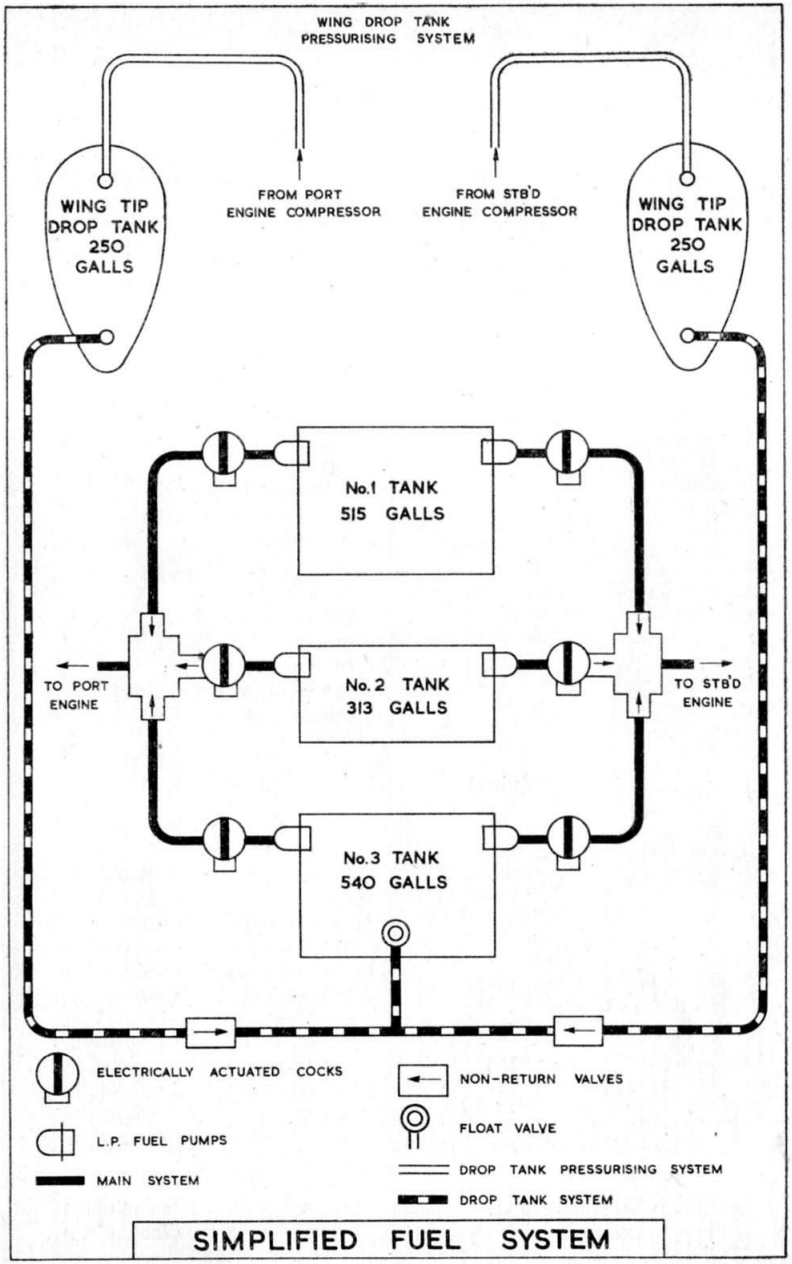

SIMPLIFIED FUEL SYSTEM

CANBERRA B2

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 V.

(c) Unless otherwise stated all airspeeds and Mach numbers quoted are "Indicated".

INTRODUCTION

The Canberra B2 is a light bomber powered by two AVON Mk1 turbine jet engines. It is an all metal mid-wing aircraft fitted with a tricycle undercarriage. The cabin is pressurised and affords accommodation for a crew of three seated in ejection seats. There is an alternative station in the nose of the aircraft for the air-bomber but there is no provision for his ejection when at this station.

FUEL AND OIL SYSTEMS

1. **Fuel system general**

(i) Three fuel tanks are fitted in the fuselage; they are numbered 1, 2 and 3 from front to rear. Two drop tanks, which feed automatically under air pressure into No. 3 tank, can be carried one beneath each wing tip.

(ii) Fuel is fed by immersed electrically-driven fuel pumps in the tanks through low-pressure cocks and filters to twin engine-driven high-pressure pumps on each engine.

