PART I

DESCRIPTIVE

NOTE.—Throughout this publication the following conventions apply:—

(a) Words in capital letters indicate the actual markings on the controls concerned.

(b) The numbers quoted in brackets after items in the text refer to the illustrations in Part VI.

(c) Unless otherwise stated, all airspeeds and mach numbers quoted are 'indicated'.

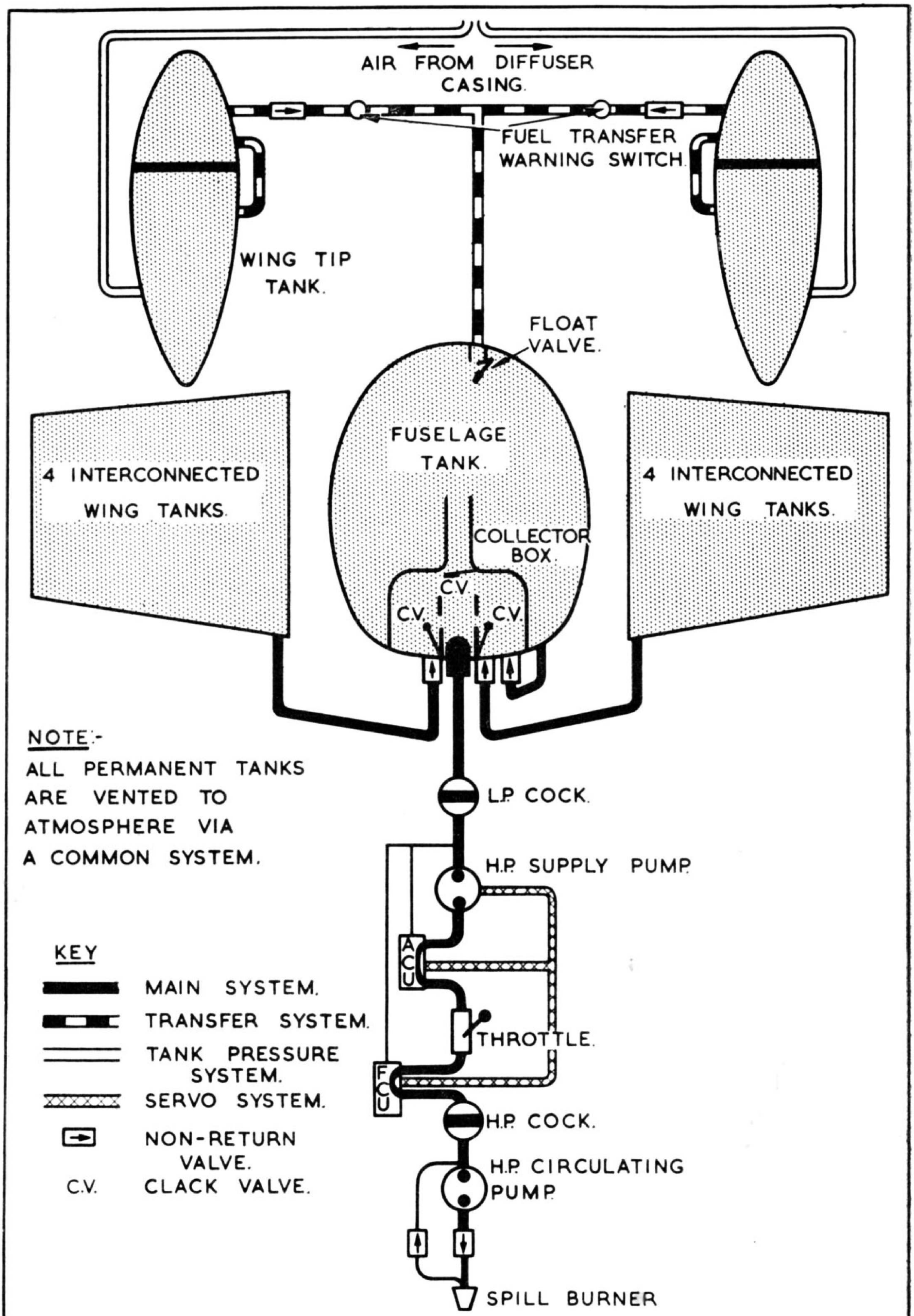
1. **Introduction**

The Venom N.F.3 is a two-seater night fighter powered by a Ghost Mk. 104 turbo-jet engine, developing 4,950 lb. static thrust at sea level. It is basically the same as the Venom N.F.2, but is equipped with A.P.S.57 search equipment, and has power-operated ailerons. The cockpit is pressurized, and four 20 mm. guns are mounted, two on each side of the nose.

FUEL AND OIL SYSTEMS

2. **Fuel tanks**

(i) Nine internal fuel tanks are fitted, one in the fuselage and four in each wing. A drop tank can be attached to each wing tip. Provision is made for fitting pylon tanks.



FUEL SYSTEM DIAGRAM

The tank capacities are as follows:—

	Gall.	lb. AVTAG
Fuselage tank	90	692
Two wing root tanks (2 × 59) ...	118	908
Six wing tanks	134	1,030
Total internal capacity ...	342	2,630
Two wing-tip drop tanks (2 × 81)	162	1,248
Total	504	3,878

All the internal tanks are pressure-vented to atmosphere via a common outlet. The drop tanks are pressurized, to enable fuel to be transferred by air pressure.

