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 VII.

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

(d) All fuel poundage figures are calculated at 7.7 lb./gall. (Normal AVTAG.)

1. Introduction

(a) The Hunter T.7 is a two-seat mid-wing trainer aircraft, with swept-back wings and a swept-back electrically-operated follow-up tailplane. Full-power ailerons and elevators are fitted, both with manual reversion facilities. The cockpit is pressurised and equipped with two Mk. 4H ejection seats.

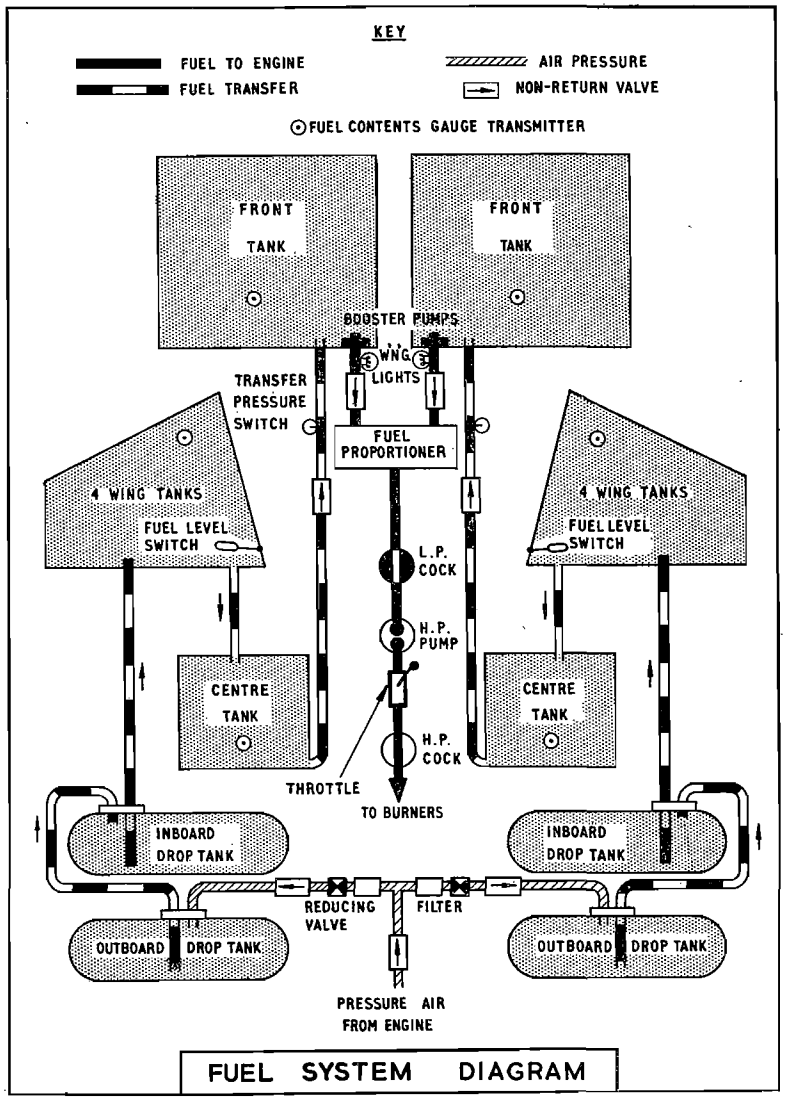
(b) The power unit is an Avon Mk. 122 engine, developing 7,575 lb. static thrust at sea level. The engine incorporates a system of fuel and air dipping which is automatic when the gun firing button is pressed to ensure surge-free gun-firing at high altitude. Automatic control of maximum j.p.t. is also embodied.

(c) A single Aden 30-mm. gun is carried semi-buried beneath the fuselage undersurface on the front starboard side. Provision is made for the carriage of R.P.s.

FUEL SYSTEM

2. Fuel tanks and gauges

(a) Fuel is carried in four flexible bag-type tanks, in the centre fuselage, and in four interconnected tanks in the forward



FUEL SYSTEM DIAGRAM

edge of each wing. Provision is made for carrying four 100-gallon pylon drop tanks.

(b) Each front tank contains an electrically-driven booster-pump fitted in a negative G fuel trap, the total contents of both permitting at least 15 seconds inverted flight.

(c) The tank capacities are:—

	Weight (lb.) at 7.7 lb./gall.	Gallons
Front tanks	1,555	202
Centre tanks	555	72
Wing tanks	1,078	140
Total, internal	3,188	414
Pylon drop tanks (4)	3,080	400
Total, all tanks	6,268	814

(d) Two electrical contents gauges (99) (102) on the centre panel indicate, in pounds, the contents of the PORT TANKS and STBD. TANKS. They indicate the contents of both *wing and fuselage* tanks (1,594 lb. per gauge). Drop tank fuel is not gauged.

3. Fuel transfer system

(a) Fuel from the drop and wing tanks is fed, by air pressure from the engine, to the centre tanks and then to the front tanks. The outboard tanks feed into the inboard drop tanks and thence to the wing tanks.

(b) The fuel transfer and the air pressure pipes are joined to each drop tank by means of a self-sealing connection, which automatically interconnects the air and fuel pipes when the drop tanks are jettisoned. When drop tanks are not carried, a bypass valve must be fitted to interconnect the two pipes.

(c) Two magnetic indicators (100) (103) on the centre panel, one for each outboard drop tank, show white when transfer from the outboard drop tanks is complete or if no drop tanks are fitted.

(d) Should the transfer system fail completely, no fuel will transfer from the wing and centre tanks. This is indicated by two TRANSFER FAILURE indicators (98), (104), below the contents gauges, showing white. At the same time the contents gauge transmitters in the wing and centre tanks will become inoperative and the gauges will then only indicate the contents of the front tanks, i.e. the amount of fuel available to the engine. If only one side of the transfer system fails, the appropriate TRANSFER FAILURE indicator will come on and the associated gauge will indicate the available contents.

4. **Fuel feed to engine**

(a) The two booster-pumps deliver fuel from the front tank to a fuel proportioner, through the L.P. cock and thence to the engine-driven H.P. pumps. From the engine-driven H.P. pumps fuel is fed through the H.P. cock to the burners.

(b) A warning light (101) below the contents gauges comes on if fuel pressure at the engine inlet drops below a satisfactory minimum.

5. **Booster-pumps control**

(a) Two booster-pumps, one in each front tank, feed to a fuel proportioner. The booster-pumps are controlled by two ON/OFF switches (96) (105) on the centre panel.

(b) Fuel from each booster-pump is fed separately to the flow proportioner (a pair of matched vane-type pumps on a common drive). Each proportioner pump delivers an equal amount of fuel to a single exit port; thence it is fed through the L.P. cock to the engine. Unequal feeding should only occur if one booster-pump delivery pressure differs from the other by more than 2 lb./sq. in. If the proportioner fails, fuel bypasses it via spring-loaded non-return valves.

(c) Two amber warning lights (88) (106) on the centre panel come on when their associated pumps are not operative.

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(d) Two circuit breakers, one for each pump, are on the coaming above the centre instrument panel and an ammeter socket and test switch are on the aft end of the cockpit starboard wall.

6. **L.P. fuel cock**

The L.P. fuel cock control (40) is on the port shelf and is moved forward from OFF to ON. It controls the fuel flow to the engine.

7. **Filter de-icing**

(a) Since fuel contains a small amount of moisture an automatic de-icing system is fitted to ensure that the fuel filter is not blocked by ice crystals at low Q.A.T.'s. When icing occurs an electric pump is switched on and pumps alcohol to the filter. It is brought into use by the increasing pressure drop through the filter. When the pressure drop returns to normal, the system is switched off.

(b) The de-icing fluid tank, of one gallon capacity, is mounted in the engine bay.

ENGINE CONTROLS

8. **Variable incidence swirl vanes and air-bleed valves**

(a) The first row of stator blades in the engine compressor consists of variable incidence swirl vanes which assist in imparting swirl to the incoming air. At low r.p.m. the first stages of the compressor deliver more air than is acceptable to the later stages. To prevent surge, the surplus air is bled off through air-bleed valves and the swirl vanes are held in the maximum swirl position. The air-bleed valves are controlled by compressor delivery air pressure and the swirl vanes ram by H.P. pump delivery fuel pressure.

