

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

1. Introduction

The Venom F.B.4 is a single-seat fighter-bomber powered by a Ghost Mk. 103 turbo-jet. It is equipped with Mk. 2F pilot ejection seat and power-operated ailerons. The cockpit is pressurised and there are four 20 mm. guns, two on each side of the nose. Provision is made for the carriage of bombs and R.P.s.

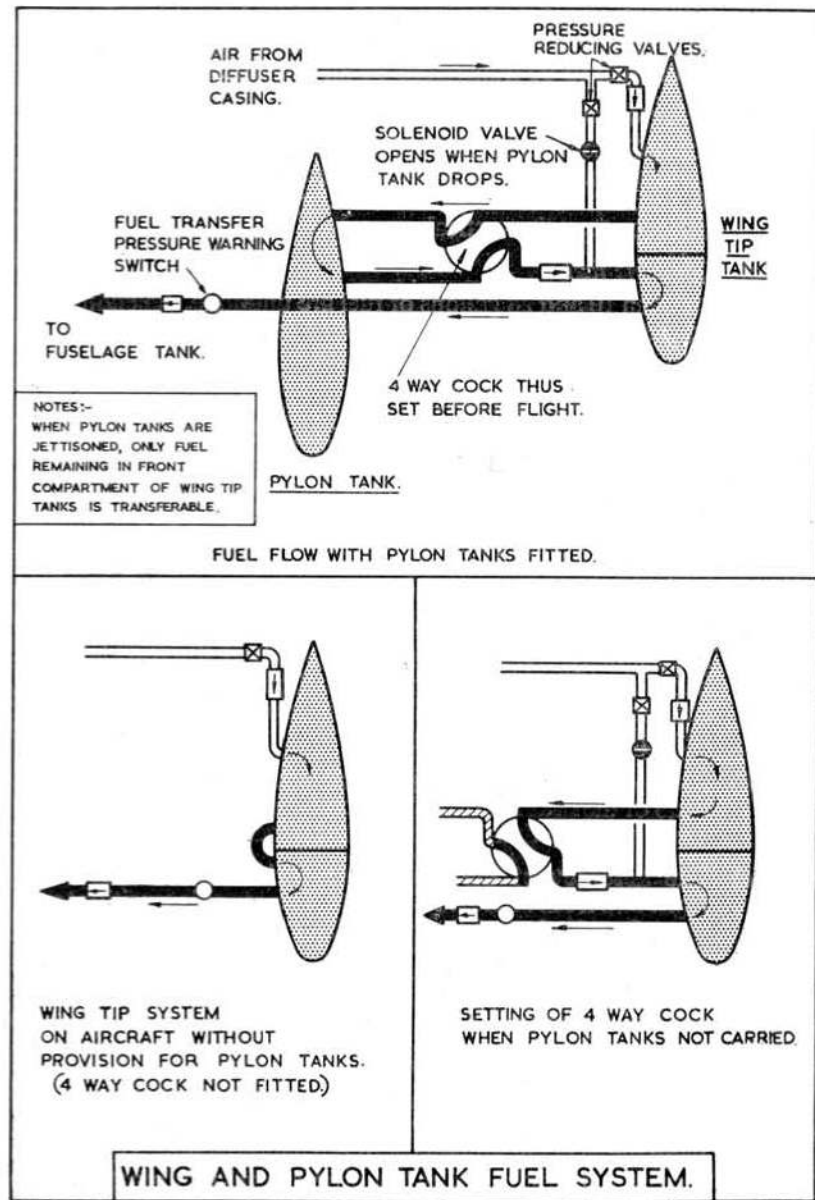
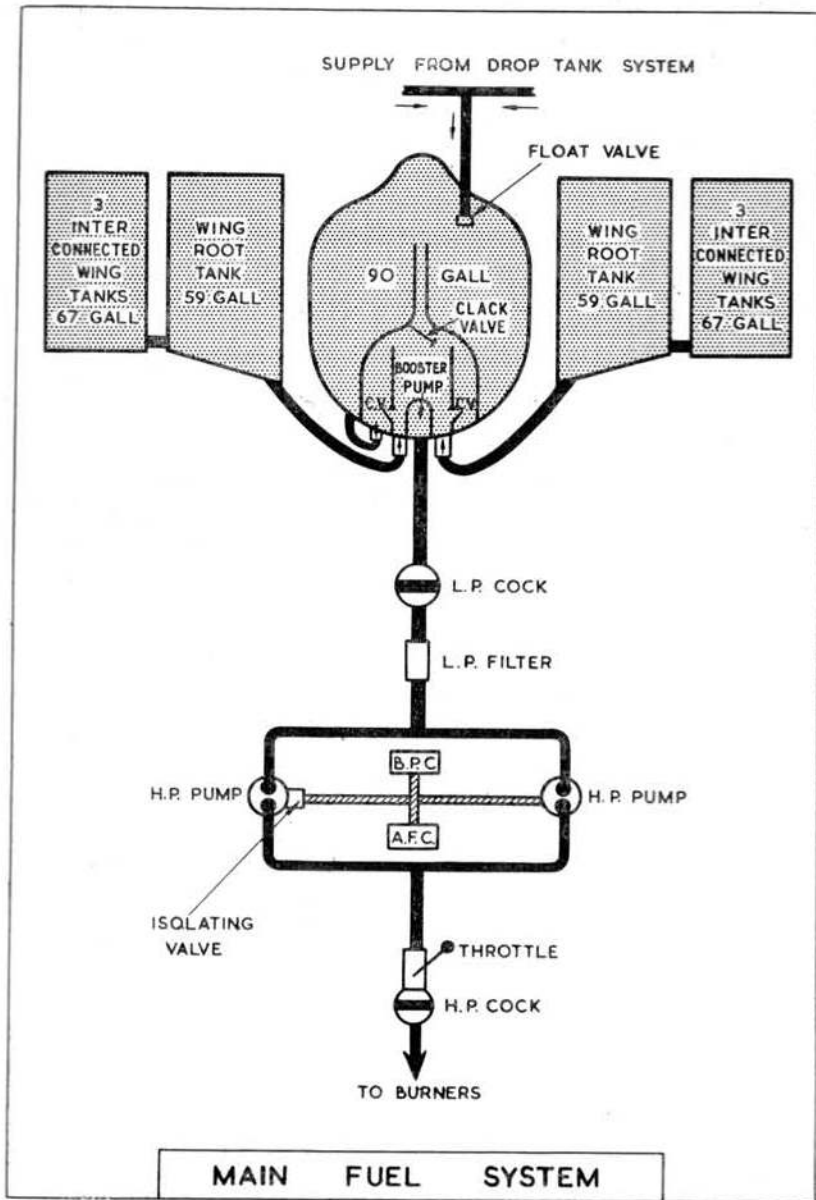
FUEL SYSTEM