(iii) From the engine-driven pumps fuel passes through the throttle valves and high-pressure fuel cocks to the engine burner rings.

(iv) A barometric pressure control—(B.P.C.) and an acceleration control unit (A.C.U.) incorporated in the fuel system

of each engine regulate the delivery pressure from the high-pressure pumps to maintain the required fuel-air ratio and r.p.m.

(v) Duple burners are incorporated.

(vi) High-pressure pump isolating valves controlled by switches (17) are fitted; these enable pressure regulation by the B.P.C. and A.C.U. to be cut out in the event of a defect developing in the pressure regulating mechanism.

2. Fuel tanks

(i) The three fuselage tanks are of flexible construction; Nos. 1 and 2 are internally braced and are self-sealing: No. 3 is of the flexible bag type. These tanks are vented to atmosphere and there is provision for incorporating a nitrogen protection system. Filler caps, one for each tank, are located beneath access doors in the roof of the fuselage aft of the equipment bay hatch. No negative "g" valves or traps are fitted. Fuel tank vent valve heaters are fitted for use when the nitrogen system is used. The heaters are controlled from a switch at (2) on the pilot's switch panel.

(ii) The auxiliary wing drop tanks are non self-sealing. They are pressurised, each from the engine compressor in the same wing, and both feed together and automatically through float-valves into No. 3 fuselage tank. No cocks or other controls, except the jettison switch—see para. 5—are required for these tanks and there is no provision for nitrogen protection.

(iii) The effective fuel capacities of the tanks are approximately:—

No. 1 tank	512 gallons
No. 2 tank	317 gallons
No. 3 tank	545 gallons*
Total main tanks	1,374 gallons
Wing drop tanks 2 × 250	500 gallons
Total all tanks	1,874 gallons

*The capacity of this tank may be found to be somewhat less than normal until the bag stretches with use.

3. Fuel cocks and tank pumps

(i) *Low-pressure fuel pumps and cocks*

Two electrically driven pumps are fitted in each fuselage tank, one in a sump on each side. The outlet from each pump is connected to an electrically actuated low-pressure cock. The pumps on the port side of each tank feed into a common collector box and so to No. 1 engine; those on the starboard side similarly supply No. 2 engine. Thus either one, two or three tanks can be used to feed either or both engines together or independently. Each pump and its associated low-pressure cock is controlled from one of six switches (53) fitted in two rows one each side of the fuel tank contents gauges on the engine instrument panel. The left-hand row of switches is labelled No. 1 ENGINE FUEL COCKS AND PUMPS, and the right-hand row No. 2 ENGINE FUEL COCKS AND PUMPS. The upper switch of each row controls the No. 1 tank pump and cock; the middle switch, the No. 2; and the bottom switch the No. 3 pump and cock. The switches are set up for ON. The engines should not be stopped by turning off these switches as this causes the engine-driven pumps to run dry and air to be drawn into the pipe lines. For this reason it is also necessary to leave at least one switch on for each engine whenever it is rotating.

(ii) *Fuel pressure warning lights*

Two fuel pressure warning lights (52) and (54) one for each engine, are fitted on the engine instrument panel. They come on if the fuel pressure at the suction side of the engine-driven pumps falls appreciably below normal due to failure of a low-pressure pump or shortage of fuel in the tank(s) in use.

(iii) *High-pressure cocks*

These are controlled from the levers (16) fitted outboard of the throttle levers. The left-hand lever controls the No. 1 engine cock and the right-hand, the No. 2 engine cock; they incorporate relighting pushbuttons. The levers are set forward for ON and back for OFF and may be clamped in either position by the smaller of the two knurled knobs (18) labelled UNLOCK — COCK LEVERS—LOCK.

4. **Fuel tank contents gauges**

(i) Three pacitor type gauges (53), one for each tank, are on the engine instrument panel. The top gauge is for No. 1 tank; the middle for No. 2; and the bottom gauge for No. 3 tank.

(ii) No contents gauges are fitted for the drop tanks.

5. **Oil system**

(i) The sump of each engine contains about 19 pints of oil for lubrication of the main engine bearings and engine-driven accessories. There are no oil tanks.