(b) The bleed valves commence to close at 6,100 r.p.m. and are fully closed by 6,500 r.p.m. The swirl vanes start to move from the maximum swirl position at about 6,400 r.p.m. and reach the minimum swirl position at about 7,500 r.p.m.

(c) The positions of the air-bleed valves and swirl vanes have no noticeable effect on engine operation. However, until the air-bleed valves are fully closed and the swirl vanes are at the minimum swirl position the compressor is not operating at maximum efficiency; thrust is reduced and specific fuel consumption is worsened.

9. **Engine starting system**

(a) Starting is by means of a triple-breech cartridge starter which accelerates the engine until it becomes self-sustaining. A high energy igniter system ignites the fuel injected into the combustion chambers by the main burners.

(b) The main control switches are mounted below the port instrument panel and include:—

(i) The ENGINE MASTER switch (80) which completes the starter circuit through the starter button (84), the ignition switch (79) and the relight button (at 39) in its normal spring-loaded out position. It also closes circuits to the booster-pumps, the engine instruments and the No. 1 inverter and should be ON for starting and at all times when the engine is running. The starter circuit-breaker (143) is on the centre pedestal.

(ii) The IGNITION switch (79) which controls the current to the igniter plugs. It is locked in the ON position.

(iii) The STARTER button (84) which initiates the automatic starting sequence.

(c) When the battery master, engine master and ignition switches are all ON and the starter button is pressed, a cartridge is indexed and fired. The cartridge fires over a period of two to three seconds and causes the compressor to turn. At the same time full current is fed to the high energy igniter plugs which ignite the fuel spray. After approximately 30 seconds the engine becomes self-sustaining and a time switch operates to cut out the igniter system and to release the starter button which has been held in during this time.

10. **Restarting in flight system**

A relight button is incorporated in the top of the H.P. cock control lever (39). It completes the circuit to the igniter plugs when relighting is required in flight.

11. **Throttle controls**

Two throttle control levers are provided, one in a quadrant on the port shelf, and the other on the centre pedestal; the throttles are interconnected. The handle of each lever incorporates a twist-grip for GGS manual ranging,

a press-to-transmit switch (11) and an airbrake control (12). A throttle damper (14) is provided for the port throttle only and is aft of the lever on the port shelf.

12. **H.P. pumps**

(a) The twin H.P. pumps share a common housing. A servo control system limits the total pump output and a governor limits over-speeding of the engine.

(b) Control of the fuel flow is effected by:—

(i) The throttle, to meter fuel to the burners.

(ii) A barometric pressure control (BPC), to vary the pump output in relation to intake pressure.

(iii) An acceleration control unit (ACU) to prevent an excess supply of fuel to the engine during periods of engine acceleration.

Both BPC and ACU are connected to the servo control system.

13. **H.P. pump isolating valve and warning light**

(a) The isolating valve is intended as a means of restoring power in flight in the event of failure of the H.P. pumps servo system causing a sudden loss of power. (See para. 100(b).)

(b) The valve is controlled by an ENGINE FUEL PUMPS, NORMAL/ISOLATED switch (36) on the port shelf. When the switch is set to ISOLATED, one H.P. pump is cut off from the servo system which continues to control only the other H.P. pump. The isolated pump moves to full stroke and is controlled only by its over-speed governor.

(c) An adjacent warning light (37) indicates when the isolating switch is on.

14. **H.P. fuel cock**

The H.P. fuel cock control (39) is mounted in a quadrant on the cockpit port shelf, and is moved forward from OFF to ON. A safety gate is provided to ensure that the H.P. cock cannot be moved unless it is first pressed downwards.

15. **Top temperature controller**

This device prevents the j.p.t. from rising above a setting of 685±5°C. J.p.t. is measured by a number of thermocouples which supply current to a magnetic amplifier which in turn reduces fuel flow to the engine should the j.p.t. rise above the maximum permitted. The system, which is fully automatic, is brought into use by a micro switch operated by the nosewheel door in conjunction with a time delay and thus is operative only when the aircraft is airborne. An override switch (38), on the port shelf, may be used to isolate the system should it become unserviceable and reduce fuel flow too much.

16. **Engine instruments and anti-icing**

(a) The engine instruments comprise a jet pipe temperature gauge (58), an oil pressure gauge (41) and an r.p.m. indicator (57).

(b) An engine anti-icing OPEN/SHUT switch (132) and indicator (131) are on the forward end of the centre pedestal. Hot air is tapped from the engine compressor and, with the switch OPEN, is ducted to the inlet swirl vanes. The system is not intended for de-icing.

17. **Oil system**

Oil is carried in the engine sump, the capacity of which is approximately 17 pints. One pressure and two scavenge pumps maintain a continuous circulation through a cooler and a filter to the engine bearings and gears.

18. **Engine fire-extinguishing equipment**

(a) A fire-extinguisher bottle, stowed between the air intakes just forward of the engine, is connected to the engine extinguisher inlet connection. Operation of the system is either by:—

(i) A manually-operated pushbutton (95) on the centre panel, or

(ii) An automatically-operated inertia switch which operates if a crash landing occurs. When the inertia switch operates, the batteries are automatically isolated irrespective of the position of the battery master switch.

(b) Twelve resetting flame detector switches are situated around the engine and forward part of the jet pipe. Operation of any of the switches causes the ENGINE FIRE warning light (at 95), incorporated in the pushbutton, to come on, provided electrical power is available. When the button is pressed the extinguisher discharges its contents through spray rings. If the fire is extinguished, the light goes out as the flame switches cool.

(c) The warning light filament may be tested by pressing the adjacent pushbutton (97).

(d) When the battery master switch is OFF the fire-extinguishers can be operated only by the inertia switch. The battery master switch must be ON to test the warning light or to operate the system by pushbutton.

MAIN SERVICES

19. **Hydraulic system**

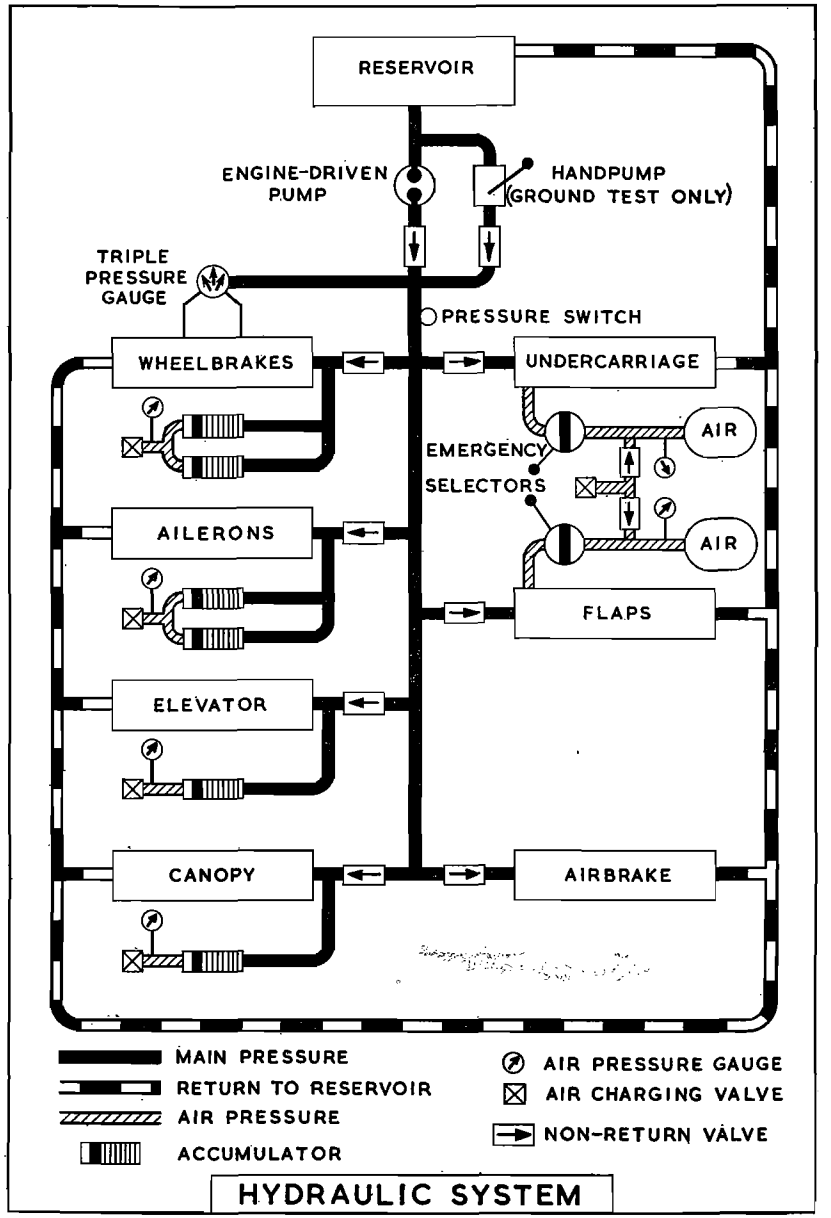
(a) An engine-driven hydraulic pump maintains a live-line pressure of 2,850±150 lb./sq. in. for the normal operation of the:—

Undercarriage and doors
Flaps
Wheel brakes
Aileron and elevator hydroboosters
Airbrake
Cockpit canopy

The main pressure is indicated by the central needle of the triple pressure gauge (30) at the forward end of the port shelf.