(ii) *Collector box*

The collector box in the base of the fuselage tank contains enough fuel to keep the engine running up to the limit of ten seconds under negative loading, or when flying in attitudes near the vertical.

(iii) *Unusable fuel*

Between 10 and 22 gallons of fuel are unusable, depending on the aircraft attitude, the amount increasing with aircraft tail-down attitude.

3. Fuel contents gauge

A Pacitor (electrically-operated) type fuel contents gauge (38) at the top right-hand side of the instrument panel gives the combined contents of all the internal tanks (full —342 gallons). There is no gauge for the wing-tip tanks.

NOTE.—There is an error in the reading on the gauge when fuels other than AVTUR are used, as the gauge is calibrated for AVTUR. (SG = 0.80.) If fuel of greater specific gravity is used, the gauge will over-read; lesser specific gravity, under-read. Later aircraft will be fitted with mass unit gauges. The indications of such gauges are more accurate than the volumetric calibrated gauges.

4. Fuel transfer system and indicators

(i) The engine is fed with fuel from the collector box in the bottom of the fuselage tank, and the fuel from the internal wing tanks is fed by gravity to the collector box. The fuel from the wing-tip tanks is automatically transferred to the fuselage tank by air pressure from the engine. Transfer takes place before fuel is used from the internal wing tanks and commences when approximately 15 gallons have been used from the fuselage tank, the rate of transfer being controlled by a float-valve near the top of the tank.

(ii) Two magnetic indicators (39) are fitted at the top of the right-hand instrument panel beside the fuel contents gauge. They show black when transfer from the wing-tip tanks and pylon tanks is taking place or when no electrical supply is available, and white when transfer is not taking place.

(iii) When the level in the fuselage tank has fallen sufficiently (30-40 gallons remaining), transfer starts from the internal wing tanks, by gravity only.

5. Fuel feed to the engine

(i) *Low pressure*

A booster pump in the base of the fuselage tank delivers fuel through the L.P. cock to two engine-driven H.P. fuel pumps.

If the booster pump fails, fuel bypasses the pump by gravity. A low pressure warning indicator (42) at the right-hand side of the instrument panel shows white when the pump delivery pressure falls below $1\frac{1}{2}$ lb./sq. in., (or when the pump is switched off). A socket and switch (47) are fitted on the starboard shelf and are for ground test use only.

(ii) *High pressure*

(a) A spill-flow fuel system is provided. The spill burner is similar in operation to the Simplex burner

with the addition of a passage to spill excess fuel away. Fuel is supplied to the burner swirl chambers at a continuous high pressure. As fuel demand decreases with increasing altitude or decreasing r.p.m. surplus fuel is returned from the burner, leaving less to pass through the atomizing orifice.

(b) To achieve this, two engine-driven pumps are employed; an H.P. supply pump to feed fuel to the throttle and an H.P. circulating pump to supply fuel to the burner inlets and to draw the excess fuel from the burners via a return spill line. Only the supply pump incorporates an overspeed governor.

(c) An acceleration control unit (A.C.U.) is connected downstream of the H.P. supply pump and a flow control unit (F.C.U.) downstream of the throttle. The A.C.U. and the F.C.U. are operated by a common servo control system connected to the H.P. supply pump. The F.C.U. controls the fuel flow past the throttle valve by maintaining a constant fuel pressure for any given altitude or forward speed. The A.C.U. adjusts the fuel flow from the supply pump, only under conditions likely to lead to rich extinction (i.e. during throttle opening). It then temporarily overrides the F.C.U. (through the servo system) to ensure an acceptable air/fuel mixture.

(d) The H.P. cock lever controls the fuel flow from the throttle to the H.P. circulating pump.

6. Fuel controls

(i) *Booster pump switch*

The booster pump is controlled by a switch (41) marked FUEL PUMP switch, at the right-hand side of the instrument panel. The circuit-breaker (54) is on the starboard control panel.

(ii) *L.P. cock lever*

The L.P. cock lever (2) is on the underside of the engine control box and is marked FUEL OFF (down and aft)

and FUEL ON (forward and up). The L.P. cock should be closed in the event of an engine fire, but must not be used to stop engine, except in an emergency, as the H.P. pumps will be damaged, and the fuel system aerated.

(iii) *H.P. fuel cock lever*

The H.P. fuel cock lever (10) is to the rear of the throttle lever on the engine control box, and is marked ON (up) and OFF (down). A catch secures the lever in the up position. This lever must always be used to stop the engine; it must also be closed if the engine fails. A re-light button is incorporated in the end of the lever.

(iv) *Fuel tank jettisoning*

The wing-tip tanks may be jettisoned electrically by pressing the outboard switch (9) to the left on the port shelf behind the throttle box. They can also be jettisoned mechanically by pulling back the outboard lever aft of the port shelf. The pylon tanks are jettisoned by the inboard switch (9) to the right or by the inboard lever.

