Part I—Description and Management of Systems

Chapter 20—Flight and Engine Instruments

List of Contents

Flight Instruments

1 Pitot-static system

(*a*) *Pressure heads*

Two electrically-heated pressure heads are fitted, one to each wing tip, and supply the following services:

Port pressure head:

1st Pilot's instruments
Auto-mach trimmer
Artificial feel phase units

Starboard pressure head:

Co-pilot's instruments
Nav/plotters' instruments
Yaw damper monitor
Bomb fusing pressure switches
Fatigue meter
VG recorder
Artificial feel units

Auto-height switch (Pitch dampers and auto-mach trimmer) Static only
Auto-height unit. (Mach trimmer). Static only
T4 bombsight computor. Pressure only

(*b*) *Static vents*

Static vents are fitted on each side of the aircraft nose. Both vents feed a common line to supply:

NBS calculators
Auto-pilot
AMU
Zero-reader
T4 bomb sight computor

(*c*) *Controls and indicators*

The heating elements of the pressure heads are switched on by the two PRESSURE HEAD HEATERS switches (E33) (E34) on the starboard console. Two PITOT HEATER magnetic indicators (A21) at the top of the engine instruments panel show black when the pressure head heaters are switched on.

(*d*) Covers are provided for the pressure heads and plugs for the static vents.

2 Pressure-operated instruments

NOTE: It is essential that frequent comparisons are made of the readings of the 1st pilot's and the co-pilot's, or the 1st pilot's and navigator's machmeters, airspeed indicators and altimeters (where appropriate). In particular, *attention must be given to these comparisons when flying at high indicated mach numbers, low indicated airspeeds and low altitudes.*

(*a*) *Airspeed indicators*

Three airspeed indicators are fitted, one on each instrument flying panel and one on the nav/plotter's panel. The 1st pilot's ASI (A9) is of the two needle type; the co-pilot's instrument is fitted with an indicator flag which shows U/C when the undercarriage is not fully locked down at airspeeds below 160 knots. When Mod. 1377 is embodied, the co-pilot's ASI is replaced by a two-needle type similar to the 1st pilot's ASI.

(*b*) *Altimeters*

Three sensitive-type altimeters, calibrated 0-60,000 feet are fitted one on each instrument flying panel and one on the nav/plotter's panel. The altimeters have a low altitude warning sector fitted, which appears at altitudes of 16,000 feet and below.

(*c*) *Machmeters*

A machmeter Mk. 3A (A13) and (A31) designed to operate over a range of 0·7 to 1·3M is fitted to each pilot's instrument flying panel.

(*d*) VSI's

Each pilot has a VSI on the right-hand side of his instrument panel.

(*e*) *Air mileage unit*

The air mileage unit Mk. 4B is fitted below the starboard engine air intake. The AMU is operated from a control panel at the nav/plotter's station and is used in conjunction with the NBS.

(*f*) VG *recorder*

A VG recorder is fitted in the bomb bay and connected to the starboard pitot-static system. The instrument automatically records the accelerations imposed on the aircraft simultaneously with indicated airspeed. The recorder is connected to the pitot-static system by a 4-way cock mounted alongside the recorder. When the cock is turned to OFF the recorder is isolated and the pitot and static connections are closed.

(*g*) *Fatigue meter*

A fatigue meter is fitted in the bomb bay and is connected to the starboard pitot-static system. The instrument measures and records during flight the number and degree of vertical accelerations to which the aircraft has been subjected. An airspeed switch, which operates at 130-150 knots, approximately, ensures that the fatigue meter only operates during flight.

3 Electrically-operated instruments

(*a*) *Turn-and-slip indicators*

(i) Two turn-and-slip indicators operated from the 28-volt DC supply, and incorporating OFF flag indicators are fitted, one on each instrument flying panel. The flag indicates OFF when no power is available.

(ii) In the event of a power failure, an alternative electrical supply for the 1st pilot's indicator from the 24-volt emergency batteries under the port console, can be brought into use by operating the switch (B5), marked TURN and SLIP, on the 1st pilot's instrument flying panel.