(b) Six hydraulic accumulators are provided in the system to give a reserve of power in an emergency. The relevant details of these accumulators are given in the table below.

Service	No. of Accumulators	Initial Air charge pressure lb./sq. in.	Location of Pressure Gauge	Location of Charge Point
Wheelbrakes	2	750	Port shelf (20)	Nosewheel bay
Ailerons	2	900	Starboard wheelbay	
Elevators	1	1,575	Port side of fin	
Canopy operation	1	1,575	Behind radio access door	



HYDRAULIC SYSTEM

(c) Indication that failure of the live-line system has occurred is given by the main needle of the triple pressure gauge and, when pressure has fallen to 600 lb./sq. in., the illumination of a red warning light (22) on the port side of the port instrument panel. An audio warning also gives warning of hydraulic failure. When the audio warning cut-off-switch (108), on the centre panel, is operated the warning is discontinued.

(d) Two high pressure air bottles, which are charged to 1,800–2,000 lb./sq. in., are provided for the emergency lowering of undercarriage and flaps respectively. Air pressure gauges (4) (3) for the bottles are mounted on the port shelf.

(e) A hydraulic handpump, for ground test purposes, is fitted in the engine bay.

20. **Electrical system (24 volt)**

(a) *D.C. supply*

(i) Two 6,000-watt d.c. engine-driven generators supply the whole of the electrical system and charge two 24-volt batteries, connected in parallel. Two GENERATOR failure warning lights (78), situated below the centre of the port instrument panel, come on only when their associated generator is not supplying power.

NOTE.—Minimum engine r.p.m. to keep the batteries fully charged are 3,700 (4,000 if one generator has failed). It must not be assumed that the generators are charging adequately if neither warning lamp is lit. The batteries can be taking an appreciable load with both lights out at low r.p.m.

(ii) Control of the batteries is effected by a BATTERY MASTER switch (83) below the centre of the port instrument panel. When set to OFF the switch isolates all electrical services from the batteries except the engine fire-extinguisher inertia switch.

(iii) An external ground supply socket is accessible via the radio bay door and is for use when a ground battery is necessary for servicing purposes.

(iv) The following table lists the various electrical warning lights and indicators in the cockpit. Failure in any circuit (except radar ranging) incorporating a magnetic indicator is shown by the indicator showing white.

Service	Indication	Function
Fire warning	1 red light (95)	Gives warning when temperature in engine bay exceeds 300±30°C.
Fuel pressure warning	1 red light (101)	Indicates fuel pressure low at engine inlet
Fuel transfer warning	2 white magnetic indicators (98) (104)	Indicate failure of transfer system
Outboard drop tank empty	2 white magnetic indicators (100) (103)	Indicate outboard drop tanks empty or not fitted
Booster pump warning	2 amber lights (88) (106)	Indicate failure of associated booster pumps
H.P. pump isolation	1 red light (37)	Indicates isolation in use
Generator failure warning	2 red lights (78)	Indicate generator failure due to: (1) Cut-out not closed; (2) Fault in circuit
Radar ranging warning	1 white magnetic indicator (27)	Indicates radar ranging in use
Hydraulic failure warning	1 red light (22)	Indicates hydraulic pressure below 600 lb./sq. in.
Undercarriage position	3 red or green lights (25)	Indicate position of each U/C unit separately. No light—unit locked up Red light—unit between locks Green light—unit locked down
Undercarriage warning	1 red light (28)	Indicates when throttle closed and U/C not locked down
Powered controls	2 pairs of 2 white magnetic indicators (45) (46) and (66) (67)	Indicate separately disengagement of aileron or elevator hydroboosters, or fault in electrical circuit
Airbrake	1 white magnetic indicator (29)	Indicates airbrake not fully retracted
Cockpit pressure warning	1 red light (113)	Indicates drop of ½ lb./sq. in. in cockpit pressure differential

Service	Indication	Function
Telebriefing	1 amber light (17)	Indicates telebriefing in use
Canopy operation	1 green light (94)	Indicates canopy locked closed with wheels down
Oxygen	2 striped magnetic indicators	Indicate respective pilot inhaling
Inverters	1 magnetic indicator (55)	Changeover of No. 2 to No. 3 inverter
	2 windows (129) (130)	Indicate state of inverters OFF—Red STBY—Yellow MAIN—Green
Engine anti-icing	1 window (131)	Indicates anti-icing on or off OPEN—Red SHUT—Green

(b) *Emergency battery*

An emergency battery is provided to supply, through separate switches, the emergency lamps, the Manual emergency selector circuit and the turn and slip indicator. If fully charged, the battery will supply between 7 and 20 hours continuous use, depending on the load imposed on it.

(c) *A.C. supplies*

(i) A.C. supply is from four type 100A inverters divided into two groups. No. 1 group comprises No. 1 (main) and No. 4 (standby) inverters which supply the Mk. 4FT compass, the cabin temperature amplifier, the autostabiliser and the top temperature controller. In addition, No. 4 inverter acts as a control to the radar ranging type 200 inverter, provided that No. 1 inverter is in circuit. If No. 1 inverter fails, radar ranging is impossible since No. 4 inverter takes over the other supplies. No. 2 group comprises No. 2 (main) and No. 3 (standby) inverters which supply the artificial horizons and the oil pressure gauge.

(ii) When the engine master switch is ON, both standby inverters are started up. After the engine is started and the generators are on line the two main inverters take over the supply.

(iii) Near the A.C. junction box on the starboard wall are four circuit breakers, one for each inverter. On the centre console are two magnetic indicators (129) (130), one for each inverter group which give OFF, MAIN and STANDBY indications. Adjacent to the pupil's artificial horizon is a STANDBY INVERTER ON magnetic indicator (55) which shows black when No. 2 inverter is supplying power and white if No. 3 inverter takes over.

(iv) Also on the centre console are two NORMAL–STAND-BY switches (141) (144), one for each inverter group. They may be used to test either standby inverter either on the ground with the engine running, or in flight. If auto-changeover to either standby inverter occurs the switches may also be used to attempt to bring the main inverter back into circuit.

(v) On the generator control panel are two TEST–NORMAL switches for servicing purposes only.

POWERED FLYING CONTROLS AND TRIMMERS

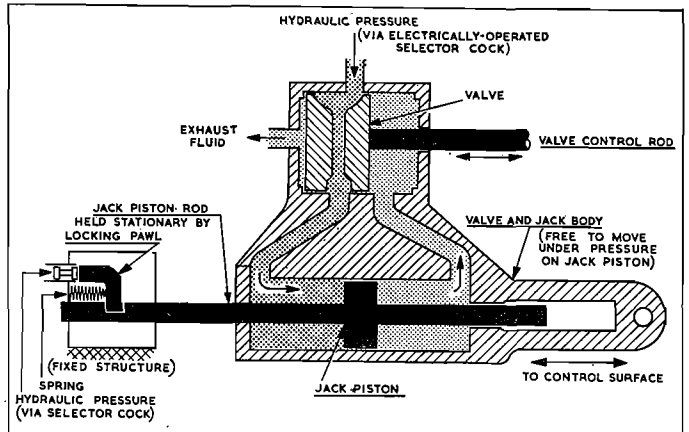
21. Flying controls operation Mods 686, 687

(a) *In Power*

The ailerons and elevator are power-operated, the power being supplied by hydraulic pressure to the aileron and elevator hydroboosters. The hydrobooster jack piston rods are each anchored to the aircraft structure by a spring-loaded hydraulically-operated pawl.