7. Oil system

Oil is carried in the engine sump only, the capacity of A.L. 1 which is 18 pints. An oil temperature gauge is at the bottom of the instrument panel.

ENGINE CONTROLS

8. Throttle control

The throttle lever (14) which moves in a quadrant marked SHUT—THROTTLE—OPEN, is on the throttle box on the port side of the cockpit. The lever incorporates a V.H.F. press-to-transmit button. A friction damper (13) is on the inboard side of the box, and is rotated clockwise to tighten.

9. Engine starting system

(i) The engine is started by a cartridge system. The engine STARTER MASTER switch (34) to the right of the

instrument panel above the radar crate must be on to engergise the firing circuit. The cartridge is fired by pressing in the button (35) marked STARTER next to the master switch; the button is then held in electro-magnetically for 30 seconds, and during this time the high-energy ignition system is in operation. The delay prevents a second cartridge being fired too soon after a misfire. During a normal start, the turbo-starter brings the engine r.p.m. up to approximately 1,500. The r.p.m. will then drop to approximately 1,100-1,200 when a light up should occur. The engine should then accelerate to the normal idling speed of 3,000 r.p.m.

(ii) The starter system contains two cartridges; the second one is auto-selected as the starter button resets. A stowage for four spare cartridges is in the port flap compartment.

10. Relighting control

An engine relighting pushbutton is incorporated in the end of the H.P. cock lever (10). It should be pressed to energise the igniter plugs when relighting in flight, and may be used as an audible check that the H.E. ignition is functioning before starting up. The relight system will operate irrespective of the position of the engine starter master switch.

A.L.1
Para. 11 (i)
Page 13

11. Engine fire-warning light and extinguishers

(i) *Fire-warning*

A fire-warning light is incorporated in the extinguisher push-button (37) at the top right-hand side of the instrument panel. When Mod. 885 is incorporated, a second warning light is fitted adjacent to the pushbutton. The presence of engine fire is indicated by either or both warning lights coming on. Successful extinction of a fire is indicated by the lights going out after carrying out action in the event of fire. The lights may be tested by pulling out the button. After test, the button should be returned gently to its normal position. Mod. 932 introduces a modified pushbutton and warning light with. beside it, a separate pushbutton for testing the light.

(ii) *Fire extinguisher*

Two fire-extinguisher bottles are stowed one in each flap shroud, and are operated by pressing the pushbutton

A.L.1
Para. 11 (ii)
Page 14

(described in (i) overleaf). The contents of the extinguishers are discharged simultaneously through spray nozzles, mounted one on each side of the engine diffuser casing. The system will operate irrespective of the position of the battery isolating switch. The cockpit pressure control must be OFF before operating the extinguishers.

12. Engine instruments

The following engine instruments are provided:—

R.P.M. indicator.
J.P.T. gauge.
Oil temperature gauge.

13. Hydraulic system

(i) A single engine-driven pump provides pressure in the system for the operation of the:

Undercarriage
Flaps
Aileron power
Airbrakes
Wheel brakes
Hood jettison

(ii) Three accumulators are fitted to provide a reserve of hydraulic pressure in an emergency. The main accumulator is connected to all the above services, but its capacity is such as to provide only one one-way operation of the undercarriage, flaps or airbrakes. A second accumulator is connected only to the wheel brakes system, while the third accumulator serves both the aileron power and the wheel brakes. The limited capacity of this third accumulator provides a maximum of only three full aileron reversals in an emergency.

(iii) Failure of the system is given by an audio warning which indicates lack of flow in the system. The audio warning may be cut out by an on/off switch (17).

(iv) If the system fails, a handpump (67) on the right of the pilot's seat can be used to operate *only* the undercarriage. flaps, hood jettison systems, and to charge the wheel brakes accumulator.

(v) On the ground the airbrakes and aileron power circuits may also be tested by the handpump following the opening of a by-pass valve accessible through a door beneath the fuselage port side.

14. **Pneumatic system**

An engine-driven compressor charges an air bottle to a pressure of 450 lb./sq. in. From the bottle the pneumatic supply passes through reducing valves to the hood seal and charges the anti-G system bottle.

15. **Electrical system**

(i) *Supply*

(a) *Generators.* Power is supplied from two generators, each with an output of 200 amps at 28 volts. Generator failure warning lights (29) for the pilot are at the top of the instrument panel, and (52) for the observer on the starboard shelf. A test panel for the generators is at the back of the cockpit fairing.

(b) *Battery.* A 24 volt, 25 amp. hr. battery is mounted on a tray at the rear of the gun bay. The battery may be isolated by means of the switch (53) on the starboard electrical panel.

(c) *External D.C. supply.* An external 24 volt battery may be plugged in at the socket at the front port side of the fuselage. When the external supply is plugged in, the aircraft battery and generators are isolated. There is no ground/flight switch.