Page 9 2.
Para. 2
(a)
A.L.1

Tanks

- (a) 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 also made for fitting two jettisonable 80-gallon pylon tanks. The estimated tank capacities are as follows:—

	<i>Gallons</i>	<i>lb. AVTUR (8 lb./gall)</i>
Fuselage tank	92	736
Wing tanks:		
pre-Mod. 983	241	1,928
post-Mod. 983	236	1,888
Wing-tip drop tanks	156	1,248
Pylon drop tanks	160	1,280
	<hr/>	
Total	649	pre-Mod. 983 5,192
	644	post-Mod. 983 5,152



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

(b) *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 10 seconds under negative loading, or when flying in attitudes near the vertical.

(c) *Unusable fuel*

Between 10 and 28 gallons of fuel are unusable, depending on the aircraft attitude, the amount increasing as the aircraft tail-down attitude is increased.

(d) *Pylon and wing-tip tanks*

The pylon tanks cannot be used unless the wing-tip tanks are fitted, as fuel transfer is via the tip tanks. Wing-tip tanks may be used, irrespective of the fitting of pylon tanks. Four-way valves in the wings are set before flight for the carriage of either pylon and wing-tip tanks, or tip tanks only.

3. **Contents gauge**

- (a) A Pacitor type fuel contents gauge (34) at the top right-hand side of the instrument panel gives the combined contents of all the internal tanks. There is no gauge for the wing-tip or pylon tanks.
- (b) Mod. 451 introduces a mass-unit gauge, giving the contents of the internal tanks in pounds. This type of gauge is more accurate than one calibrated in gallons.
- (c) The accuracy of the fuel gauge varies considerably in flight and from aircraft to aircraft. The gauge is sensitive to aircraft attitude and fuel state. When descending rapidly from high altitudes it under-reads considerably but re-adjusts itself shortly after resuming level flight. In addition, the gauge generally tends to under-read.

4. **Transfer system and indicators**

- (a) 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 and pylon drop tanks is automatically

transferred to the fuselage tank by air pressure from the engine. Transfer is via the tip tanks front compartments and takes place before fuel is used from the internal wing tanks. It starts when approximately 15 gallons (120 lb.) have been used from the fuselage tank, the rate of transfer being controlled by a float-valve near the top of the tank. During transfer, the tip tanks rear compartments empty first, then the pylon tanks (if fitted) and finally the tip tanks front compartments.

- (b) Two magnetic indicators (36) are at the top of the right-hand instrument panel, beside the fuel contents gauge. They show black when transfer from the wing-tip tanks is taking place, or when no electrical supply is available, and white when transfer is not taking place. There is no positive indication that fuel is actually transferring to the tip tanks from the pylon tanks but this can be judged by the time taken before fuel stops transferring from the tip tanks.
- (c) When the level in the fuselage tank has fallen sufficiently, 30–40 gallons remaining (240–320 lb.), transfer starts from the internal wing tanks, by gravity only.

5. **Feed to the engine**

- (a) There is a booster pump in the collector box which delivers fuel through the L.P. cock to two engine-driven H.P. pumps, which supply fuel to the engine. If the booster pump fails, fuel is delivered to the H.P. pumps by means of a gravity by-pass. A warning light (25) comes on if the fuel delivery pressure falls below $1\frac{1}{2}$ lb./sq. in. Normally, when the pump is on, the warning light should go out. The light will be on at all times when the pump is off and electrical power is available.
- (b) From the H.P. pumps, fuel is delivered to an H.P. cock and a throttle valve. When the H.P. cock is opened, fuel will flow at the rate determined by the B.P.C., through the throttle valve to a fuel flow distributor, and thence to each burner. The rate of flow set by the B.P.C. will be dependent upon the position of the throttle, the altitude and the ram pressure at the air intakes.
- (c) When the throttle is opened or closed, an acceleration control unit (A.C.U.) temporarily overrides the B.P.C. and ensures the correct delivery.

- (d) Both the B.P.C. and A.C.U. control the delivery of fuel to the engine by varying the output of the H.P. pumps, through a servo mechanism.
- (e) The two engine-driven H.P. pumps have interconnected servo mechanisms and are thus capable of operating in harmony and together satisfy the fuel requirements of the engine. Should one pump fail, the output of the other is sufficient to supply the fuel required by the engine under all conditions. The B.P.C. and the A.C.U. are linked to both pumps, which differ from each other only in respect of a solenoid-operated isolating valve incorporated in the front pump. An overspeed governor is incorporated in each pump.

6. Controls

(a) H.P. pump isolating valve

- (i) The isolating valve is primarily intended as a means of restoring power in flight in the event of a sudden drop in engine r.p.m., caused by failure of the servo system or either H.P. pump. It must also be used as a safeguard against failure during take-off (see para. 47).
- (ii) The valve is controlled by a switch (55) marked FUEL PUMP EMERGENCY, on the electrical panel. On later aircraft the switch is repositioned on the instrument panel, beside the aileron power selector (20). When it is ON, the valve isolates the front pump from the fuel pump servo system, the B.P.C. and the A.C.U. but the rear pump remains under the control of the B.P.C. and A.C.U. In these circumstances, provided that a failure has not occurred, the front pump will be operating at full stroke, controlled only by the pump overspeed governor, while the rear pump will be operating at reduced stroke.

(b) Booster pump switch

The booster pump is controlled by a switch (54), marked FUEL PUMP SWITCH, on the electrical panel.

(c) L.P. cock lever

The L.P. cock lever (13) 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 engine fire but must not be used to stop the engine, except in an emergency, as the H.P. pumps will be damaged and the fuel system aerated.