(b) *In Manual*

(i) Manual operation of the controls may be selected deliberately by operating a switch in the cockpit (see para. 22(a)) to release the locking pawls provided that electrical power is available or reversion will happen automatically if hydraulic pressure drops below 200 lb./sq. in.



DETAIL OF AILERON BOOSTER JACK
(ELEVATOR JACK SIMILAR)

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(ii) When operating in Manual, control surface movements are achieved through a mechanical linkage. The controls are heavy in Manual, especially the ailerons, but to avoid excessively high stick forces the pawls automatically disengage and release the anchored jack piston rods, allowing them to slide freely with the jack bodies.

(c) *Hydraulic power reserve*

Accumulators are fitted in the power control circuits to provide a reserve of power if the main hydraulic supply fails. This reserve may be sufficient for a maximum of 3½ complete cycles of aileron and elevator operation before the controls revert automatically to Manual, but even if no control movement is made accumulator pressure will not be maintained for a long period due to seepage through the hydraulic components. With some types of hydraulic failure immediate reversion to Manual will result.

21A. Flying controls operation—Post-mods. 686, 687

(a) Mods. 686 (aileron) and 687 (elevator) introduce bypass hydro-boosters. The jack pistons are anchored to the aircraft structure by the permanent engagement of the locking pawls. False anchor-ages are eliminated and application of Power is positive on selection under all conditions.

(b) Since the piston is permanently anchored to the structure, the valve and jack body now moves about the piston with either Power ON or Power OFF selected. This is made possible by

(i) Low-friction seals in the hydrobooster.

(ii) A spring-loaded bypass valve in the jack body which allows residual fluid to be pumped from one side of the piston to the other.

(c) When Power is selected ON, the bypass valve closes automatically as hydraulic pressure rises above 400 lb./sq. in. The controls are then in Power; the appropriate magnetic indicator shows black when pressure rises above 600 lb./sq. in. If hydraulic failure occurs or Power is selected OFF the indicators show white as pressure falls below 600 lb./sq. in. and the bypass valve opens automatically below 200 lb./sq. in. The controls are then in Manual.

22. Controls and indicators

(a) Two POWER OFF-off-POWER ON double-pole selector switches (45) (46) which are spring-loaded to the central (off) position are on the port instrument panel. Deflection upwards to POWER ON isolates the fail-safe circuit to allow initial engagement or re-engagement. If, on releasing the switch, Power is incorrectly engaged Manual is automatically reselected. Manual is also automatically selected if any pawl disengages, even though momentarily. Deflection of the switch downwards immediately selects Manual. The aircraft can therefore be flown only with Power correctly engaged or in Manual.

(b) Two POWER ON-POWER OFF single-pole switches (71) (72), on the starboard instrument panel, are provided in order that the instructor may select Manual at any time. Power engagement is by the switches on the port instrument panel provided that the instructor's switches are at POWER ON.

(c) Two magnetic indicators (at 45 and 46) (66) (67), one for the AILERON circuit and the other for the ELEVATOR, are beside each set of switches and show black when the piston rod locking pawls are correctly engaged and white when the appropriate pawl is disengaged or incorrectly engaged, or alternatively when electric power to the indicator is not available.

(d) A hydraulic pressure gauge (30) shows the hydraulic pressure delivered by the pump. A red warning light (22) is fitted to warn the pilot that hydraulic pressure has dropped below 600 lb./sq. in. and is accompanied by audio warning.

23. Manual emergency selector buttons

Two yellow-and-black striped POWER OFF push-buttons (43) are at the bottom left-hand corner of the port instrument panel to permit the emergency selection of Manual of either ailerons or elevators or both, should the aircraft electrical system have failed. When either button is pressed an electrical supply from an independent dry battery is connected to the appropriate selector cock and the associated controls then revert immediately to Manual.

NOTE.—These buttons must not be pressed if normal electrical power is available as in this event it is likely that the control circuit fuse will be blown.

24. Aileron feel and trim

(a) On the ailerons, the piston rods are anchored to the aircraft structure, the air loads are resisted entirely by the hydraulic jack effort and no load is fed back to the control column. To provide control feel, a spring is fitted in the control circuit and gives an artificial stick force which is proportional only to aileron deflection but not to airspeed. A handwheel (not illustrated) is fitted on the left-hand side of the port control column to provide spring feel adjustment and should be used to counteract any out-of-trim forces which may occur when flying in Power. A white line is inscribed on the handwheel. When the trimmer is neutral the line points forward and the trimmer engages in a spring-loaded detent. Movement from this position is through 300° either to the left or to the right thereby adjusting the zero force position of the stick.

(b) A trim tab is fitted on the port aileron. It is only intended for use in Manual and a guard is placed round one of the two trim controls to prevent inadvertent use when in Power. (See para. 31.)

25. Aileron gear change

(a) The control column/aileron gearing is automatically changed when Manual reversion occurs, so that for the same stick movement aileron travel in Manual is approximately two-thirds of that obtained in Power.

(b) This automatic changeover is provided for by the insertion of a hydraulic jack in the aileron control linkage. When hydraulic pressure is fed to the jack (via the aileron power selector cock) the jack extends to alter the linkage effective arm. When hydraulic pressure is lacking, the jack retracts under spring pressure.

26. Elevator feel

The locking pawl is fixed to the aircraft structure and the air loads on the elevator are resisted entirely by hydraulic jack effort. To provide control feel, a spring is fitted in the control circuit between the control column and the variable-incidence tailplane. The spring gives an artificial feel to the elevator control circuit by imposing a force proportional to stick deflection but not to airspeed (i.e. air loads).

27. **Variable-incidence tailplane**

(a) An electrically-operated variable-incidence tailplane is provided to trim out the changes of stick force. It is hinged at the rear end, while a projection on the leading edge is connected to an electrically-operated actuator mounted in the dorsal fin below the tailplane. The actuator is operated by one of two electric motors, the main and the standby. The main motor is controlled by a thumb switch (76) on top of each stick and the tailplane operates in the same way as a conventional trimming tab but is more powerful in effect. After selecting by feel the required tailplane angle to give zero stick force for a given flight condition, the elevator is trailing with no air load imposed on it. The tailplane main motor circuit is protected by a circuit breaker (2) on the port wall.

(b) The thumb switch on the starboard stick overrides the trimming action of the switch on the port stick. A switch under a flap (128) on the starboard shelf can be operated to cut out the trim circuit.

(c) The standby motor, which is fitted to meet the case of failure of the main motor, or its electrical supply, is controlled by a switch (33) under a cover on the port shelf. When the cover is raised to enable operation of the standby switch, the main motor circuit is isolated. The standby motor operates at about one-third the rate of the main motor.

(d) The setting of the tailplane is shown on an indicator (47) on the port instrument panel.

28. **Electric follow-up tail**

(a) *General*

An electrical interconnection enables the variable-incidence tailplane to follow-up elevator movement. Used together they give greater manœuvrability at high mach numbers.

(b) *Selectors and indicators*

(i) A TAILPLANE, ON/OFF switch (86), by means of which the interconnection may be selected, is on the centre panel. The tailplane incidence position indicator shows when the tailplane is functioning as a flying control, i.e. the indicator moves when the control column is deflected as well as when the trim switch is actuated.

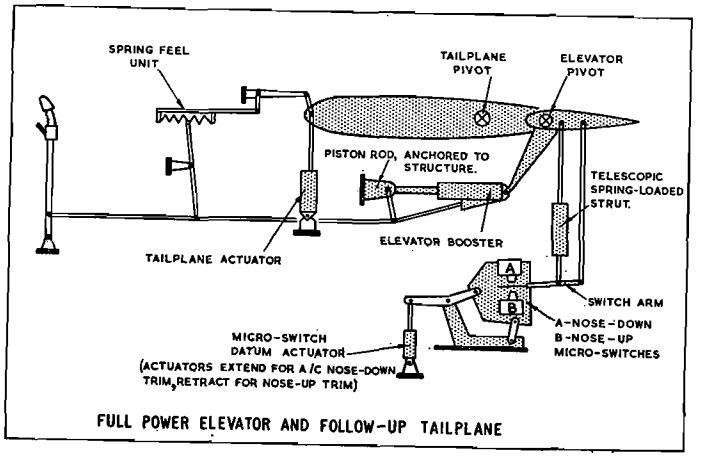
(ii) The circuit is so arranged that when the cover of the standby trim switch is raised both the main actuator, the interconnection and the datum actuator are isolated.