(d) *Flight instruments A.C. supply.* Two inverters, MAIN and STANDBY, supply A.C. for the flight instruments (M4. F compass and artificial horizon). The circuit breakers (54) for the two inverters are

on the starboard shelf. The main inverter switch (34) at the top of the instrument panel is linked with the starter master switch, and is labelled STARTER AND FLIGHT INSTRUMENTS. The standby inverter switch (41) at the right-hand side of the instrument panel is linked with the booster pump switch, and is labelled FLIGHT INSTRUMENTS. Both inverters will therefore be on whenever the engine is running, but the instruments are supplied only by the main inverter. If this fails, then the supply is automatically taken up by the standby inverter. A magnetic indicator (55) on the starboard shelf shows white in this event.

(e) *Radar supply*. A.C. supply for the GEE equipment is obtained from an inverter controlled by the switch (48) on the starboard shelf, and for the F.I.S. and A.P.S. 57 equipment from an inverter controlled by the inverter switch and circuit breaker on the starboard electrical panel, above item 51.

AIRCRAFT CONTROLS

16. Flying and trimming controls

(i) *Ailerons*

(a) The ailerons may be operated either hydraulically or manually. Hydraulic operation is selected by a valve (68) on the floor by the right of the pilot's seat. The valve is pushed down for MANUAL operation and pulled out for POWER operation; it is turned clockwise to lock in either position. If hydraulic pressure fails, the aileron control reverts to manual automatically. A red light (at 17) at the front of the port shelf illuminates when hydraulic pressure in the aileron circuit falls or MANUAL is selected.

(b) *Power operation*. Movement of the control column is transmitted by cables to servodynes at each aileron. Artificial feel is provided by a spring strut in the aileron circuit, giving a force proportional to aileron deflection but not to airspeed. The stick position can be adjusted by rotating the strut (1), on the left-hand side of the cockpit, in the natural sense.

(c) *Manual operation.* When hydraulic pressure falls, or is turned off by pushing down the selector valve, ports are opened connecting both sides of the servodyne pistons; manual operation is then obtained.

(d) *Servo-tabs.* Each aileron has a servo-tab, which operates during power operation to relieve loads on the servodynes. When hydraulic pressure falls or is selected off, a pressure switch enables the ailerons to be trimmed by means of an actuator connected to the port servo-tab. The spring-loaded trim switch (4) is on the port shelf and a circuit breaker (57) on the starboard shelf. A trim cut-out switch aft of the trim switch may be used to isolate the actuator in case of a runaway trim. A warning light (at 17) on the port shelf forward of the throttle box lights up when the port aileron tab is not in the neutral position. ~~when in manual.~~ The tab must be in the neutral position with the light out before power is engaged. A.L. 1

(ii) *Elevator*

The elevator is manually operated and has a servo-tab to assist the pilot, and a trimming tab controlled by the handwheel (15) on the engine control box. The trim indicator (12) is on the rear face of the box.

(iii) *Rudder*

The rudder is not power operated. Each rudder has a ground adjustable trim tab. A spring in the rudder circuit supplements the aerodynamic forces in centralising the rudder. The rudder pedals can be adjusted for reach by lifting them and then sliding them forward or aft into the required slot.

17. Flying controls locking gear

(i) *Internal*

A single V-shaped bar assembly secures the pedals and prevents fore and aft movement of the control column. The quick-release pin secured to this assembly is inserted

through the hinge of the upper portion of the column to prevent aileron movement. When not in use, the locking gear is stowed behind the pilot's seat.

(ii) *External*

Clamping blocks are provided for the ailerons. Safety locks, each with a red flag, may be inserted in the radius rods of the main undercarriage struts. Stowage for these locks is provided in the starboard gun-bay door.

18. **Undercarriage**

(i) *Normal operation*

The undercarriage selector lever (26) is on the left of the instrument panel, and is pulled *out and up* to select up. When the wheels are on the ground, the lever is locked in the down position by a solenoid-operated plunger.

(ii) *Position indicator*

A standard undercarriage position indicator (23) is below the lever. Indications are:—

Undercarriage locked up and doors closed	No lights
Undercarriage unlocked	Three red lights
Undercarriage locked down	Three green lights

A red light (25), above the indicator, comes on only if any of the three wheels are *locked up* and the throttle is less than a quarter open. The light is extinguished when *all* the wheels start to come down.

A.L.1
Para. 18 (iii)
Page 18

(iii) *Emergency operation*

If the engine-driven pump fails, and accumulator pressure is exhausted, the undercarriage can be lowered by means of the handpump on the right of the pilot's seat. Before using the handpump set the *flap* selector lever to neutral to prevent possible dumping of hydraulic fluid. Up to 115 strokes of the handpump may be necessary to lower the undercarriage fully and lock it down.

(iv) *Undercarriage emergency override*

The undercarriage can be retracted in emergency when the aircraft is on the ground by first operating the guarded switch (at 17) on the port shelf forward of the throttle box, provided that electric power is available, and then using the normal undercarriage selector.

19. **Flaps**

(i) *Normal operation*

The flaps selector lever (11) is on the rear face of the engine control box. There are three positions on the selector lever quadrant, UP—NEUTRAL—DOWN. Any degree of flap movement may be obtained by selecting and then returning to neutral after the required position is reached. If it is necessary in emergency to conserve accumulator pressure, the lever should be returned to neutral after the flaps are fully down but may be left in the up position when they are up.