(ii) Oil pressure gauges (43), one for each engine are fitted on the engine instrument panel; these register whenever electrical supply to the instruments is available.

ENGINE CONTROLS

6. **Throttle controls**

(i) The two throttle levers (15) are on the engine controls quadrant marked SHUT—THROTTLE—OPEN, on the port side of the cockpit. The friction is adjusted by means of the larger of the two knurled knobs (18) on the side of the throttle box.

(ii) To minimise the tendency for surging and excessive temperatures to occur during acceleration when the throttles are opened rapidly, acceleration control units are embodied in the engine fuel pump servo regulating systems. These become progressively less effective as altitude is gained ceasing to function at about 5,000 feet. They are also rendered ineffective when the fuel pump isolating valves are closed. Surging in the lower r.p.m. range is further minimised by the incorporation in the engine compressors of automatic bleed valves and variable angle swirl vanes. As the engine accelerates the closing of the bleed valves and change in angle of the swirl vanes cause, at about 6,700 r.p.m., a sudden decrease of approximately 300 r.p.m with a noticeable increase in thrust. The r.p.m. then increase steadily as the throttle is further opened. As power is reduced, when r.p.m. fall to about 6,200 there is a sudden increase of about 300 r.p.m. with a marked decrease in thrust as the bleed valves open and the swirl vane angle changes. With the bleed

valves open the engine operates less efficiently with a consequent increase in specific fuel consumption.

7. **Engine starting system**

(i) A single breech cartridge starter is fitted for each engine. They are operated by the starter pushbuttons (25) and (56) fitted on the sloping extension below the instrument flying panel.

(ii) *Loading procedure*

After checking that the MASTER STARTING switch (26) is set to OFF, the breech cap is unscrewed and the cartridge inserted so that the extractor claws grip the base. The cartridge is then inserted into the barrel and the cap screwed home finger tight only, while holding the central spring-loaded stud depressed. If screwed too tight it may be difficult to unscrew subsequently and the starter may be damaged. A spent cartridge is removed by unscrewing the cap after releasing the locking ratchet by pressing on the spring-loaded stud in the cap. The cartridge case is removed from the cap by depressing the two finger buttons at its base.

(iii) *Reloading interval*

When the starter is cold two shots may be fired in rapid sequence. A pause of ten minutes must be made before reloading and firing each subsequent shot.

(iv) On no account should any work be carried out on the starter while the engine is rotating.

(v) The torch igniters are operated by the starter time sequence switch, after pressing the starter pushbutton, if the IGNITION switches on the sloping panel below the instrument flying panel are on.

(vi) The cartridge starter firing pushbuttons and ignition switches are operative only when the master starting switch is ON. When these pushbuttons are pressed the starter time sequence switches come into operation to energise the torch igniters and fire the cartridges. To turn the engines without starting them, the ignition switches are turned off to ensure that the torch igniters do not operate when the starter pushbuttons are pressed.

8. **Engine relighting system**

The torch igniters may be used to relight an engine in flight, if its ignition switch and the master starting switch are on, by pressing the relighting pushbutton on the knob of the appropriate high-pressure cock lever.

9. **Engine instruments**

The fuel gauges, fuel pressure warning lights, r.p.m. indicators (39) and (42), an oil pressure gauge for each engine, and a dual jet pipe temperature gauge (40), are fitted on the engine instrument panel.

MAIN SERVICES

10. **Hydraulic system**

(i) A hydraulic pump on each engine draws fluid from a hydraulic fluid reservoir which contains 31 pints of fluid and is fitted on the starboard side in the equipment bay. A standpipe in the reservoir conserves a reserve of fluid for use with the handpump. From the engine-driven pumps fluid is delivered to the system for operation of the:—

Undercarriage
Flaps
Air brakes
Bomb doors
Wheel brakes

(ii) For servicing purposes, or in the event of engine or pump failure or shortage of fluid, all services can be operated by means of the handpump (66) fitted by the pilot's right knee. When not in use the handle for this pump is stowed in clips aft of the entrance door on the starboard side.

(iii) Two hydraulic accumulators are incorporated to equalise pressure in the system and ensure rapid operation of the services. One is fitted in the forward bomb-bay for the wheel brakes, and a second in the the starboard wheel well for the other services. Each accumulator is fitted with a pressure gauge which should indicate not less than 1,350 lb./sq. in. when the engines are not running. An additional gauge indicating the pressure in the brake system accumulator is fitted outboard of the engine instrument panel.