(c) *Function*

(i) Whenever the interconnection is switched ON, and electric power is available, it functions irrespective of whether the elevator is in Power or in Manual. It is arranged in the form of a follow-up linkage, so that, for a given stick deflection and tailplane trim position a predetermined relationship exists between tailplane and elevator angles. A linkage attached to the elevator carries a switch arm, one end of which moves between two micro-switches. Movement of the elevator relative to the tailplane energises one of these switches which operates the tailplane actuator to move the tailplane. When the tailplane reaches the required position the micro-switch is de-energised and tailplane movement stops, leaving the elevator deflected relative to the new position of the tailplane.

(ii) To prevent continual hunting of the tailplane actuator, the elevator has a small range of movement over which the micro-switches are not selected.

(iii) A spring-loaded telescopic strut is incorporated in the linkage so that full and unrestricted stick movement



FULL POWER ELEVATOR AND FOLLOW-UP TAILPLANE

is always obtainable. The strut telescopes when either the elevator is moved faster than the rate at which the tailplane actuator can follow up or when the tailplane has reached the end of its travel.

(d) *Trimming*

Trimming is carried out by means of either thumb switch (76) on the control columns. When the instructor is using his trim switch the electric supply to the pupil's trim switch is isolated. In addition to altering the tailplane incidence, operation of the switch also resets the datum position of the two micro-switches. During trimming the elevator is kept in line with the tailplane by the centring action of the spring feel strut, the switch arm thus following the resetting of the micro-switches datum position. The datum setting cannot be altered by means of the standby switch.

OTHER AIRCRAFT CONTROLS

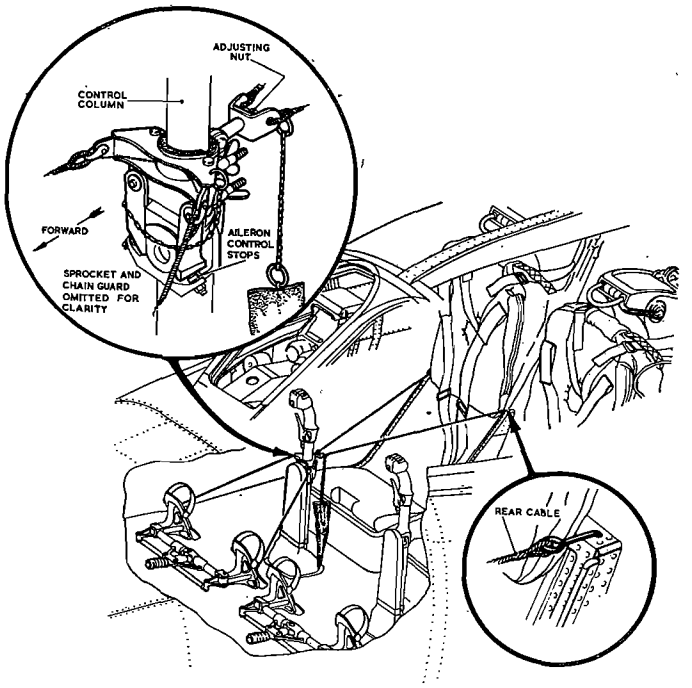
29. Rudder pedals adjustment

Each pair of rudder pedals is adjustable for leg reach by means of a control toggle (42) (73) at the bottom of each instrument panel. When either control is pulled out, a plunger is disengaged from a hole in the adjusting shaft, thus allowing the appropriate rudder pedals to be pushed forward against the pressure of a spring, or to swing aft by spring pressure. When adjustment is complete, releasing the control to allow the plunger to engage in the nearest hole will fix the rudder pedals in the desired position.

30. Flying controls locking gear

(a) *Internal locking*

The internal locking device secures one set of flying controls. It consists of four cables which are joined to a clip, designed to attach to either control column. The other ends of the cables incorporate hooks which should be attached to holes in the cross member at the top of the appropriate ejection seat pan and to the outboard edges of the rudder pedals. When fitting the cables the rudder pedals should be in the central position and the cables tensioned by adjustment of the seat pan.



FLYING CONTROLS LOCKING GEAR

(b) *External locking*

Locking clamps are provided for all flying control surfaces.

(c) No stowage is provided for internal or external locks.

31. Trimming tab controls

(a) The rudder and port aileron incorporate electrically-operated trimming tabs. Combined aileron and rudder trim controls (35) (125) are situated on the port and starboard shelves, each with a combined tab position indicator (34) (127) just forward of it. The aileron trim tab must be set to neutral before take-off and must remain so at all times when Power is engaged.

(b) A locking guard is fitted to each pilot's trim control to prevent the inadvertent operation of aileron trim

in Power. In addition, when the guard (126) on the instructor's trim control is swung clear of the control, a micro switch is operated to disconnect the electrical supply to the pupil's rudder and aileron trim. The instructor's guard must be engaged for solo flight.

(c) *Autostabiliser*

To improve the damping of the lateral and directional oscillations of the aircraft a Mk. 2 autostabiliser is provided and operates in conjunction with the rudder trim tab. The AUTOSTABILISER OFF–STDBY–ON switch (63) is on the centre panel. When switched from OFF to STDBY electrical power from No. 1 group inverters is directed to a rate gyro only. When switched to ON, the rate gyro and the trim tab servo-motor are both energised and the autostabiliser is in operation. The OFF position should only be selected if the autostabiliser malfunctions or if it is essential to conserve electrical power.

32. **Undercarriage control and position indicator**

(a) Two selector pushbuttons (23), UP and DOWN, are on the port side of the pupil's instrument panel. Three selector pushbuttons, UP, DOWN (69) and PUPIL (70) are on the starboard side of the instructor's instrument panel. When the PUPIL pushbutton is pressed in undercarriage selection is controlled by the pupil's pushbuttons and the instructor's pushbuttons are both in the out position. A selection of UP or DOWN by the instructor causes the PUPIL switch to release, thereby cutting off the electrical supply to the pupil's pushbuttons which remain in their selected positions. The instructor then has full control of the undercarriage but may pass control back to the pupil at any time by pressing in the PUPIL button. This action is only possible if both pairs of selector pushbuttons are similarly selected and the battery master switch is ON. For solo flight, the PUPIL pushbutton must be in the depressed position.

(b) A standard position indicator (25) is fitted to the left of the pushbuttons on the port instrument panel. A warning light (28) below these pushbuttons comes on if, with the undercarriage not locked down, the throttle is closed.

33. **Undercarriage emergency operation**

(a) Should electrical or hydraulic failure occur, the undercarriage may be lowered irrespective of the setting of the normal selectors by pulling the U/C emergency release (18), on the port shelf, while holding in the central knob. This admits air from an emergency bottle direct to the lowering jacks, forcing them to lower and lock. The available air pressure is shown on a gauge (4) at the rear end of the port shelf. The release must be pulled fully out until several inches of wire show.

(b) If it is required to retract the undercarriage on the ground, either UP selector pushbutton should be twisted clockwise and then pressed. This is inoperative if the undercarriage emergency system has been used.

34. **Flaps control and position indicator**

(a) The flaps are selected electrically and operated hydraulically. Selection is by means of a switch (26) (68), on the outboard side of each instrument panel, which provides UP, DOWN (80°) and six intermediate positions (15°, 23°, 30°, 38°, 45°, 60°).

(b) A safety catch is provided on the instructor's selector lever (68) which must be released to move the lever upwards into a gate beyond the fully UP position and downwards from that position. Only when the lever is in the gate is the pupil's selector operative. Any selection by the instructor cancels a selection made previously by the pupil. For solo flight the lever must be engaged in the gate.

(c) The flaps may be selected to any position but the extent to which they will lower depends upon the air loads. If speed is increased with the flaps extended, the angle will be adjusted to suit the air loads (but see para. 78(g)).

(d) A flap position indicator (44) is fitted adjacent to the selector switch on the port instrument panel.

35. **Flaps emergency operation**

Should electrical or hydraulic failure occur, the flaps may be lowered fully down only, irrespective of the setting of the normal selector, by pulling the emergency release (24), on

the port instrument panel, while holding in the central knob. This admits air from an emergency air bottle direct to the lowering jacks. The available air pressure is shown on a gauge (3) at the rear end of the port shelf. The release must be pulled fully out until several inches of wire show.

36. Airbrake control

(a) An under-fuselage airbrake is provided. It is electrically selected and hydraulically operated and will extend fully at any speed.