(ii) *Position indicator*

A flaps position indicator (24) is fitted at the left-hand side of the instrument panel. It is connected to the right-hand flap only, and may give a false reading for intermediate flap settings on the ground. When the flaps are under air load, the indication is correct.

(iii) *Emergency operation*

The flaps may be operated by the handpump after normal selection, if the engine-driven pump fails and the main accumulator is exhausted.

20. **Airbrakes**

(i) *Normal operation*

The airbrakes are operated by a lever (16) extending from the top of the engine control box. No intermediate settings are available.

(ii) *Emergency operation*

The airbrakes cannot be operated in flight by the hand-pump.

21. Wheel brakes

The maxaret wheel brakes are operated by a lever, incorporating a parking catch, on the control column, and differential braking by use of the rudder bar. The available pressure in the system (2,400 lb./sq. in. max.) and at each wheel brake (1,500 lb./sq. in. max.) is indicated on the triple-reading pressure gauge (17) on the port shelf. This pressure allows several full applications of the brakes if the main system has failed, and in this event the pressure will fall to 1,400 lb./sq. in. as the brakes are used. At this point the accumulator will be fully discharged and the gauge reading will drop rapidly to zero. Pressure may however be restored by use of the handpump. The maxaret units permit the use of full braking without the possibility of wheel locking and consequent tyre damage. The units can only come into operation when the wheels are rotating. In no circumstances should the brakes be applied until after touchdown

COCKPIT EQUIPMENT

22. Access to cockpit

The cockpit is entered by means of a retractable footstep on the port side of the fuselage; this footstep normally retracts as the weight of the foot is removed.

Alternatively the cockpit may be entered by means of a ladder which can be locked in a ferrule on either side of the cockpit.

23. Hood operation

(i) *Opening the hood from outside*

The flush-fitting external release handle is housed centrally just aft of the hood. A pushbutton on the handle

is pressed to make the handle spring out of its housing; the handle is then turned anti-clockwise through 90° to release the hood lock (some force may be necessary). The hood can then be raised by hand; an arrangement balances the hood in any position, making movement up or down easy. When fully open, it is locked by a spring-loaded catch acting on the hood strut.

(ii) *Closing the hood from inside*

The hood is lowered by hand after operating the hood balance arm release knob marked HATCH STRUT RELEASE and locked when closed by pulling the large handle, at the top and centre of the windscreen, back and up. When this is done, a locking lever, next to the internal handle, should snap forward onto the handle—if it does not, it should be pushed forward. The locking lever, when fully forward, inflates the hood seal in addition to preventing any inadvertent operation of the handle.

24. Hood jettisoning

(i) *Hydraulic jettisoning*

The hood may be jettisoned hydraulically by pulling up the handle (69) on the cockpit floor, forward and to the right of the pilot's seat. When the handle is pulled up, a Bowden cable releases the hood at the rear end; at the same time a jack is operated, throwing the hood open.

(ii) *Manual jettisoning*

If the hydraulic mechanism fails or the Bowden cable breaks, the hood can be jettisoned manually as follows: the ring handle just to the right-hand side of the hinge mechanism is pulled out—this releases the rear end of the hood which is then opened normally at the front by releasing the locking lever and pushing the internal handle down and forward. Care must be taken to keep the hand unclenched to avoid snatch of the wrist when the hood suddenly lifts.

NOTE.—Attempts to jettison manually by first opening the hood in the normal way, and then pulling the ring handle, must never be made.

25. Cockpit lighting

(i) Eight red flood lamps and four U/V lamps are fitted at various places in the cockpit, including one of each on the forward face of the control column. The master and dimmer switches (6) are all on the switch panel on the port shelf.

(ii) A single amber emergency lamp fed from a small dry battery is fitted on the port wall and is controlled by a switch (40) to the right of the j.p.t. gauge.

26. Seat and harness adjustment

(i) *Seat*

The pilot's seat can be raised or lowered by a lever (66) on the right of the seat; a plunger at the top must be depressed before the lever can be moved. The observer's seat is not adjustable.

(ii) *Harness release*

The lever for the pilot's harness release is on the cockpit port wall. The observer's harness release is on the starboard wall of the cockpit.

27. Oxygen system

(i) A pressure-demand system is fitted. Oxygen is stored in three cylinders.

(ii) The pilot's regulator (46) is just by his right leg; the observer's regulator (63) is on the starboard panel. A contents gauge (18) is below the instrument panel. Additional magnetic flow indicators, (43) for the pilot, and (36) for the observer, are at the right-hand side of the instrument panel. These show alternate white and black when oxygen flow is available. Failure of oxygen supply is shown by a permanent ~~white~~ black indication.

A.L. 1

(iii) The Mk. 17C regulator has the following controls:—

(a) ON/OFF valve—controls the flow of oxygen.

(b) Air-dilution NORMAL—100% OXYGEN valve—controls the flow of air.

(c) Three-position EMERGENCY SWITCH.

(d) Flow and blinker unit.