(iv) A cut-out in the main hydraulic pump delivery circuit operates automatically to maintain the working pressure in the accumulators and system generally at 2,500 to 2,550 lb./sq. in.

(v) The selector valves for all services, except the wheel brakes, are electrically actuated from switches in the cockpit. The wheel brake control valve is mechanically operated and there is provision for mechanical actuation of the selector valves for lowering the undercarriage and opening the bomb doors in emergency.

11. **Electrical system (24 volts)**

(i) *D.C. supply*

A 6 K.W. generator on each engine charges the battery which supplies power for the operation of the electrical services.

(ii) *Generator control*

(a) Each generator has a control switch (74) and (77), a field circuit breaker (79) and a generator failure warning light (73) and (78) situated on the electrical control panel. Should at any time a generator fail in flight as indicated by its warning light, its control switch should be set to OFF and after a short pause ON again; this will reset the main generator circuit breaker if this has tripped. If the warning light does not go out, check and if necessary reset the field circuit breaker. If the warning light still remains on the generator should be isolated by setting its control switch to OFF. A voltmeter (75) indicates the voltage of the D.C. electrical system. When the generators are charging, the normal reading is 28 volts, when they are not charging the normal reading is 24 volts.

(b) Should a generator failure warning light remain on, or when flying on one engine, all non-essential electrical load, and in any case No. 5 inverter, should be switched off (see sub-para. (x) and subsequent sub-paras.).

(c) The generator cut-in speed is about 4,150 r.p.m. and cut-out speed is between 4,000 and 3,500 r.p.m. If a generator has cut in and the engine is subsequently throttled to r.p.m. below 4,000 a heavy discharge

from the battery will occur, and will persist until the generator cuts out. Full output is maintained at r.p.m. in excess of 5,000. Should at any time the voltmeter reading fall below 22 volts when low r.p.m. are being used, r.p.m. should be increased and maintained above 5,000 for as long as practicable and all non-essential electrical loads switched off.

(iii) *Battery control*

(a) A GROUND/FLIGHT switch and external battery socket are fitted behind an access door on the starboard side of the fuselage aft of the entrance door. When set to GROUND the aircraft battery is isolated from the system but all services can be operated from a ground battery or by current supplied by the generators providing the engines are running above 4,500 r.p.m.

(b) A battery isolating switch (76) on the electrical control panel when set to OFF isolates the battery from the electrical system with the exception of the crash switch, the canopy escape hatches, and bomb emergency jettison, circuits. A similar isolation of the electrical services is effected automatically by the crash switch which also operates the engine fire-extinguishers.

(c) Although engine starting is effected by cartridge it is recommended that except in emergency an external electrical supply is used during starting in order to relieve the aircraft battery of unnecessary load.

(iv) *Circuit breakers*

Twelve circuit breakers (62) operable by the pilot, one for each L.P. cock and L.P. pump, are situated beneath a spring-loaded perspex plate on the forward face of the electrical control panel. Any circuit breaker which has tripped due to temporary overload may be reset by depressing the plate. A circuit breaker (72) marked PILOTS SERVICES situated on the electrical control panel protects the supply to the:—

External lighting and landing lamp.
D.V. panel demisting heater.
Fuel vent valve heater.
Pressure-head heater.

(v) *A.C. supply*

A.C. current is supplied to the flight instruments and radar equipment by D.C. to A.C. inverters. Both the D.C. and A.C. supply to the radar equipment are controlled automatically by switching on its A.C. power supply switch.

(vi) *Flight instruments power supply*

(a) The power supply for the A.C. operated flight instruments is provided by Nos. 2 and 3 inverters whose output is controlled at 115 volts 400 cycles. The distribution of power is as follows:—

No. 2 inverter	*No. 3 inverter*
Mk. 4B compass	Bomb sight
Artificial horizon	Computor
	Radar scanner and cooling motors
Oil pressure indicators	Radar regulator cooling motor

(b) In the event of failure of No. 2 inverter the supply to all the flight instruments may be taken from No. 3 inverter. In the event of failure of both inverters the D.C. supply to the turn and slip indicator should remain. In the event of failure of No. 3 inverter the relevant radar equipment is automatically switched off to prevent damage due to overheating.