(b) Control of the airbrake is by means of a three-position switch (12), spring-loaded to the central off position, on each throttle lever. No position other than fully in or fully out can be selected. A magnetic indicator (29) on the port instrument panel shows black only when the airbrake is fully in.

(c) The airbrake is automatically inoperative when the undercarriage is lowered. If the undercarriage is lowered when the airbrake is out, the airbrake will automatically retract. *Airbrake IN must not normally be obtained by selecting undercarriage DOWN.*

(d) A spring-loaded switch (142) on the centre pedestal enables the airbrake to be tested on the ground. When the switch is held to TEST, the airbrake extends through 10° only and then retracts with a slight bump. The indicator shows white momentarily while the airbrake is out.

37. Wheel brakes control

(a) The wheel brakes are operated hydraulically by means of a lever attached to the forward face of the control column and a differential relay controlled by the rudder pedals.

(b) The main hydraulic pressure (2,850 ± 150 lb./sq. in.) is shown on the triple pressure gauge (30) together with the pressure at each main wheel (1,500–1,650 lb./sq. in.).

(c) Should the hydraulic system fail, the pressure in the wheel brakes accumulators will be sufficient for landing but will leave little in hand for subsequent taxying. The available accumulator pressure is shown on a gauge (20) at the forward end of the port shelf.

(d) (i) Maxaret brake units are fitted and permit the use of full braking when essential without the danger of wheel locking and tyre damage. The units come into operation only if the wheels are rotating and in no circumstances should the brakes be applied before touchdown.

(ii) Should hydraulic pump failure occur, the brakes accumulators, if fully charged, should provide sufficient pressure for about 40 operations of the units. The brakes will remain effective until accumulator pressure drops to 750 lb./sq. in.

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38. Braking parachute

(a) The braking parachute, stowed in a container above the tail cone, is controlled either by the pupil's two-position OFF/JETTISON–STREAM switch (53) or by the instructor's three-position JETTISON–Off–STREAM switch (110). The two-position switch should normally be at OFF/JETTISON and the three-position switch in the mid (off) position.

(b) Selection of the two-position switch to STREAM ejects the parachute. Returning the switch to OFF/JETTISON disconnects the parachute from the aircraft. The switch is only operative when the three-position switch is in the mid (off) position.

(c) When Mod. 850 is embodied an amber warning light is adjacent to the switch. It comes on when the parachute is streamed and remains on after it is jettisoned.

39. Electrically-operated flight instruments

(a) The turn and slip indicator is operated by D.C. whenever electrical supply is available. If electrical supply is lacking, the word OFF appears in the face of the instrument. Below the instrument is a TURN & SLIP, NORMAL–EMERGY switch. With the switch at NORMAL, supply is from the aircraft batteries; with the switch at EMERGY, supply is from the emergency battery.

(b) The Mk. 3B or Mk. 4 artificial horizon is operated by A.C. (see para. 20(c)(i)). In the Mk. 4 artificial horizon a power failure indicator is incorporated and shows the word OFF when electrical supply is lacking. If the fast erection button is used before flight to erect the horizon it must not be kept depressed after satisfactory erection is achieved. In flight the button should only be used in unaccelerated level flight.

(c) The Mk. 4 FT compass is also operated by A.C. (see para. 20(c)). A test panel is fitted at the rear end of the starboard shelf.

GENERAL EQUIPMENT AND CONTROLS

40. Canopy operation

(a) The canopy, which is hinged at its rear edge, is normally operated electro-hydraulically, but provision is made for manual operation if electric or hydraulic failure occurs. The canopy is normally controlled by an OPEN–off–CLOSE switch (93) on the centre panel and cannot be opened when a generator is charging. The battery master switch must be OFF before the canopy can be opened. An override switch (not illustrated) is provided on the port side of the cockpit to permit opening the canopy with the engine running and the battery master switch ON or OFF. A warning horn sounds when CLOSE is selected, and at the same time the canopy begins to move to the closed position. When Mod. 756 is embodied a 3–5 second delay takes place before the canopy begins to open or close. A green light (94) above the switch (93) comes on when the canopy is locked closed with the wheels selected down and goes out when the wheels are selected up. In addition, two transparent panels (8) (120), one on each wall of the cockpit, are provided to check the position of the canopy jacks. When the canopy is closed the bolt should align with a mark on the perspex panel.

(b) The canopy may be lifted off from inside by removing the pip-pin on the outboard side of the canopy jettison release unit to isolate the canopy jettison gun and then operating the red handle on the port side of the unit.

(c) The canopy may be opened or closed from outside by means of an OPEN–off–CLOSE switch in the nose-wheel bay, provided that electrical power is available. A hydraulic accumulator, if fully charged, provides for the canopy to be opened and closed three times before the accumulator becomes exhausted of fluid. The accumulator can be charged externally by use of the handpump.

41. Canopy jettisoning

(a) The canopy is jettisoned by gas pressure from a jettison gun acting on two pistons which eject the canopy upwards and backwards. This action may be initiated by pulling the

canopy jettison handle (137), at the rear of the centre pedestal.

(b) The canopy is also jettisoned automatically whenever either handle of either ejection seat is pulled (see para. 44(j)).

(c) *External emergency release*
An external emergency release ring is inside a break panel on the port side of the fuselage. When the release ring is pulled the canopy is ejected by the jettison gun.

WARNING.—If this method is used all personnel must be clear of the vicinity of the aircraft. After pulling the ring the operator should immediately stand clear.

42. Cockpit pressurisation, heating and demisting

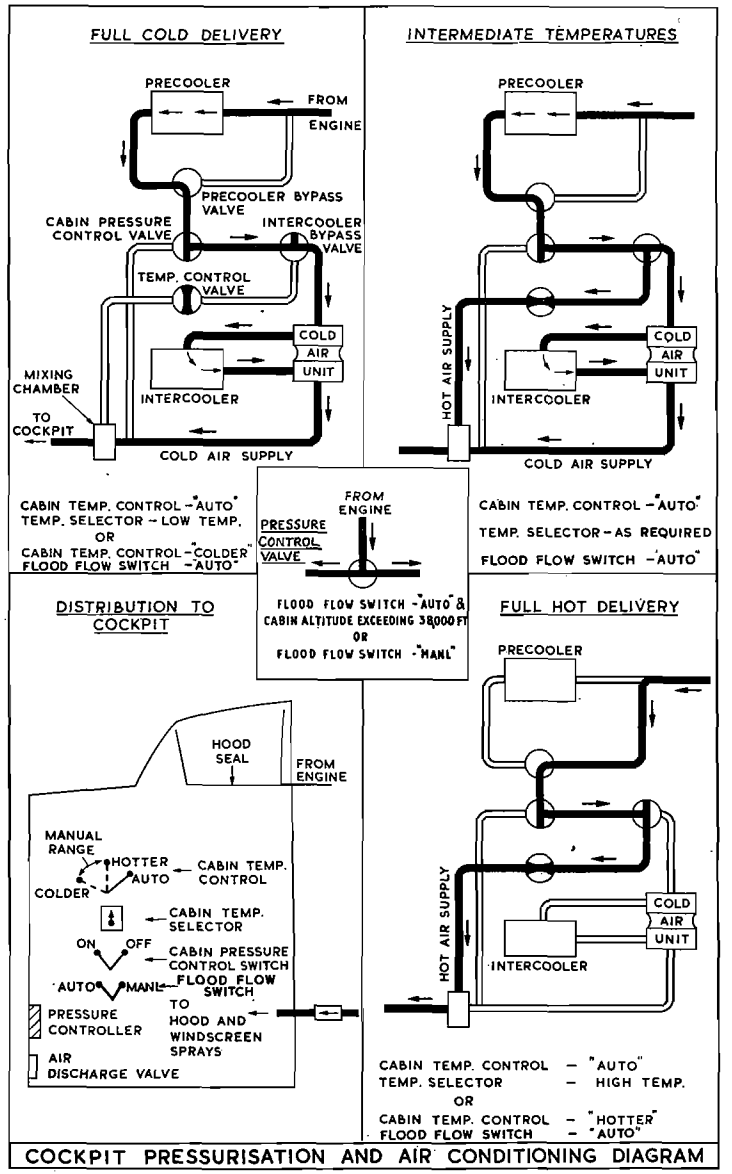
NOTE.—The system is inoperative whenever the canopy is open.