(d) H.P. fuel cock lever

The H.P. fuel cock lever (7) is mounted outboard of the throttle lever and is marked OPEN (forward) and SHUT (aft). When in the OPEN position it allows fuel to flow from the engine-driven pumps to the burners. It should normally be used to stop the engine. On later aircraft, this lever is positioned inboard of the throttle lever and incorporates a pushbutton for relighting the engine in flight. On early aircraft, relighting is carried out by a separate switch on the left-hand instrument panel (see para. 10).

(e) Fuel tank jettisoning

The wing-tip tanks may be jettisoned electrically, by pressing the rear button (9) on the inboard face of the throttle box. They can also be jettisoned mechanically by pulling back the lever (65) on the right of the seat. The pylon tanks are jettisoned by the forward button (9) or by the lever (17) on the left of the seat.

ENGINE CONTROLS AND SYSTEMS

7. Throttle control

The throttle lever (10), which moves in a quadrant marked SHUT-THROTTLE-OPEN, is in the throttle box on the port side of the cockpit. The lever incorporates a V.H.F. press-to-transmit button. A friction damper control is on the inboard side of the box and is rotated clockwise to tighten.

8. Engine starting system

- (a) The engine is started by a cartridge system. The engine starter master switch (50) on the electrical panel must be ON to energise the firing and ignition circuits. The cartridge is fired by pressing in the button (37), on the right of the instrument panel; the button is then held in electromagnetically for 20 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 up to approximately 1,500 r.p.m., by which time a light-up should have occurred and the engine should continue to accelerate to the normal idling speed of 3,000 r.p.m.

- (b) The starter system contains two cartridges; the second one is auto-selected as the starter button resets. Four spare cartridges may be stowed in the flap compartment.

9. Relighting control

- (a) On early aircraft, engine relighting in flight is by a rotary ignition time switch (19) on the left of the instrument panel. When switched ON, current is supplied to the high energy condenser units, which in turn supply the sparks for relighting. A clockwork mechanism in the switch returns the dial pointer from the fully ON position to the OFF position in 20 seconds and cuts off the supply of current to the condensers.
- (b) On later aircraft, a relighting pushbutton is incorporated in the end of the H.P. cock lever. 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.

10. Oil system

Oil is carried in the engine sump, the capacity of which is 16 pints. In addition, three pints of oil circulate in the system. An oil temperature gauge is on the left of the instrument panel.

11. Engine fire-warning light and extinguishers

(a) Fire warning

A fire-warning light (31) is on the right of the G.G.S. The flame switches are of the resetting type; if the fire has been extinguished the light will go out.

(b) Fire extinguishers

NOTE.—No crash-operated inertia switch is fitted.

Two fire-extinguisher bottles are carried, one in each flap shroud, and are operated by pressing the pushbutton on the electrical panel, provided that electrical power is available. The contents of the bottles are discharged through spray nozzles on the engine diffuser casing. The cockpit pressure control must be OFF before the extinguishers are

operated. Below generator cut-in speed, electrical supply is available from the batteries, provided that the battery isolating switch is on. Above generator cut-in speed, the extinguishers can be operated irrespective of the setting of the battery isolating switch. When Mod. 921 is embodied, the extinguishers are wired direct to the batteries.

12. Engine instruments

The following engine instruments are provided:—

- R.p.m. indicator
- J.p.t. gauge
- Oil temperature gauge

MAIN SERVICES

13. Electrical system

(a) D.C. supply

- (i) Two 1,400 watt (28-volt) engine-driven generators supply the aircraft electrical system and charge the aircraft batteries.
- (ii) Two generator failure warning lights (47), on the electrical panel, come on whenever their respective generators are not supplying power. Two generator isolating switches and two field circuit breakers (at 61) are on the electrical panel. Provision is made for ground-testing each generator by ammeter and volt-meter sockets.

(b) Batteries control

- (i) A guarded battery isolating switch (48) is on the electrical panel. In the OFF position, the switch isolates the aircraft batteries from all electrical services; the generators will, however, still supply the services if the engine r.p.m. are sufficiently high.
- (ii) The electrical services may be ground-tested with an external battery connected to the three-pin plug on the starboard side of the fuselage. With the battery plugged in, the aircraft batteries are automatically isolated.

(iii) There are two emergency batteries, one (2.4 volt) for the emergency lighting and one (24 volt) for the standby V.H.F. and the turn and slip indicator. The endurance of the former is approximately one hour and of the latter, 20–30 minutes.

(c) *A.C. supply*

(i) A.C. for the Mk. 4F compass and the artificial horizon is supplied by a type 100A inverter in the forward gun bay. The A.C. supply is controlled by the Mk. 4F compass switch (51), on the electrical panel, and a circuit breaker (62), at the rear of the cockpit.

(ii) There is no standby inverter but Mod. 478 introduces a torque switch. If the inverter overspeeds, the torque switch opens, breaking the D.C. supply to the inverter; at the same time a warning light, on the right of the instrument panel, comes on.

14. Pneumatic system

(a) 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 wheel brakes relay valve and the anti-G system.