(vii) *Flight instruments control*

(a) Under normal operation Nos. 2 and 3 inverters are automatically switched on when the engine Master Starting Switch is set to ON. When necessary the inverters may be switched on independently of the Master Starting Switch by putting the switch (71), on the electrical control panel, marked NORMAL—TEST, to the TEST position.

(b) An A.C. voltmeter (70) on the electrical control panel, under normal conditions shows the A.C. voltage supplied from No. 2 inverter to the flight instruments. In emergency when No. 3 inverter is supplying the flight instruments the voltmeter then shows the voltage from No. 3 inverter.

(c) The D.C. supply to the NORMAL—TEST switch and Master Starting Switch, and through this switch to the turn and slip indicator, is protected by the

400 cycle circuit breaker (67). Similarly the D.C. supply to both Nos. 2 and 3 inverters is protected by circuit breakers (84) marked INVERTERS No. 2 and No. 3.

(viii) *Flight instruments emergency control*

In the event of failure of No. 2 inverter as indicated by either the A.C. voltmeter falling into the red portion of the scale or the behaviour of the instruments themselves, the switch (80) marked NORMAL—EMERGENCY should be set to EMERGENCY. No. 2 inverter is then isolated and No. 3 inverter supplies the flight instruments as well as the equipment normally supplied by it.

(ix) *D.C. supply to the turn and slip indicator*

In the event of failure of both Nos. 2 and 3 inverters, although the A.C. operated instruments will not function, the turn and slip indicator may still be available with either:—

(a) the normal—emergency switch set to EMERGENCY provided that the No. 3 inverter circuit breaker has not tripped, or:—

(b) the normal—emergency switch set to NORMAL provided that the 400 cycles circuit breaker has not tripped.

(x) *Radar power supply*

A.C. current at 115 volts 1,600 cycles is provided by inverter No. 5 with No. 4 inverter as an emergency standby. To ensure that only one inverter is running at one time, a master switch (68) on the electrical control panel marked NO. 4—NO. 5 CHANGEOVER is provided. It is normally set to No. 5.

(xi) *Control of radar power supply*

(a) No. 5 inverter supplies A.C. current for the operation of:—

Rebecca
Gee H
Tail warning device

(b) Control of No. 5 inverter is effected through two push switches (81) marked START—NO. 5 INVERTER: STOP—NO. 5 INVERTER, provided that the changeover switch (68) is set to No. 5.

(c) Four ON-OFF switches (82) labelled for their respective services distribute the output of No. 5 inverter in addition to the D.C. supply to the individual equipment.

(d) The D.C. supply to No. 5 inverter and the equipment it supplies is protected by the 1,600 cycle circuit breaker (83).

(xii) *Radar power supply emergency control*

(a) In the event of failure of No. 5 inverter the A.C. supply can be maintained by:—
(i) Switching the changeover switch to No. 4.
(ii) Switching on No. 4 inverter switch (69).
No. 4 inverter operates at a reduced output and automatic isolation of the tail warning device and the transmitter of the Gee H equipment is provided. Both Rebecca and the Gee receiver, however, remain operative in emergency but only one of these aids should be used at a time to prevent overloading No. 4 inverter.

(b) A circuit breaker marked INVERTER No. 4 (84) protects the D.C. supply to No. 4 inverter.

NOTE.—It is important when starting No. 4 or No. 5 inverter that the individual services supply switches (82) should be in the OFF position.

AIRCRAFT CONTROLS

12. **Flying controls**

(i) The control column handwheel carries the wheel brake lever (37), parking catch (31), tailplane incidence control switch (38), a Press-to-Transmit pushbutton (24) and the air brake control switch (35). A snatch device is incorporated to ensure that the control column does not impede the pilot's exit during ejection. This works in conjunction with the canopy emergency jettison system which, when operated, pulls the control column fully forward at the same time severing, by means of an explosive charge, the connection between the control column and the elevator control system.

(ii) The rudder pedals are of the conventional type and are adjustable for leg reach by means of the central star wheel (57) on the rudder bar.

13. **Flying controls locking gear and picketing points**

(i) All control surfaces are locked by means of clamps with red flags attached fitted externally. In flight the clamps are stowed in a valise in the rear fuselage reached through the camera hatch. Operation of the flap selector switch when the external clamps are fitted, can damage the flaps; this is prevented by locking the switch in the up position by a pin attached to a large metal disc. The pin is stowed in flight with the locking clamps in the valise.