(a) Hot air under pressure is bled from the engine compressor to supply the heating, pressurisation and demisting system. The air supply to the cockpit terminates in spray pipes which provide for windscreen side panels and canopy demisting.

(b) On the cockpit port shelf are the master ON/OFF switch (7) which controls the flow to the cockpit, the temperature control lever (6) which permits the selection of AUTO or manual HOTTER–COLDER and the temperature selector (5) which is for use in AUTO to pre-select the desired temperature, which is then maintained by a thermostat. In the manual range, temperature is controlled by first setting the lever to HOTTER or COLDER and then, when the desired temperature is reached, engaging the lever in the central gate.

(c) The cockpit altimeter (85) on the centre panel should indicate in accordance with the following table. Should the cockpit pressure drop below a pre-determined minimum, a red light (113) on the right of the altimeter comes on.

Actual altitude	Cockpit altitude	Cockpit altitude at which warning light comes on
20,000 ft.	13,000 ft.	13,750 ft.
30,000 ft.	16,500 ft.	18,000 ft.
40,000 ft.	22,500 ft.	24,000 ft.



COCKPIT PRESSURISATION AND AIR CONDITIONING DIAGRAM

(d) (i) A "flood flow" valve is incorporated in the system, which may be controlled in AUTO or MANL according to the setting of the FLOOD AIR FLOW control switch (9).

(ii) When the switch is set to MANL, "flood flow" is brought into operation and is used primarily for clearing any transparency misting.

(iii) When the switch is at AUTO, should loss of cockpit pressure cause the cockpit altitude to exceed 38,000 ft., an altitude switch operates to supply "flood" air to the cockpit.

(iv) For recommendations for the use of the system, see para. 64.

(v) A switch (1) for *ground testing* the visual warning circuit is to the rear of the normal controls. It must not be used in flight.

43. Anti-G suit system

(a) The purpose of the system is to provide air at low pressure for the pilots' anti-G suits, the connections for which are on the port sides of the ejection seats.

(b) Air under pressure is stored in two air bottles, the contents of which are indicated by a pressure gauge (115) on the starboard shelf. The gauge does not read with the system OFF. When the cock (139) between the seats is ON and G in excess of approximately $1\frac{1}{2}$ is applied, a spring-loaded valve operates and allows air to pass to and inflate the anti-G suits. The amount of inflation depends on the amount of G applied.

(c) The system may be tested, with the cock ON, by pressing the ANTI-G TEST button (138) adjacent to the on/off cock, as gently as possible to avoid severe discomfort due to too rapid inflation. A second test pushbutton (117) on the starboard shelf is provided for the instructor's use.

44. Ejection seats Mk. 4 H

(a) *General*

(i) Two ejection seats are fitted. Each seat has a combined safety and parachute harness which is fastened by a single quick-release box. A back-type Mk. 430 harness and parachute pack of the horse-shoe type, is fitted.

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(a) contd.
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The pack is secured by two restraining straps at the upper end and forms a headrest. The seat well accommodates a personal survival pack containing a dinghy and seat cushion. Two leg-restraining straps are fitted at the front of the seat pan. An emergency oxygen bottle is stowed behind the seat.

(ii) At the rear of each seat is the 80 ft./sec. ejection gun and a drogue gun. The seats have two firing handles, one on the drogue container attached to the face blind and the other on the front of the seat pan. Stowages (140) for the seat safety pins and canopy jettison safety pin are between the seats on the rear bulkhead.

(iii) When Martin Baker Mod. ~~610~~ 491 is embodied a G-stop is incorporated to prevent the opening of the main parachute if the speed of the seat is too high for safe deployment. The switch prevents the operation of the barostatic time delay unit until the speed of the seat has fallen to a safe figure. The seat has a ground level ejection capability provided that the aircraft's flight path is parallel to the ground. If the aircraft is descending or nose-down more than the minimum altitude will be required.

(b) *Seat adjustment handle and lean-forward release*

The seat height may be adjusted by the handle (123) on the starboard side of the seat. The harness lean-forward release (135) is the forward lever on the port side of the seat pan.

(c) *Combined-harness quick-release box*

The quick-release box, when fastened, secures the occupant to the seat. The box must not be operated when carrying out manual separation in the air since this will free the occupant from both seat and parachute (see (e)).

(d) *Manual override D-Ring*

The manual override D-ring is fitted near the quick release box and partly below the rip-cord D-ring. If manual separation from the seat is necessary the override D-ring should be pulled to its fullest extent before operating the manual separation lever. The parachute is then disconnected from the automatic opening line and the protective canvas flap over the rip-cord D-ring is removed.

(e) *Manual separation lever*

The lever (136) at the rear of the port side of the seat pan, when pulled, releases the seat harness portion of the combined harness from its three attachment points and also releases the parachute restraining straps. At the same time the leg-restraining straps are freed. The occupant is then free to leave the seat wearing his parachute.

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WARNING.—Manual separation must only be carried out *after* operation of the manual override D-ring, otherwise there is a danger of falling out of the seat with the parachute still attached to the seat. If the lever is inadvertently operated the seat must subsequently be serviced by suitably qualified maintenance personnel.

(f) *Rip-cord D-ring*

This is normally covered by a canvas flap retained in position by two press studs and is removed by the action of pulling the manual override D-ring. It is provided for manual opening of the parachute should either the seat fail to eject or automatic opening of the parachute fail after ejection.

(g) *Harness-restraint apron*

A harness-restraint apron is provided to secure the instructor's seat harness, dinghy pack and parachute when the aircraft is flown solo. The leg-restraining straps are not secured by the apron. Mod. 730 provides a stowage box for the apron in the nosewheel bay, starboard side. When the aircraft is flown dual the apron must be securely stowed in its box with the lid securely fastened.

(h) *Leg-restraining straps and adjusting controls*

(i) The straps ensure that the occupants' legs are drawn back automatically and restrained close to the seat pan during ejection, thus providing clearance and preventing the legs being blown apart after ejection. The straps pass through snubbing units, at the front of the seat pan, which allow the cords to pass freely down through the unit but prevent them passing upwards. An adjusting ring, under each snubbing unit, when pulled out, allows the occupant to adjust the cords to give comfortable leg movement in the aircraft.

(ii) After ejection the legs are held in position until the seat-harness portion of the combined harness is released or until the manual separation lever has been operated. The restraining straps are then pulled through the leg strap D-rings to free the legs.

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(j) *Normal operation of the seat*

(i) When either firing handle is operated, the canopy is jettisoned immediately by gas pressure from the canopy jettison cartridge; at the same time a delay unit at the back of the seat is started. This unit then withdraws the sear from the seat gun one second after the handle is pulled. The seat is then ejected and the drogue gun fired half a second later. If G conditions necessitate using the seat pan alternative firing handle, the pilot must first press his head firmly against the top of the parachute pack to prevent spinal injury on ejection.

(ii) All leads incorporate quick releases which are automatically broken on ejection.

(iii) As the seat is ejected a static line readies the barostatic time-delay mechanism. When the free descent reaches 10,000 feet or at once if ejection has taken place below that height and, with Mod. 916 embodied, provided that the G-stop has not operated, the barostat removes an obstruction from the gear train of the mechanism allowing it to operate. After three seconds (1½ with G-stop fitted) the seat harness portion of the combined harness is released, the seat-stabilising drogues are freed and by a connecting lifting line the face screen is disconnected and the parachute deployed. The occupant is momentarily prevented from leaving the seat by two restraining straps until deployment of the parachute lifts him clear of the seat.

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45. Oxygen system

(a) Oxygen is carried in four Mk. 5D cylinders. A Mk. 17D or 17E (Mod. 919) demand regulator (62) on the centre panel and another (121) on the starboard shelf, control the supply to each pilot. A contents gauge (61), which is mounted above the port regulator, indicates the amount of oxygen remaining in the system which is common to both pilots through their respective regulators.

(b) Each regulator consists of an ON/OFF valve which controls the flow of oxygen, an air-inlet NORMAL–100% OXYGEN switch, and a three-position test/emergency switch. Magnetic indicators on the regulators provide flow indications for each pilot provided that the battery master switch is ON. A remote indicator (65) for the instructor is on the starboard instrument panel.

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(c) When the ON/OFF valve is on and the inlet switch is at NORMAL, an air/oxygen mixture is fed to the pilot's mask up to a height at which 100% oxygen is automatically delivered. When the inlet switch is at 100% OXYGEN, no air is added irrespective of the height. This position should always be used on Mk. 17D regulators; on Mk. 17E regulators the setting should be NORMAL. The emergency switch, when moved to either right or left, admits oxygen under greater pressure.