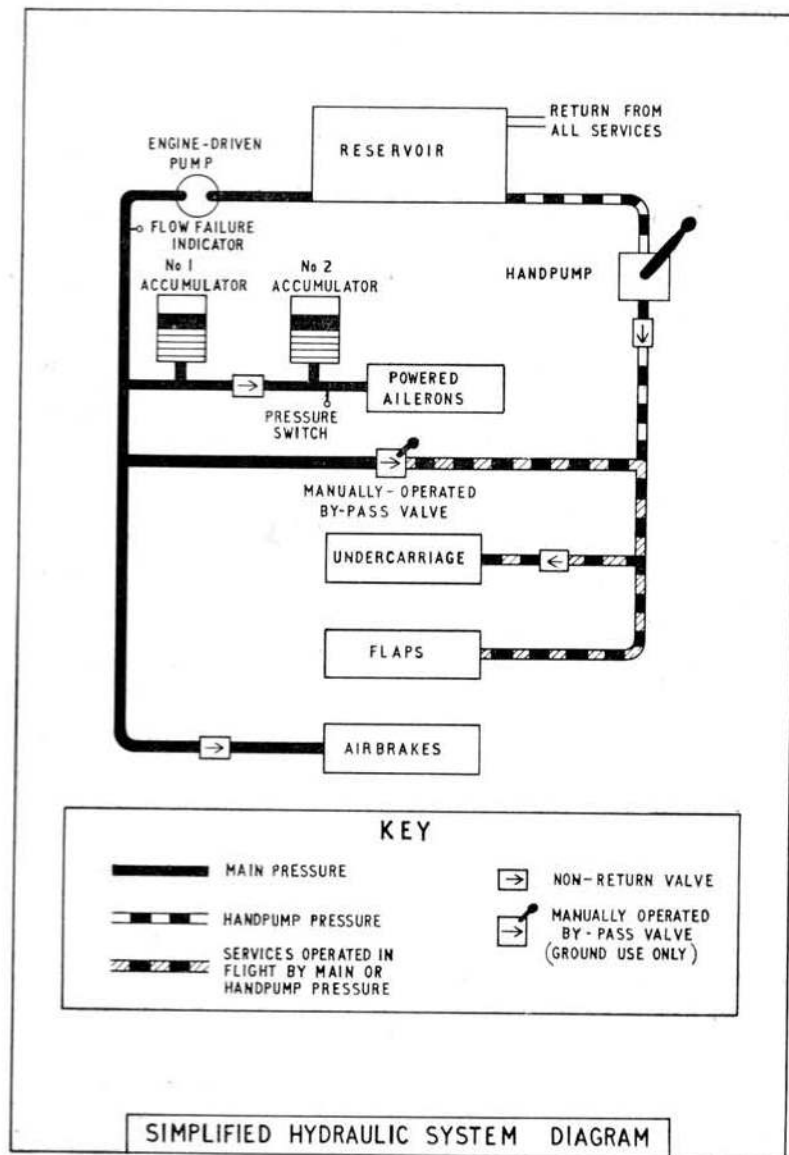
(b) The main supply pressure and the pressure at each wheel brake (150 lb./sq. in.) are shown on a triple-pressure gauge (39) on the right of the instrument panel.

15. Hydraulic system

(a) An engine-driven pump provides pressure for the operation of the following:—

Undercarriage
Flaps
Airbrakes
Powered ailerons

(b) Two accumulators are fitted. No. 1 (main) accumulator will serve any selected system but, in emergency, provides sufficient pressure only for the *immediate* one-way operation of the flaps and undercarriage; otherwise the pressure will be fed to the powered ailerons. No. 2 accumulator serves the aileron power circuit only and should provide sufficient *immediate* reserve for three full aileron reversals if the hydraulic system fails. Because of normal hydraulic



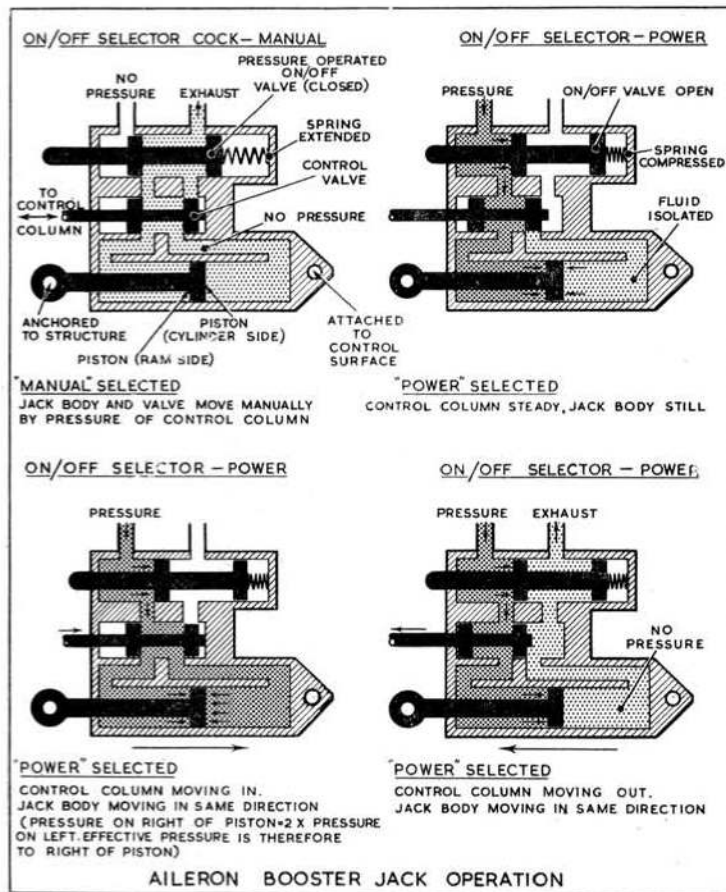
component seepage, the accumulator pressure will dissipate in a short time, even if no call is made on the accumulators.

- (c) If either the engine or the engine-driven pump fails, a handpump (15) on the left of the pilot's seat, on the floor, will operate the undercarriage or flaps, at a reduced rate. The handpump will not operate the airbrakes or ailerons; nor will it charge either of the accumulators, except on the ground, when a manually-operated valve (accessible through a door on the port side underneath the fuselage) can be opened. For full details of emergency operation, see para. 88.
- (d) There are two types of warning of hydraulic failure, one operated by lack of pressure and the other by lack of flow in the system. A pressure switch is incorporated in the aileron power circuit and, when pressure falls or the ailerons are selected to manual, it causes a red light (11) to come on. A flow switch is incorporated downstream of the hydraulic pump and, when lack of flow in the main hydraulic system occurs, it causes an audio warning to sound in the earphones and, at the same time, illuminates the red light previously mentioned. The warning may be silenced by the switch (45) on the electrical panel.

POWERED AILERONS AND CONTROLS

16. General

- (a) The ailerons are power-operated by oil supplied under pressure from the aircraft hydraulic system. A booster jack of the servodyne type, consisting of an on/off valve, a control valve, a jack body and a piston, is fitted close to each aileron. The control column is connected direct to the control valve, the piston rod is anchored to the aircraft structure and the jack body is connected to the control surface.
- (b) (i) When hydraulic pressure to the booster jacks is selected on, the pressure fluid is directed to the servodyne on/off valve which opens, compressing its return spring. With the control valve central (i.e. control column central) fluid is then passed to the ram side of the piston head (i.e. the left side, in the sketch) and the fluid on the cylinder side (i.e. the right) is isolated.
- The jack is thus locked hydraulically.