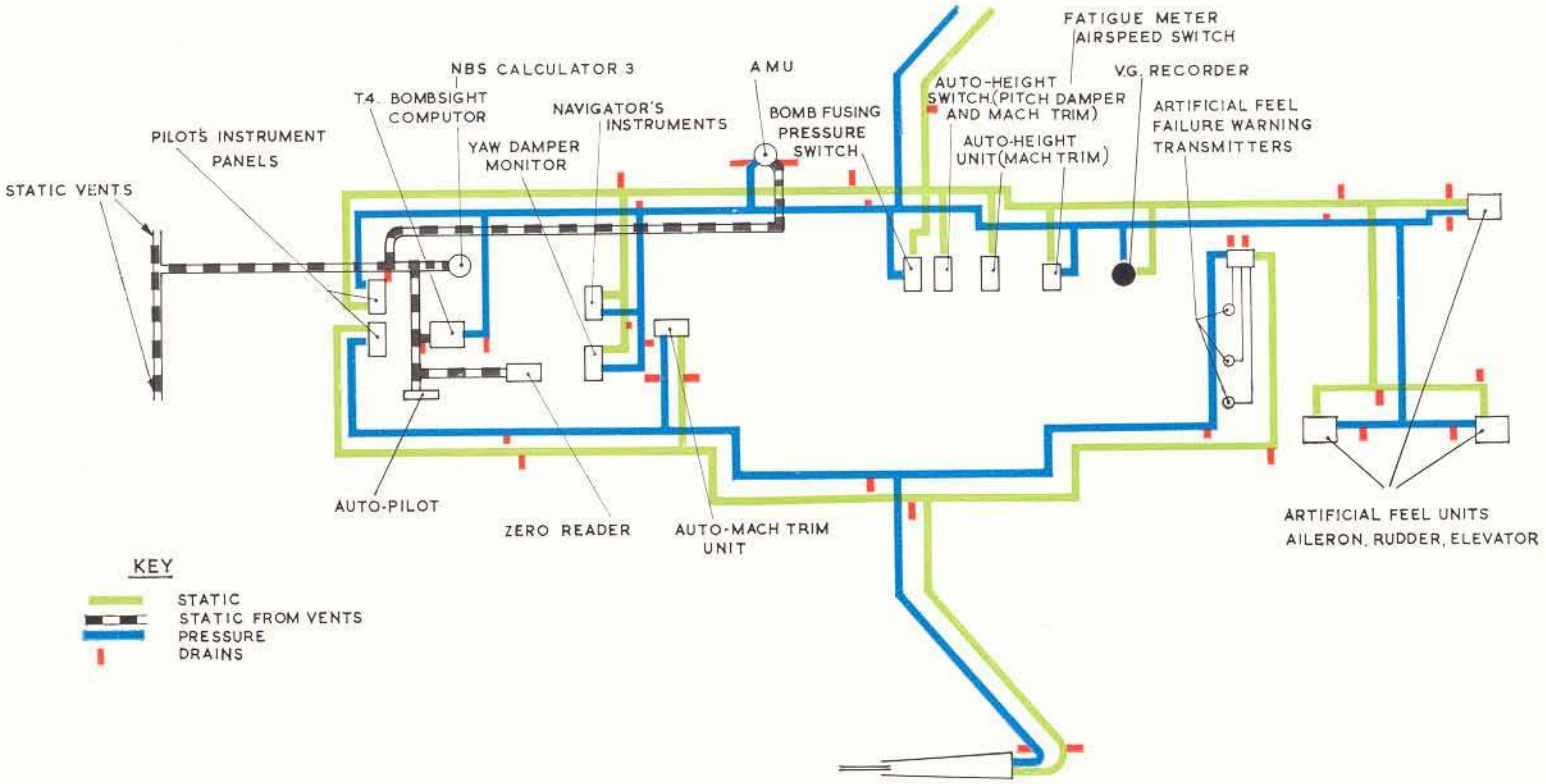

Fig 1 Pitot-Static System

(*b*) *Horizon indicating instruments*

(i) A Mk. 4 artificial horizon and a gyro horizon Mk. 4 operated from the 115-volt AC supply from the No. 3 inverter, are fitted on the 1st and co-pilot's instrument flying panels, respectively. Each instrument incorporates a fast erection button and an OFF flag. Alternative supplies are available from the No. 2 inverter (see Chapter 7, para. 6 of this Part). The fast erection button must be checked out and free to turn before flight.

(ii) When electrical supply is lacking the OFF flag on the instrument will be visible.

4 Miscellaneous instruments

(*a*) *Accelerometer*

An accelerometer (A18) is mounted on the engine instruments panel. This instrument indicates all accelerations imposed on the aircraft in the pitching plane by means of three concentrically mounted pointers; one pointer indicates instantaneous G and the other two register the maximum positive and the maximum negative G readings until reset by the resetting knob.

(*b*) *Outside air temperature gauge*

An outside air temperature gauge is fitted on the nav/plotter's panel.

Engine Instruments

5 JPT gauges

The JPT gauges (B13) are on the engine instruments panel. They are operated by 115-volt, 400 CPS single-phase AC from No. 1 and 3 inverters. (Outboard engines No. 1 ; inboard engines No. 3).

6 RPM indicators

The RPM indicators (B16) are on the engine instruments panel. They are of the percentage type. The main scale is calibrated in tens from 0-100%, and a smaller scale gives readings from 0-10%. They are operated from a self-contained circuit supplied by a tachometer generator on the associated engine.

7 Oil pressure gauges

The oil pressure gauges (B18) are on the engine instruments panel. They are operated by 115-volt, 400 CPS single-phase AC from No. 3 inverter.

8 Oil temperature gauges (Mod. 1996)

(*a*) To provide warning of a No. 5 bearing failure, four oil temperature gauges are fitted on the AEO's table ; each gauge is calibrated from 80°C to 180°C. A white marker line is provided on the panel, in the twelve o'clock position, above each gauge. The power supply for the gauges is 28 volt DC.

(*b*) On the ground, after the initial installation of the gauges, and periodically thereafter, the engines are run at 75% RPM for 20 minutes and the resulting oil temperatures are recorded in the F700. At the same time, the individual gauges are rotated and secured in the panel so that the temperatures are aligned with the markers.

(*c*) During all flights, the oil temperatures must be recorded every ten minutes, commencing ten minutes after take-off. (See Part III, Chap. 2, para. 3A).