When the ON/OFF valve is ON and the dilution valve is at NORMAL, an air/oxygen mixture is fed to the mask up to a height when 100% oxygen is automatically delivered. When the dilution valve is at 100% OXYGEN, no air is added, irrespective of the height. This position should be selected if any symptoms of anoxia are present. The emergency switch, when moved to either right or left, admits oxygen under greater pressure. Normally it should be central, but should be offset if cabin pressure failure occurs. The mask may be tested before flight by firmly pressing in the emergency valve, when in the central position; oxygen is then supplied under pressure. The firmer the switch is pressed the greater the pressure (up to five times that obtained with the switch in either side-position). The mask can then be adjusted until no leaks are present.

28. **Cockpit air conditioning**

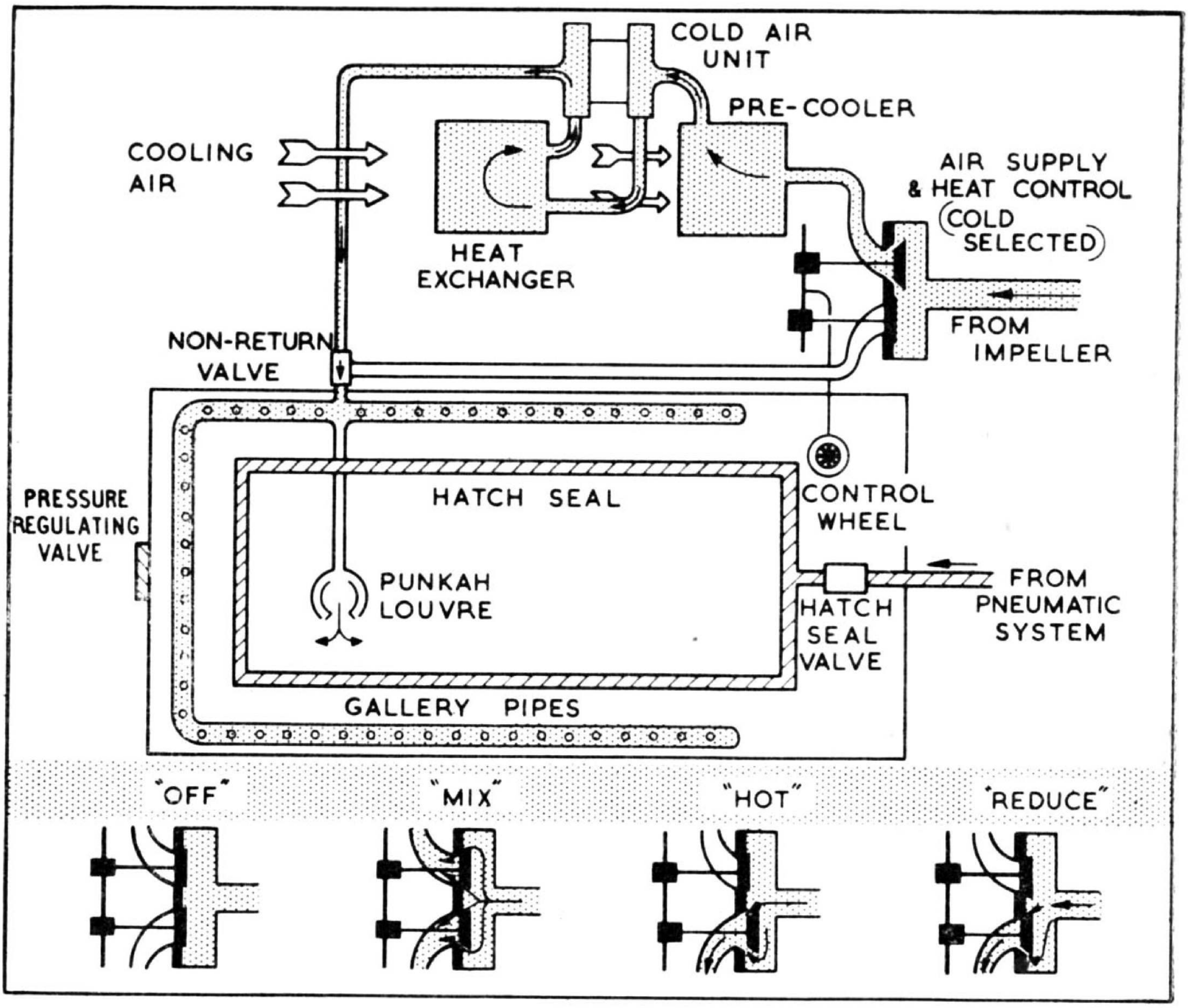
(i) Cockpit pressurising, heating, and cooling are controlled by movement of the wheel (3) on the port shelf. The wheel rotates through 270°, and has five marked positions: OFF—COLD—MIX—HOT—REDUCE. If a reduction of cockpit temperature is desired at altitude, MIX is to be preferred to REDUCE otherwise the reduced volume of air entering the cockpit may adversely affect the pressure differential. COLD or MIX *must not* be selected on the ground otherwise overheating of the cold air unit may occur with subsequent damage.

(ii) *Pressure*

With the hood seal control on (i.e. with the hood handle lock in the forward position) the cockpit pressure is automatically controlled by a valve which allows a steady build-up of differential cockpit pressure above approximately 12,000 feet, until at 35,000 feet the full differential

pressure is reached. The cockpit pressure is indicated on an altimeter (45) at the bottom right-hand side of the instrument panel. A warning light (44) beside the altimeter comes on when the cockpit altitude falls below the allowable minimum for a given altitude. The table below shows the cockpit altitudes corresponding to the minimum pressures. When the control is at REDUCE the cockpit pressure will be reduced.