(ii) Ring bolts are provided for picketing; they are stowed with the control locking clamps, and screw into sockets covered by flaps labelled PICKETING POINT located as follows:—

On each main undercarriage fairing.
Below the fuselage aft of the rear skid.

A fourth picketing attachment is provided by the radius rod lugs on the nose-wheel strut.

14. **Variable incidence tailplane and trimming controls**

(i) The tailplane incidence is electrically controlled from a switch (38) labelled TAIL TRIM CONTROL NOSE DOWN—OFF—TAIL DOWN on the control column.

(ii) The rudder trimming tab and aileron spring tab bias device are also electrically operated from switches (20) on the shelf on the port side of the cockpit.

(iii) Position indicators for all three controls are on the left-hand side of the instrument flying panel.

15. **Undercarriage controls and indicator**

(i) Two pushbuttons (28) to the left of the instrument flying panel control the electrical actuators for the undercarriage selector valve. The red button is pressed for UP and the green button for DOWN. An electrically operated lock prevents normal operation of the UP button when the weight of the aircraft is on the wheels. This lock can be overridden by applying extra pressure on the UP button.

(ii) A standard type undercarriage position indicator (27) is fitted near the pushbuttons. The red nose-wheel light comes on at any time if either throttle is less than one-third open when the wheels are not locked down.

(iii) In emergency the undercarriage can be selected down

mechanically by pulling the red toggle handle (30) fitted above the pushbuttons.

16. **Flaps control**

(i) The flaps selector electrical actuator is controlled from the switch (29) which is set up to raise and down to lower the flaps. They have only two positions, fully up or fully down. No provision is made for mechanical operation.

(ii) The flaps position indicator is on the panel near the trim indicators.

17. **Air brakes control**

The switch (35) controlling the electrical actuator for the air brakes is on the control column. It has three positions, OFF (for in), HALF and FULL. On early aircraft this switch has two positions only, OFF (in) and ON (fully out).

18. **Wheel brakes control**

(i) The hydraulic wheel brakes are operated by the lever (37) on the control column. A parking catch (31) is provided. Differential application is obtained by operating the rudder bar.

(ii) The pressure available for brake operation, which should not be less than 1,300 lb./sq. in. is shown on the gauge. If pressure is low it can be restored by means of the handpump.

GENERAL EQUIPMENT AND SERVICES

19. **Access**

(i) Entrance to the pressure cabin is through the pressure-tight door on the starboard side of the fuselage below the canopy. It is opened from outside by pressing the button to release the handle which is then pulled out and turned anti-clockwise to withdraw the bolts. From inside the door is locked by rotating the toggle handle, near the lower edge, anti-clockwise and then pulling the handle inboard. To open the door the button forward of the handle is

pressed, the handle pushed outboard and rotated clockwise.

(ii) For emergency jettisoning—see Part IV.

20. **Seats and harness releases**

(i) The pilot's seat, and the two side-by-side seats in the navigator's compartment are of the emergency ejection type. See (iv) below.

(ii) Adjustment for height is effected by means of levers, incorporating thumb operated spring-loaded catches, fitted on the starboard side of each seat. The pilot's seat lever is (65).

(iii) The Z type harness locks may be released by means of a spring-loaded lever—pilot's (63)—on the starboard thigh guard, to allow the wearer to lean forward. When the lever is released the harness is locked by a ratchet mechanism from going further forward; as the wearer leans back, however, the harness is locked in any position, and to lean forward again he must operate the spring-loaded lever. If in the first instance the wearer leans forward more than six inches before releasing the lever, the harness locks will be beyond the ratchet mechanism and the wearer can lean forward or back as desired until he leans back to the six inch position, where the ratchet mechanism again comes into play.

(iv) The ejection seats incorporate headrests, footrests, two thigh guards, and a folding guard for the right knee—the pilot's retaining clamp is (64). At the rear of each seat is the ejection gun and on the port side the drogue gun. The ejection gun of each seat is fired independently by means of a handle immediately above the headrest, to which is attached a flexible blind to protect the face. When the handle is pulled down to the full extent of its travel it operates a sear which releases the firing pin.