- (ii) When the control valve is moved inwards, pressure fluid passes to both the ram and the cylinder sides of the piston head. Since the effective area of the cylinder side of the piston head is twice that of the ram side, the jack extends with an effort equivalent to the difference in pressure.
- (iii) When the control valve is moved outwards, the cylinder side of the piston head is connected to exhaust and the ram side is connected to pressure. The jack

then retracts with an effort equivalent to extension effort.

- (c) If hydraulic pressure falls or is selected off, the spring in the on/off valve overcomes the hydraulic pressure and exhausts both sides of the jack piston on the return lines to the reservoir. In manual, control surface movements are achieved by the control column pushing the control valve against its stop and then pushing manually the jack body to obtain control surface movement. The controls are heavier in manual because of (i) the artificial feel spring and (ii) the necessity to move the jack and aileron manually.

17. Controls and indicators

- (a) The aileron power system is controlled by a selector valve (20) on the lower left of the instrument panel. To select POWER, pull out the control and turn left to lock. To select MANUAL, push in the control, turn right to lock.
- (b) Failure of the system hydraulic pressure is shown by a red light (11) beside the selector valve, which comes on if hydraulic pressure in the system falls appreciably below normal. In addition, failure of one or both hydraulic pumps is indicated by the audio warning. The aileron power hydraulic accumulator provides sufficient reserve for a limited number of aileron movements before becoming exhausted.

18. Aileron feel and trim

(a) Spring feel

The piston rod of the servodyne unit is anchored to the aircraft structure and all air loads on the ailerons are resisted entirely by hydraulic jack effort. No air load is fed back to the control column. To provide a measure of control feel, a plain spring is fitted in the control circuit which gives an artificial stick force proportional to stick deflection but not to airspeed. Rotation of the spring-feel strut (66) applies trim when the ailerons are in power.

(b) Trim tabs

Each aileron has a servo-tab which operates during power operation to relieve loads on the booster jacks. When hydraulic pressure falls or is selected off, a pressure-switch operates to enable the ailerons to be trimmed by means of

an actuator connected to the port servo-tab. The spring-loaded trim switch (8) is on the port shelf. A warning light (26), on the port instrument panel, lights up when the port aileron tab is out of the neutral position, provided that MANUAL is selected. *The tab must be at neutral with the light out before power is engaged.* A circuit breaker (4) for the trim circuit is on the port wall.

OTHER AIRCRAFT CONTROLS

19. Elevator and rudder controls

(a) Elevator

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

(b) Rudder

Each rudder has a ground adjustable anti-balance tab. The rudder pedals can be adjusted to suit the pilot's leg length by lifting them and then sliding them forward or aft into the required slot.

20. Flying controls locking gear

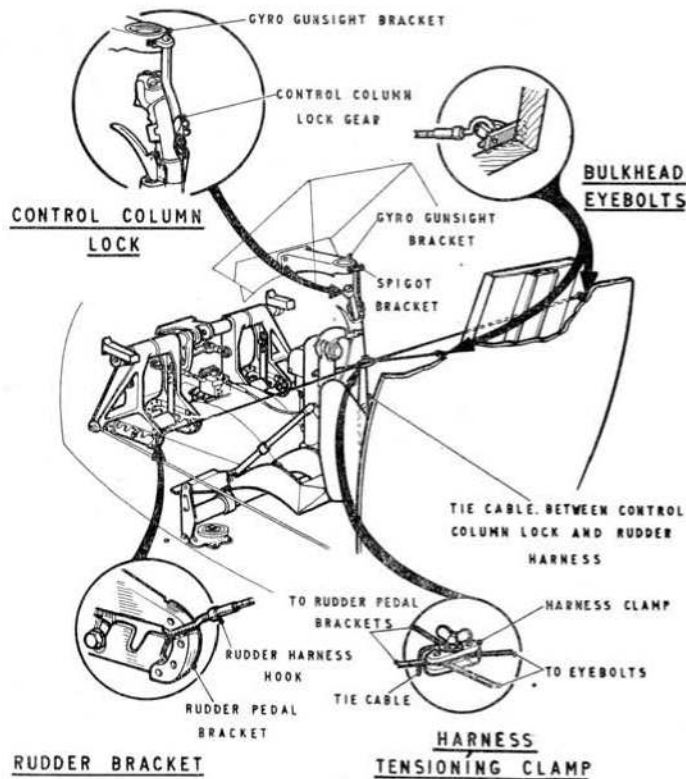
(a) Internal (see diagram overleaf)

The flying controls are locked with a cable harness. The spigot of the handle clamp is inserted into the bracket at the base of the gunsight bracket and the clamp body is bolted round the handgrip.

The small hooks on the cable harness clip into eyebolts on the bulkhead, situated about elbow height each side of the seat. The longer hooks clip on the rudder pedal brackets. Tension adjustment is made by sliding the locking clamp along the harness. The gear is stowed (2) behind the pilot's seat.

(b) External

Clamping blocks are provided for the ailerons.



FLYING CONTROLS LOCKING GEAR

21. Undercarriage

(a) Normal operation

The undercarriage selector (18) is the longest of three levers extending from the rear face of the engine controls box and has two positions, UP and DOWN. A safety catch on the lever must be held back before the lever can be raised. When the wheels are on the ground, the lever is locked in the DOWN position by a solenoid-operated plunger, provided that the lever is *fully* down and the safety catch engaged.

(b) Position indicator

A standard undercarriage position indicator (21) is on the bottom left-hand side of the instrument panel. Indications are:—

Undercarriage locked up	No lights.
Undercarriage unlocked	Three red lights.
Undercarriage locked down	Three green lights.

A red light (29), above the instrument panel, 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.

(c) Emergency operation

If the engine-driven hydraulic pump fails and accumulator pressure is exhausted, the handpump to the left of the pilot's seat can be used to lower the undercarriage. Immediately hydraulic failure is suspected, set the flap selector lever to neutral to avoid possible dumping of hydraulic fluid. Up to 115 strokes may be necessary to lower the undercarriage fully and lock it down.