Actual altitude (ft.)	Equivalent altitude (cockpit)	Approx. cockpit altitude at which light comes on
20,000	15,000	16,500
30,000	19,000	20,750
40,000	24,000	26,000
45,000	28,500	31,000



COCKPIT PRESSURIZATION AND HEATING

(iii) Air for pressurising enters the cockpit through a louvre and also through holes in the gallery pipe for windscreen and hood demisting.

29. Windscreen de-icing

The windscreen de-icing system is controlled by a hand pump (19) on the cockpit floor. The handle is turned anticlockwise to unlock, and pumped in to raise pressure. The handle returns slowly to the out position while spraying the windscreen.

30. Direct-vision panel

A direct-vision panel is fitted in the port quarter of the front windscreen, and is opened by turning a screw knob at the top. When the panel is open it lies at an angle across the top of the cockpit and in this position it presents a hazard to the pilot in a crash landing. It can however, be removed and handed to the observer—no stowage is provided.

31. Windscreen wiper

A windscreen wiper may be fitted on later aircraft. Details will be included by amendment.

32. Anti-G equipment

Pressurised air for anti-G suits is taken from connections attached to the seats. The selector lever (21) on the cockpit floor at the centre is pulled out and up for ON. The test button nearby is pushed down to test. The observer's test button is to the left of the observer's seat.

33. Emergency equipment

A hand-operated fire-extingusher is fitted to the port side of the hood centre beam. Stowage for a first-aid kit is provided inside the port ammunition access door. A crowbar (58) is on the cockpit starboard wall.

PART I—DESCRIPTIVE

FLIGHT AND NAVIGATION EQUIPMENT

34. Flight and navigation instruments

(i) *Mk. 4F compass and artificial horizon*

(a) The Mk. 4F compass and artificial horizon will function whenever alternating current is available, provided the flight instruments switches are on and the circuit breakers are in. If the main inverter supply fails, the standby inverter is automatically brought into circuit. See para. 15(i)(d).

(b) Mod. 923 introduces a Mk. 4 artificial horizon, which incorporates a fast-erection button and an OFF flag to indicate power failure.

(ii) *Turn and slip indicator*

The turn and slip indicator will function whenever d.c. electrical power is available. When Mod. 569 is embodied, the emergency lights battery may be used to supply the instrument in the event of electrical failure. The emergency supply switch is below the Mk. 4F compass, next to the oil temperature gauge.

(iii) *Pressure-operated instruments*

The pressure head heater switch (49) is on the starboard shelf.

(iv) *E.2.A. stand-by compass*

An E.2.A. stand-by compass is mounted to the right of the observer's crash guard.

(v) *Radio altimeter*

The radio altimeter indicator (27) is on the left of the standard flying panel, the limit switch (22) underneath, and the limit lights (30) just underneath the clear vision panel.

(vi) *Clock*

A Mk. 4 clock is on the left of the instrument panel.

(vii) *Accelerometer*

Mod. 798 introduces an accelerometer, to the left of the gunsight.

35. External lighting

Lights	Switch position
Navigation lights.	(48) on starboard shelf, plus circuit breaker (54) on starboard shelf.
Identification lights	(48) on starboard shelf plus circuit breaker (54) on starboard shelf.
Landing lamp.	Three-position selector switch (65) OFF—LOW—HIGH on starboard shelf.

SIGNALS EQUIPMENT

36. Wireless installation

(i) *VHF-TR1934/1935 (ARI.5490)*

The two VHF controllers (7) with changeover selector switch (8) are mounted on the panel aft of the throttle quadrant. The pilot's press-to-transmit switch is on the throttle GGS twist-grip (14). The navigator's press-to-transmit switch (60) is on the starboard shelf. A press-to-mute switch is on the control column handgrip. The navigator's foot-operated mute switch is near his right foot position.

(ii) *Intercommunication (A.1961)*

Two switches are fitted, an OFF — NORMAL — EMERGENCY switch for the pilot and a HOMING—INTERCOM switch (56) for the navigator. When the pilot's switch is at NORMAL and the navigator's switch is at INTERCOM, the A.1961 amplifier is used for intercommunication purposes. With the switches thus set, when either press-to-transmit switch is pressed only the pilot or navigator's transmission is heard. With the pilot's switch at EMERGENCY or OFF intercommunication is via the VHF system and all conversations will be broadcast if either press-to-transmit switch is used.

PART I—DESCRIPTIVE

FLIGHT AND NAVIGATION EQUIPMENT

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(a) The Mk. 4F compass and artificial horizon will function whenever alternating current is available, provided the flight instruments switches are on and the circuit breakers are in. If the main inverter supply fails, the standby inverter is automatically brought into circuit. See para. 15(i)(d).

(b) Mod. 923 introduces a Mk. 4 artificial horizon, which incorporates a fast-erection button and an OFF flag to indicate power failure.