(v) The drogue gun, which releases a drogue parachute stowed in the container behind the headrest, is fired by means of a static line attached to the aircraft and does not operate until the seat is well clear. The drogue parachute slows down and stabilizes the seat, enabling the pilot to release his harness, fall forward out of the seat

and make a normal parachute descent.

WARNING.—The firing handle must always be locked against the possibility of accidental withdrawal whenever the aircraft is on the ground. A fabric safety strap is attached to the front edge of the drogue container and it should be passed through the blind handle and secured by means of the safety pin which is attached to a metal disc. It is the occupants responsibility to do this after landing, and to remove and stow the pin in the stowage provided on the port side of the drogue container prior to take-off. Immediately on entering the cockpit, personnel must ensure that the firing handles are locked.

21. **Pressure cabin**

(i) The cabin is pressurised with a controllable mixture of hot and cold air from the compressors of both engines. A pressure control valve automatically maintains the correct pressure in the cabin at altitudes above 10,000 feet. Below this height the cabin is not pressurised.

(ii) A cabin pressure red warning light (49) on the panel to the right of the engine instrument panel comes on if, owing to a leak or defect in the system, the cabin pressure falls excessively.

(iii) A cabin altimeter (48) indicating the equivalent pressure altitude in the cabin, is on the panel to the right of the engine instrument panel.

(iv) The cabin may be pressurised and the cabin temperature regulated by adjusting the switch (50) marked COLD—OFF—HOT. When the needle of the indicator (51) is vertical the cabin is pressurised, further movement of the needle into the red segment increases the temperature of the pressurising air. Below 10,000 feet this control works only as a cabin temperature control.

(v) At low altitudes, cold air can be admitted to the cabin through an adjustable vent to the left of the instrument flying panel. This shuts off automatically when pressurising commences but should always be closed when cold air is not required.

22. **Canopy D.V. panel and demisting**

(i) The jettisonable canopy cannot be opened on the ground or in flight. A direct vision window is fitted to port of a

small armoured glass windscreen. The window is electrically heated the switch being at (2). At low altitudes, at which the cabin is not pressurised, the window can be opened by unscrewing the knurled clamping knob and hinging the frame downwards ensuring that it engages in the retaining clip. The window must always be closed and tightly secured before the aircraft is taken to altitudes at which pressurising becomes effective.

(ii) The entire canopy and air-bomber's window in the nose are of the "dry air" sandwich type. Cartridges containing the drying agent for the canopy are fitted, one on the coaming behind the pilot's right shoulder and one on the shelf behind his seat. Small indicator windows in the casings enable the crystals to be seen, they should appear green when the cartridges are in serviceable condition. Dry air is circulated through the canopy by a small electrically driven fan controlled from a switch at (2). This should be switched on when entering the cockpit to ensure that all the air in the sandwich is passed through the drying cartridges before take-off.

23. **Canopy and roof hatch jettisoning and control column snatch unit controls and operation**

(i) A panel marked DANGER DETONATORS on the port side of the fuselage carries:—

(a) A MASTER SAFETY SWITCH (10) which must be set to ON before the canopy and roof hatch jettisoning and control column snatch unit can be operated. It should be set to ON before take-off and switched OFF after landing.

(b) A CANOPY JETTISON SWITCH (13) which when set to ON fires the detonators to explode the canopy and roof hatch bolts thus allowing the canopy and hatch to blow off. It does not operate the control column snatch unit. This switch is protected by a spring guard.

(ii) With the master safety switch on, raising the shielded lever (21), fitted on the shelf to port of the pilot's seat, operates both the canopy and roof hatch jettisoning and control column snatch unit circuits. It is for use prior to abandoning the aircraft by means of the ejection seats. It should be operated immediately before abandoning only, as control of the aircraft is lost immediately the

control column snatch unit operates. This lever is shielded by a hinged flap (21) marked DANGER CONTROL COLUMN RELEASE AND CANOPY JETTISON.

(iii) The navigator's roof hatch can be jettisoned independently of the canopy by setting either of the two shielded SAFETY switches to ON and then operating the associated guarded switch marked JETTISON. These are mounted in the navigator's compartment on the port and starboard (93) sides respectively.