(d) Undercarriage emergency override

The undercarriage can be retracted in emergency, when the aircraft is on the ground, by first operating the guarded switch (5) on the port wall aft of the throttle box and then using the normal undercarriage selector.

NOTE.—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. This stowage is deleted by Mod. 965.

22. Flaps

(a) Normal operation

The flaps selector lever (16) 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. The lever should be returned to neutral after the flaps are fully down, if it is necessary in emergency to conserve accumulator pressure, but may be left in the up position when they are up.

(b) *Position indicator*

There is a flaps position indicator (23) 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.

(c) *Emergency operation*

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

23. **Airbrakes**(a) *Normal operation*

The airbrakes are operated by a lever (14) extending from the top of the engine control box. No intermediate settings are available.

(b) *Emergency operation*

The airbrakes cannot be operated in flight by the handpump.

24. **Wheel brakes**

The pneumatically-operated wheel brakes are controlled by a lever (incorporating a parking catch) on the control column and differential braking is controlled by use of the rudder bar. The available pressure in the system and at each wheel brake is indicated on the triple-pressure gauge (39). The maximum pressure at each wheel brake is 150 lb./sq. in.

25. **Flight instruments**(a) *Mk. 4F compass and artificial horizon*

The A.C. supply to the Mk. 4F compass and artificial horizon is controlled by the Mk. 4F compass switch (51) on the electrical panel and a circuit breaker (62) at the rear of the cockpit on the starboard side. A test panel (63) for the compass is at the rear on the starboard side. There is no standby inverter but a warning light, on the right of the instrument panel, comes on if the supply to the inverter fails (see para. ~~15 (a)~~).

13 (c)

(b) *Turn and slip indicator*

The electrical supply to the turn and slip indicator is fed through two fuses, connected in parallel and through a relay. If the normal supply fuse fails under operating conditions, the supply will be routed through the alternative fuse. Post-Mod. 409, the turn and slip can also be supplied from an emergency battery, the supply being controlled by the standby V.H.F. ganged switches.

(c) *Pressure-operated instruments*

A combined pressure head on top of the port tailfin supplies pressure for the A.S.I., V.S.I., altimeter and machometer. The pressure head is electrically heated, current for the heater being controlled by a switch (at 49) on the electrical panel.

(d) *E.2A standby compass*

An E.2A standby compass (32) is on the right of the G.G.S.

(e) *Accelerometer*

An accelerometer (33) is outboard of the E.2A compass.

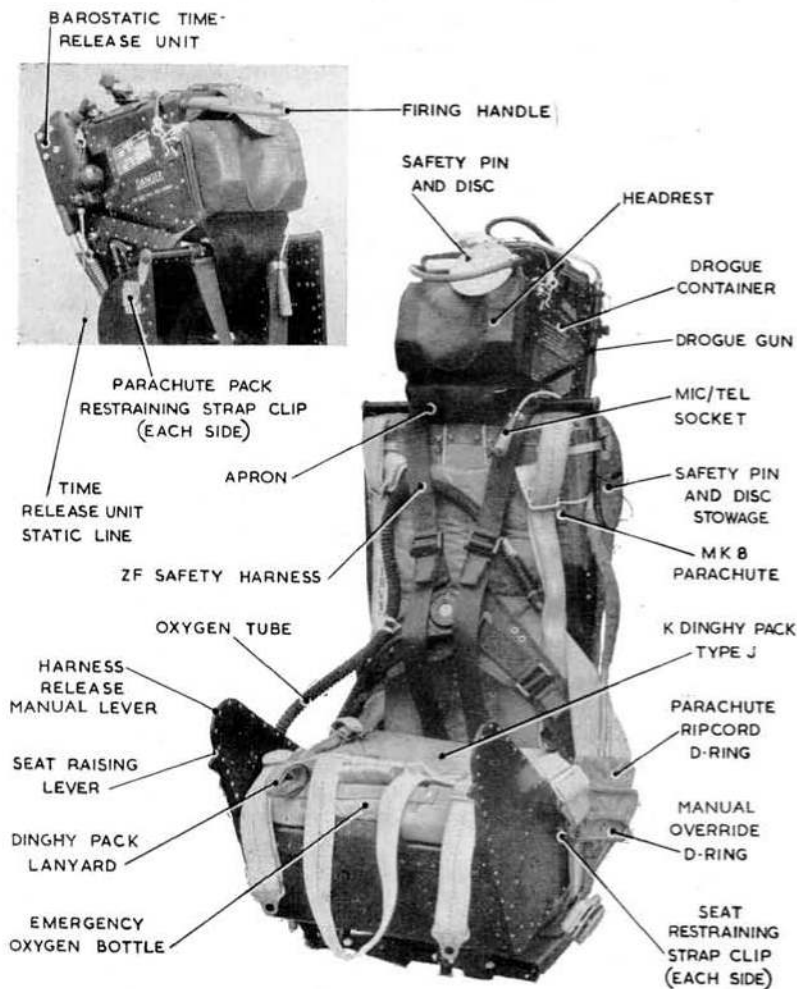
GENERAL EQUIPMENT AND CONTROLS

26. **Entrance to cockpit**

A spring-loaded retractable footstep is located on the port side of the fuselage. The footstep may be pulled out after first depressing the end fairing and is held out by means of a spring-loaded catch. When the weight of the body is on the step, the catch is depressed and when the weight is removed the step should spring to the closed position. It is not possible to operate the step from inside the cockpit.

27. **Ejection seat Mk. 2F**

- (a) A Mk. 2F pilot ejection seat is fitted, incorporating a type ZF harness, headrest, footrests, parachute container and a seat well for the dinghy and emergency oxygen supply.
- (b) The height of the seat may be adjusted by a lever on the starboard side of the seat; the harness release is also on the starboard side.
- (c) The ejection gun is fired by pulling the handle above the headrest.



EJECTION SEAT MK.2F

- (d) All leads incorporate quick releases, which are automatically broken on ejection.
- (e) After ejection, at heights of 10,000 ft. and below, a barostat causes an automatic time cycle to start. After five seconds (3 seconds post seat Mod. 205) the safety harness is released, as are the facescreen, firing handle and headrest pad. An apron attached to the seat drogue then pitches the pilot head first out of the seat, at the same time opening his parachute.
- (f) A manual override D-ring is fitted over the rip-cord D-ring and should be operated to isolate the automatic device if the system has failed.
- (g) Mod. 792 introduces leg-restraining cords.