(d) Each mask may be tested before flight by firmly pressing in the emergency switch of the associated regulator when in the central position. Oxygen is then supplied under pressure (up to 5 times that obtained with the switch in either side position). The mask can then be adjusted until no leaks are present.

(e) *Emergency system*

Operation of the emergency bottle behind each seat is automatic on ejection. After the pilot has separated from the seat the bottle remains with the seat and emergency oxygen is no longer available. Each bottle may be brought into use manually by pulling its associated control (124) (145) on the right of the seat pan.

46. Internal lighting

(a) *General*

Miniature pillar (single lamp) and bridge (double lamp) lighting is installed adjacent to the instrument panel components required to be illuminated. In addition hooded red lamps are provided for the port and starboard shelves and cockpit walls. All dimmer switches are separately fused.

(b) *Centre and port instrument panels*

Two dimmer switches (54) (56) and (59) (60) on each panel control the lamps which are mounted in pairs. Each dimmer switch controls one lamp in each pair. Exceptions to this are the single lamps illuminating the artificial horizon failure indicator and oil pressure indicator on the port instrument panel and the Green Salad indicator and braking parachute switch on the centre instrument panel. In each case the former light is controlled by the appropriate dimmer switch (54) or (59) and the latter by dimmer switch (56) or (60).

(c) *Starboard instrument panel*

A single dimmer switch (64) controls the lamps on the instrument panel. The lamps are mounted in pairs with the exception of the lamps for the instructor's power control switches and oxygen contents indicator.

(d) *Centre pedestal lamps*

Two white single pillar lamps on the centre pedestal are controlled by a single-pole ON/OFF switch (147).

(e) *Side red flood lamps*

Five lamps on the port side and two on the starboard side are controlled by two dimmer switches (10) (116), one on each side of the cockpit.

(f) *E2B compass lamp*

The compass lamp is controlled by a NORMAL–Off–EMERGENCY switch (134), forward of the throttle box on the centre console. When set to NORMAL, power supply is from the bus-bar; when set to EMERGENCY, supply is from the emergency battery. With the switch at NORMAL or EMERGENCY the degree of illumination is controlled by a dimmer switch (133) forward of the throttle box.

(g) *Emergency lamps*

Two emergency pillar lamps on the centre panel are controlled by an on/off switch (89) below them.

47. **External lighting**

The navigation lights are controlled by an on/off switch (109) on the centre panel. Mod. 741 introduces a FLASH–OFF–STEADY switch in lieu of the on/off switch.

48. **Accelerometer**

The accelerometer (92) on the centre panel indicates all normal accelerations imposed on the aircraft by means of three concentrically mounted pointers. One pointer indicates instantaneous G, the other two register the maximum positive and negative G readings respectively until reset.

49. **Pressure head heater**

The heater element in the pressure head is controlled by a switch (81) below the centre of the port instrument panel.

50. **Emergency equipment**

(a) *Crowbar*

This is stowed in spring clips under the starboard windscreen platform.

(b) *E.2B compass*

This is mounted on the windscreen arch above the centre panel.

NOTE.—When swinging or otherwise checking the compass it is essential that the G.G.S. recorder is stowed.

(c) *First-aid kit*

This is mounted above the main fuse box on the bulkhead behind the pilots' seats.

RADIO AND RADAR CONTROLS

51. **VHF equipment**

(a) *ARI. 18064*

The two 10-channel VHF controllers (15), with an adjacent changeover switch (16) are on the port wall. A press-to-transmit switch (11) is in the end of each throttle lever handle. The sets are stowed in the radio bay.

(b) *Intercomm. A1961*

(i) The intercomm. amplifier is controlled by two switches (118) (119) labelled ON/OFF and EMERGENCY/NORMAL.

(ii) When the ON/OFF switch is set to ON the amplifier warms up and is available within 30 seconds. With the EMERGENCY/NORMAL switch at NORMAL all intercommunication is via the A1961 amplifier. Pressing either pilot's press-to-transmit switch isolates that pilot's microphone from the circuit.

(iii) If the power supply to the amplifier fails, or if switched off, setting the EMERGENCY/NORMAL switch to EMERGENCY connects the pilots' microphones to the microphone line of the VHF transmitter-receiver and the pilots' telephones to the audio-frequency output line of the transmitter-receiver, thus providing emergency intercomm. It should be noted that all conversation will be broadcast should either press-to-transmit switch be pressed.

(iv) A muting switch (146) for the VHF circuit is on the centre pedestal.

(c) *ARI. 18012*

The telebriefing land-line plug is on the underside of the rear fuselage, forward of the tail bumper. When the plug is connected the VHF circuit is de-energised and an amber warning light (17) on the port shelf indicates that telebriefing is in use. The pilot's press-to-speak button is adjacent.

(d) *Green Salad*

The control switches (13) are on the cockpit port wall. The indicator (111) is on the centre panel.

52. **DME—Rebecca Mk. 8**

(a) The control unit (112) and the range and heading meter (90), which indicates range and left/right heading from the homing beacon, are on the centre panel.

(b) Four aerials are fitted, one in the engine starter door, one in the engine access door and one in each air intake.

53. **Radar ranging**

(a) The radar ranging ON/OFF switch (31) is on the forward end of the port shelf. An adjacent magnetic indicator (27) shows white when radar ranging is in use and black when its use is discontinued. The radar presentation switch (21) is outboard of the undercarriage selector buttons. Electrical power for the system is obtained from a Type 200 inverter controlled by No. 4 Type 100A inverter.

(b) A spring-loaded TARGET REJECT IN–OUT switch (19) for the port GGS is on the port wall and one (87) for the starboard GGS is on the centre panel.

(c) A range proximity indicator light and a lock-on light are on the right-hand camera recorder bracket on each GGS.

ARMAMENT CONTROLS

54. **Gyro gunsights Mk. 8**

(a) Each GGS is housed in a fixed mounting one above each instrument panel. The GGS on/off switch (91) is on the right of the port sight.

(b) Each sight automatically provides for both manual and radar ranging. Altitude and ballistics units automatically compensate for the time of flight and gravity drop of the particular ammunition in use. The altitude unit is fully automatic but the ballistics unit must be pre-set for the particular ammunition before flight.

(c) The main selector (32) is on the port shelf together with a dimmer control for the port GGS. The instructor/pupil selector (114) and test button for the green and amber lights is on the starboard shelf with the dimmer switch for the starboard GGS.

55. **G90 and recorder cameras**

(a) The cine and recorder cameras (see para. 50(b) NOTE) are operated automatically whenever the gun or camera operating pushbutton (77) on either control column is energised, with the camera master switch ON.

(b) The CAMERA MASTER switch (82) is on the switch panel below the instrument panel. The aperture switch (107) is on the starboard side of the panel.

56. **Gun firing**

(a) A gun-firing trigger is on the forward face of each control column handgrip. The circuit is automatically isolated when the undercarriage is locked down. A BUTT TEST switch (122) is on the starboard shelf. It is operated by a special key and provides an override of the automatic isolation of the gun-firing circuit.

(b) The gun is operated by A.C. obtained from a Type 300 inverter, which is operative only when either gun trigger safety flap (75) is raised and the gun-firing circuit is "live".

57. **RP/bomb release**

(a) *R.P. firing*

When the BOMBS/RP switch (51) is set to RP and the RIPPLE/NORMAL and SELECTOR switches are set as required, RP's are fired by pressing the bomb/RP release pushbutton beneath a safety flap (74). No jettison facilities are available.

(b) *Bomb controls*

Bomb controls are on the armament control panel on the left of the port GGS; a FUZING switch (52), a BOMBS/RP switch (51) and a NORMAL/PRACTICE switch are provided but are not operative.

58. **Drop tank jettisoning**

(a) *Inboard drop tank jettison*

When the bomb fusing switch is set to OFF, both drop tanks are jettisoned by pressing the INBD STORES JETTISON pushbutton (50).

(b) *Outboard drop tank jettison*

When the OUTBD STORES pushbutton (48) is pressed, both *outboard* tanks are jettisoned.

59. **"Clear Aircraft" switch bar**

When the bomb fusing switch is OFF, all stores carried on the four pylons may be simultaneously jettisoned by pulling down the CLEAR A/C switch bar (49) on the armament panel.