24. **Oxygen system and pressure breathing**

(i) Six 750 litre oxygen cylinders are stowed on the port side aft of the pressure bulkhead.

(ii) A Mk.11C regulator (6) is fitted on the port wall of the cockpit for the pilot.

(iii) A Mk.11D regulator is fitted on the port side of the navigator's station. This supplies oxygen to the port navigator as well as to two Mk.11E regulators fitted, one at the starboard air-bomber's position (90), and the second at his nose station with a mask tube socket near it.

(iv) Three economisers are fitted, one for the pilot, one for the navigator and one for the air bomber when occupying his seat; when at his nose station pressure breathing only is provided.

(v) A change-over cock (60) and quick release mask tube socket is fitted to the right of his seat for the pilot. Similar cocks and sockets are on the bulkhead, adjacent to the two crew seats. These cocks enable normal oxygen supply to be drawn through the economisers or pressure breathing to be selected. These cocks should be pre-set and wire locked in the required position before flight. The mask tubes disconnect automatically when the seats are ejected.

25. **Cabin lighting**

(i) The cabin is illuminated by two dome lamps, one on each side in the roof in the navigator's compartment. The lamp-holders incorporate switches. Small floodlamps (91) are fitted near the dome lamps. They are controlled by dimmer switches adjacent to them.

(ii) The cockpit instrument panels are illuminated by 4 U.V. and 4 red floodlamps. Four dimmer switches, two on the

port side (32) and (33), each controlling two lamps, are fitted centrally on the coaming.

(iii) Emergency panel lamps are on either side below the coaming. The ON-OFF switch (34) for these is on the coaming; it has a luminous spot for identification in the dark. These emergency lamps are operated from a separate 2.4 volt battery.

(iv) In addition to the main lamps and floodlamps in the navigator's compartment there is a portable chart board lamp with an integral dimmer switch, which can be plugged into either of two sockets, one embodied in each of the main dome lamps.

(v) A dome lamp with integral switch is fitted at the air bomber's nose station.

26. **External lighting**

(i) An EXTERNAL LIGHTS MASTER switch (19) is on the switch panel to port of the pilot's seat; it must be set ON before any of the external lights will function.

(ii) The navigation lights are controlled from a switch (8) near the master switch.

(iii) An OFF—MORSING—STEADY selector switch and a colour selector switch marked RED—GREEN—AMBER are mounted on the same panel. A MORSING pushbutton is also fitted.

(iv) The switch marked OFF—LOW—HIGH on the same panel switches on the landing lamp and controls its angle of beam.

(v) The switch (8) controls the taxying lamps.

27. **Compasses**

(i) A Mk. 4B gyro compass is installed. The master indicator and control panel are at the navigator's station. The pilot's repeater (36) which can also be used as a directional gyro is fitted centrally on the instrument flying panel. The repeater embodies caging and setting knobs and an annunciator. A changeover switch (55) marked COMP—D. GYRO is on the sloping panel below the instrument flying panel.

(ii) A P12 compass is below the coaming on the starboard side of the cockpit.

28. **Radio equipment**

A radio control panel mounted on the port side of the fuselage has:—

(a) Control switches for the A.R.I. 5131, TR. 1934/35 (9) and (14), and the A.1134A. intercom. system (11).

(b) A V.H.F. changeover switch and volume control (12).

A press-to-transmit pushbutton 24 is on the control column handwheel.

29. **Bomb doors**

The bomb doors are operated by the pilot by means of the switch (4), marked OPEN and CLOSED, mounted on the pilot's switch panel. An indicator light (23) alongside the switch comes on when the doors are fully open.

30. **Bomb control installation**

(i) The main bomb controller and distributor are mounted on the starboard side of the fuselage in the navigator's compartment.

(ii) The bomb release pushbutton is on the starboard side in the nose compartment. A second bomb release pushbutton is on the pilot's switch panel. On later aircraft this switch is mounted on the control column.

(iii) For emergency operation of bomb doors and jettisoning of bombs—See Part IV.

31. **Cameras**

There is provision for fitting a camera in the rear fuselage. The control unit is on the starboard side at the navigator's station.

32. **Signal pistol**

There is a pressure-tight mounting for a signal pistol in the escape hatch in the roof of the navigator's compartment. The pistol can be removed from its mounting, whether or not the cabin is pressurised, for use as a hand pistol.