28. Hood operation

- (a) The sliding hood may be opened or closed by means of the winding handle (53) on the cockpit starboard wall; the handle must first be pulled out, then rotated in the natural sense. A plunger incorporated in the spring-loaded handle permits the hood to be locked in any desired position. When opening the hood from inside, the initial movement of the winding handle will partially turn off the hood seal cock (52), to remind the pilot that this lever must be turned off before opening the hood.
- (b) Mod. 437 introduces a lanyard beside the handle. This lanyard should always be attached during flight. (See subpara. (f) below.)
- (c) Mod. 447 modifies the handle, which no longer has to be pulled out before turning. Instead, the locking plunger is released by pressing a pushbutton in the end of the handle.
- (d) Mod. 929 introduces a shroud over the handle and push-button, preventing inadvertent operation during flight.
- (e) Operation from outside is effected by first pressing and holding in the button marked PRESS TO SLIDE CANOPY, on the starboard side of the fuselage just below the canopy rail. The hood is then free to slide in either direction. The hood cannot be operated externally if the seal cock is ON, or if the lanyard is attached to the handle.

(f) *Jettisoning the hood*

Unless Mods. 1042, 1043 are embodied, the overlapping demisting pipes cause a lock, preventing satisfactory jettisoning, unless the hood is first opened one inch. It is therefore essential that, before jettisoning, the lanyard should be attached to the winding handle and the hood moved back to the limit imposed by the lanyard (one inch). The hood is then jettisoned by pulling inwards the lever (14) on the cockpit starboard wall.

- (g) The hood may be jettisoned from outside by opening the starboard ammunition door above the engine intake and pulling the red-painted jettison cable inside.

29. **Cockpit lighting**

- (a) There are three red floodlamps and four U/V lamps at various places in the cockpit. The master and dimmer switches are all on the port wall. Post-Mod. 328, three further red floodlamps are installed.
- (b) There is a single amber emergency lamp above the instrument panel, which is controlled by a switch (6) on the port wall. The lamp is supplied by a battery independent of the main services.

30. **Oxygen system and pressure-breathing equipment**

- (a) Oxygen is carried in two cylinders stowed behind the pilot's seat. The high pressure supply is taken to a Mk. 16A regulator (41) on the starboard side of the instrument panel. The low pressure supply is taken from the regulator to a selector valve (64), marked P.B. and ECON., behind the pilot's seat on the starboard side. From the selector valve, oxygen is directed either to the pressure-breathing waistcoat and the pilot's type J oxygen mask (when pressure-breathing equipment is in use) or to the economiser and then to the type H mask, via a flexible tube, depending on the position of the selector valve.
- (b) *With pressure-breathing equipment*
When the pressure-breathing waistcoat and type J mask are used, the selector valve must be wired in the P.B. position. The flow selector lever on the regulator should be used in the normal way to vary the flow according to the cockpit altitude.

(c) *Without pressure-breathing equipment*

When the type H mask is used, the selector valve must be wired in the ECON. position.

NOTE.—1. The economiser will be damaged if pressure-breathing equipment is used with the selector valve in the ECON. position. The ECON. position must always be used when wearing an H-type mask.

2. The use of pressure-breathing equipment entails the replacement of the Mk. 1 quick-release socket in the pilot's supply tube by a Mk. 3 quick-release plug. The changeover from ECON. to P.B. cannot therefore be made in flight.

31. **Emergency oxygen**

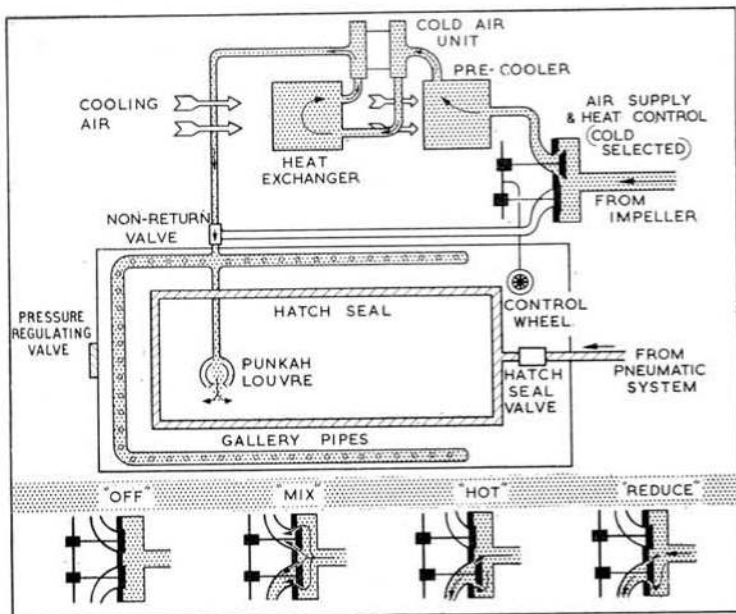
An oxygen supply is incorporated in the dinghy pack. On ejection, the main oxygen service is broken at the quick-release plug, while a cable anchor by the economiser operates the emergency oxygen supply to the pilot's mask.

32. **Cockpit air conditioning**

NOTE.—A hood seal control on the starboard wall must be on before attempting to pressurise the cockpit.

- (a) Cockpit pressurising, heating and cooling are controlled by movement of the wheel (3) on the port wall. The wheel rotates through 270° and has five marked positions: OFF—COLD—MIX—HOT—REDUCE. COLD or MIX *must not* be selected on the ground, otherwise overheating of the cold air unit may occur with subsequent damage.
- (b) *Pressure*

With the hood seal cock on and the wheel set other than OFF, 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 of 3 lb./sq. in. is reached. The cockpit pressure is indicated on an altimeter (38) at the right-hand side of the instrument panel. A warning light (40), below the altimeter, comes on when the cockpit altitude falls below the allowable minimum for a given altitude. The table overleaf shows the cockpit altitudes corresponding to the minimum pressures. When the control is at REDUCE the cockpit pressure will be reduced.



