(2) Gently lower the mast and pressure head until the pitot pipe coupling and heater cable terminal block are accessible.

(3) After disconnecting the heater cables and uncoupling the flexible tubing from the pipe coupling, it will then be possible to remove the mast and pitot head from the aircraft.

(4) To remove the pressure head from the mast eight grub screws should be removed. The grub screws are located as shown in fig.2.

42. The foregoing procedure is reversed when fitting a pressure head to the aircraft, ensuring that:-

(1) When fitting the pressure head to the mast:-

(a) The drain hole is on the underside, when fitted to the aircraft.

(b) The eight grub screws securing the pressure head are coated with 'Loctite' prior to insertion.

(2) When fitting the mast to the fuselage:-

(a) All traces of sealant is removed from the mounting flange and the flange coated with 'Thiokol' - PR1431 to ensure protection against ingress of moisture. In accordance with S.T.I.293.

(b) The mounting flange countersunk holes are scraped clear of paint or sealant immediately prior to refitting screws to ensure that the mast is earthed.

NOTE . . .
If the Maricon tubing in the pressure head is to be replaced ensure that the replacement tubing is 9.75 in. in length to avoid the possibility of kinking when re-fitting the pressure head to the aircraft.

STATIC VENTS

43. Removal of the vent plates is straightforward and no special instructions are required.