(ii) *Turn and slip indicator*

The turn and slip indicator will function whenever d.c. electrical power is available. When Mod. 569 is embodied, the emergency lights battery may be used to supply the instrument in the event of electrical failure. The emergency supply switch is below the Mk. 4F compass, next to the oil temperature gauge.

(iii) *Pressure-operated instruments*

The pressure head heater switch (49) is on the starboard shelf.

(iv) *E.2.A. stand-by compass*

An E.2.A. stand-by compass is mounted to the right of the observer's crash guard.

(v) *Radio altimeter*

The radio altimeter indicator (27) is on the left of the standard flying panel, the limit switch (22) underneath, and the limit lights (30) just underneath the clear vision panel.

(vi) *Clock*

A Mk. 4 clock is on the left of the instrument panel.

(vii) *Accelerometer*

Mod. 798 introduces an accelerometer, to the left of the gunsight.

35. External lighting

Lights	Switch position
Navigation lights.	(48) on starboard shelf, plus circuit breaker (54) on starboard shelf.
Identification lights	(48) on starboard shelf plus circuit breaker (54) on starboard shelf.
Landing lamp.	Three-position selector switch (65) OFF—LOW—HIGH on starboard shelf.

SIGNALS EQUIPMENT

36. Wireless installation

(i) *VHF-TR1934/1935 (ARI.5490)*

The two VHF controllers (7) with changeover selector switch (8) are mounted on the panel aft of the throttle quadrant. The pilot's press-to-transmit switch is on the throttle GGS twist-grip (14). The navigator's press-to-transmit switch (60) is on the starboard shelf. A press-to-mute switch is on the control column handgrip. The navigator's foot-operated mute switch is near his right foot position.

(ii) *Intercommunication (A.1961)*

Two switches are fitted, an OFF — NORMAL — EMERGENCY switch for the pilot and a HOMING—INTERCOM switch (56) for the navigator. When the pilot's switch is at NORMAL and the navigator's switch is at INTERCOM, the A.1961 amplifier is used for intercommunication purposes. With the switches thus set, when either press-to-transmit switch is pressed only the pilot or navigator's transmission is heard. With the pilot's switch at EMERGENCY or OFF intercommunication is via the VHF system and all conversations will be broadcast if either press-to-transmit switch is used.

(iii) *Telebriefing (ARI.18012)*

The pilot's warning lamp, which indicates the system is in use, and the press-to-talk push switch (5) are on the port panel. The landline connector is in the end of the port tailboom.

37. Radar installation

AN/APS.57 (ARI.5860), ARI.5847, Mk. 3 Gee (ARI.15816), AYF (ARI.5284) and IFF Mk. 3 GR (ARI.5131) installations are fitted. The radar scanner is carried within the detachable nose fairing.

ARMAMENT EQUIPMENT

38. Guns

A.L.1
Para. 38
Page 28

Four 20 mm. guns are mounted, two on each side of the nose, and are fired electrically by a trigger on the control column, after the safety catch has been released. To prevent the inadvertent firing of the guns when the aircraft is on the ground, the electrical firing circuit is broken when the undercarriage is locked down. Unless Mod. 934 is embodied, there is no override switch. This modification introduces an override switch, which is located in the gun bay.

39. Gunsight

(i) *Gyro-gunsight*

A retractable gyro-gunsight Mk. 5 is fitted above the instrument panel, and is normally raised or lowered by means of a switch (32) beside the sight provided that the gunsight circuit breaker (59) on the starboard shelf is in. If the electrical system fails it is possible to lower the sight by a manual control (31). This control should be used only in an emergency since servicing will be necessary before the sight can be used again.

(ii) *Gyro-gunsight selector—dimmer control*

A G.G.S. selector—dimmer control (33) is at the top of the instrument panel to the right of the gunsight. Ranging

is radar controlled through the A.I. Mk. 21, but the pilot has an override control embodied in the throttle grip. When radar ranging is switched on, the pilot's control should be kept at the minimum (200 yds.) position while executing any sharp manœuvres, but should be moved to the maximum (800 yds.) position when tracking smoothly, to enable the sight to be radar controlled whenever the target range drops below 800 yds. Mod. 877 introduces a strobe disconnect switch, marked RADAR-MANUAL, which allows manual control of the sight if the strobe unit fails. The switch is located in the position normally occupied by the starter master switch (34); the latter switch is then moved to the right of the starter pushbutton.

40. **Cameras**

(i) *Gyro-gunsight recorder camera*

A recorder camera may be fitted on the top of the gun-sight. It will operate whenever the guns are fired or the camera button on the control column is pressed, provided the camera master switch (47) on the starboard shelf is on. Stowage for the camera is provided on the back of the pilot's seat. The test switch (47) on the starboard panel enables both the recorder camera and G.45 camera circuits to be energized on the ground.

NOTE.—The recorder camera must only be fitted and removed when the GGS is in the retracted position.

(ii) *G.45 camera*

A G.45 camera is pod-mounted under the port wing and will operate whenever the guns are fired or the camera switch is pressed, provided the camera master switch is on. A sunny-cloudy switch is on the starboard shelf. beside the camera master switch.