COCKPIT PRESSURISATION AND HEATING

Actual altitude (ft.)	Equivalent altitude (cockpit)	Approx. cockpit altitude at which light comes on
20,000	14,100	18,000
30,000	18,800	22,000
40,000	24,000	28,000
50,000	28,000	32,000

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- (c) Air for pressurising enters the cockpit through a louvre and through holes in the windscreen and hood de-misting pipe. The amount of air passing to the windscreen can be controlled by adjusting the louvre. Post-Mod. 1043, when COLD is selected, air does not pass through the demisting pipes and it is therefore necessary to open the louvre to obtain pressurisation.

33. Windscreen de-icing

The windscreen de-icing system is operated by a hand-pump (43) on the right of the cockpit floor. The handle is turned anti-clockwise to unlock and pumped in to raise pressure. The handle returns slowly to the out position while spraying the windscreen.

34. Anti-G equipment

Pressurised air for the G-suit is taken from pneumatic connections attached to the seat. The selector lever (42) below the oxygen regulator is pulled out and moved in-board for ON. The anti-G valve and test button (60) (pushed down to test) are at the after end of the electrical panel. If pneumatic system failure occurs, pressure in the anti-G system fails when the air bottle pressure falls to 250 lb./sq. in.

35. Emergency equipment

Stowage for a first-aid kit is provided on the decking behind the pilot's head. A crowbar (1) is on the left of the pilot's seat.

36. External lighting

Lights	Switch position
Navigation lights	(49) on electrical panel
Identification lights	(49) on electrical panel
Landing lamp	Three-position selector switch (59) OFF—LOW—HIGH on electrical panel NOTE.—No lamp fitted at present

SIGNALS EQUIPMENT

37. Wireless installation

- (a) *V.H.F.*—*TR.1934*, *TR.1985* or *TR.1998*
The V.H.F. controller (24) is on the left-hand instrument panel. The pilot's press-to-transmit switch is on the G.G.S. twist-grip.
- (b) *Standby V.H.F.* (*TR.2002*)
- (i) Mod. 409, amended by SRIM 1994, introduces a standby V.H.F. system, which can be run from either the main or the emergency battery. The system is controlled by three ganged switches (marked NORMAL V.H.F.—STANDBY V.H.F. and wire-locked to NORMAL) and a single switch (marked S/B V.H.F., OFF—ON), both on the electrical panel.

- (ii) When testing the normal V.H.F., the standby can be tested by putting the single switch ON. The TR.2002 should then operate from the mains battery, cutting out the normal V.H.F.
 - (iii) If main electrical power fails, the standby set is brought into operation by breaking the wire lock on the ganged switches and selecting STANDBY V.H.F. The standby set (and the turn and slip indicator) are then supplied by the emergency battery.
 - (iv) If the normal V.H.F. system fails, but main electrical power is available, the ganged switches should be left in the NORMAL position and the single switch should be put ON.
- (c) *Telebriefing*
The pilot's warning light (22) (which indicates that the system is in use) and the press-to-talk pushbutton are on the lower side of the port instrument panel. The landline connector is in the end of the port tail boom.
- (d) *Rebecca Mk. 7*
The controller is at the aft end of the port wall, the range and heading indicator (28) is on the left of the G.G.S. and a circuit-breaker (56) is above the electrical panel.

ARMAMENT EQUIPMENT

38. **Guns**

There are four 20 mm. guns, two on each side of the nose; they are fired electrically by a trigger on the control column, after the safety catch has been released. To prevent inadvertent firing of the guns when the aircraft is on the ground, the electrical firing circuit is broken when the undercarriage is locked down. Mod. 933 introduces a 3-position armament safety switch in the nosewheel bay, allowing gun-firing on the ground. The switch is marked GUN FIRE TEST SWITCH and is spring-loaded to the off (centre) position.

39. **Gunsight**(a) *Gyro-gunsight*

A gyro-gunsight Mk. 4E is above the instrument panel and is controlled by the master switch (57) on the electrical panel. The R.P./GUNS selector (58) is on the starboard wall.

(b) *G.G.S. selector-dimmer control*

A G.G.S. selector-dimmer control (30) is at the top of the instrument panel to the right of the gunsight. Ranging is operated by a twist-grip on the throttle lever handle.

40. **Cameras**(a) *G.G.S. recorder-camera*

A recorder-camera may be fitted on the top of the gunsight. It will operate whenever the guns are fired or the camera button on the control column is pressed, provided that the camera master switch (57) on the electrical panel is on. Stowage for the camera is provided on the cockpit floor beneath the throttle quadrant. A test switch on the lower port instrument panel enables the camera circuit to be tested on the ground.

(b) *G.45 camera*

A G.45 camera is pod-mounted beneath the port wing and will operate whenever the guns are fired or the camera switch is operated, provided that the camera master switch is on. A sunny-cloudy switch (49) is on the electrical panel.

41. **R.P. and bombs**

The R.P.s may be fired either in pairs or salvos according to the position of the PAIRS-SALVO selector switch (57). The firing pushbutton is mounted on the control column handgrip. The button releases the R.P.s or bombs according to the position of the R.P./BOMBS selector switch on the electrical panel. The nose and tail fusing switches, the single-salvo selector and the port and starboard selector switches (57) for the bombs are also on the electrical panel.

42. **Light series bomb carrier**

Light series bomb carriers may be fitted on the bomb pylons to carry light practice bombs. Changeover switches in the wheel wells are set to PRACTICE BOMBS when the carriers are fitted.

43. **Bomb jettisoning**(a) *Bombs fitted direct to pylons*

There is no electrical bomb jettison switch. Bombs may be jettisoned unfused through the normal release circuit or by

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the mechanical jettison lever. If provision is made for pylon tanks (Mod. 78), bombs may be jettisoned electrically (fused or unfused, depending on the position of the fusing switch) by use of the pylon tank release button on the inboard face of the throttle box.

(b) *Bombs fitted to light series carriers*

In this case, the pylon electrical release circuit is disconnected, therefore bombs cannot be jettisoned electrically through the pylon tank circuit. They may be released singly through the normal bomb circuit (in which case they will be fused), or the carriers complete with bombs (unfused) may be jettisoned by the mechanical jettison lever.



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R-Type Mk2
pressure breathing
mask

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