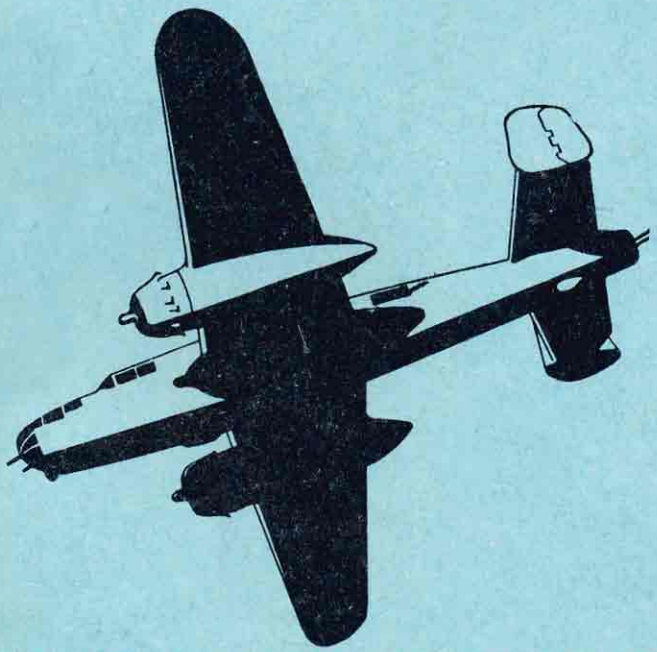
A.P. 2341C—P.N.

PILOT'S NOTES

FOR

MITCHELL III

TWO CYCLONE R-2600-29 ENGINES



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AMENDMENTS

Amendment lists will be issued as necessary and will be gummed for affixing to the inside back cover of these notes.

Each amendment list will include all current amendments and will, where applicable, be accompanied by gummed slips for sticking in the appropriate places in the text.

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A.L. NO.	INITIALS	DATE	A.L. NO.	INITIALS	DATE
1			7		
2			8		
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5			11		
6			12		

NOTES TO USERS

THIS publication is divided into five parts: Descriptive, Handling, Operating Data, Emergencies, and Illustrations. Part I gives only a brief description of the controls with which the pilot should be acquainted.

These Notes are complementary to A.P.2095 Pilot's Notes General and assume a thorough knowledge of its contents. All pilots should be in possession of a copy of A.P.2095 (see A.M.O. A93/43).

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

Additional copies may be obtained by the Station Publications Officer by application on Form 294A, in duplicate, to Command headquarters for onward transmission to A.P.F.S., 81, Fulham Road, S.W.3 (see A.M.O. A1114/44). The number of this publication must be quoted in full—A.P.2341C—P.N.

Comments and suggestions should be forwarded through the usual channels to the Air Ministry (D.T.F.).

MITCHELL III

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PILOT'S NOTES

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PART I

DESCRIPTIVE

INTRODUCTION

1. The Mitchell III aircraft is a mid-wing twin-engined monoplane bomber, fitted with two double-row Cyclone R.2600-29 engines, Hamilton hydromatic propellers and tricycle undercarriage.

FUEL AND OIL SYSTEMS

2. **Wing fuel tanks**

Each engine is provided with an independent fuel system, but a cross-feed valve enables the two systems to be connected. Fuel is supplied by engine-driven pumps from two self-sealing tanks in each wing. Each rear wing tank feeds into the corresponding front wing tank through a non-return valve. Three self-sealing auxiliary wing tanks are fitted outboard of the main tanks, and the contents of these auxiliary tanks can be transferred to their respective front wing tanks by electric pumps. The capacities are as follows :

	U.S. gal.	Imp. gal.
2 front wing tanks (each) ...	184	153
2 rear wing tanks (each)... ...	151	126
2 groups of 3 aux. wing tanks (each group)	152	127
Total per side	487	406
Total per aircraft ...	974	812

On most aircraft, a " Liquidometer " fuel gauge (25) incorporating a selector switch is fitted on the right-hand side of the instrument panel. It indicates the contents of the four main wing tanks and is graduated in U.S. gallons. On later aircraft, dual-dial gauges are

fitted. A combined gauge (19) above the Liquidometer gauge indicates the contents of the auxiliary wing tanks. Before either gauge will operate the BATTERY DISCONNECT switches (39) on the left-hand switch panel must be ON.

3. **Fuselage tanks**

A fixed self-sealing tank of 215 U.S. gallons (179 Imperial gallons) capacity is fitted at the top of the bomb bay ; the contents of this tank can be transferred to either front wing tank ; and, for ferrying, a droppable tank of 335 U.S. gallons (279 Imperial gallons) capacity can be carried below the fixed bomb-bay tank. When the droppable tank is fitted, the fixed tank feeds into it, and the contents of the droppable tank can be transferred into either the starboard or port front wing tanks. When the droppable tank is jettisoned, an automatic shut-off valve in the pipe-line between the two bomb-bay tanks will close so that fuel does not escape from the upper tank into the bomb bay. The fixed self-sealing tank has a direct reading gauge which can be seen through a removable inspection panel in the passage way over the bomb bay, and the droppable tank has a direct-reading gauge which can be seen through a window on the shelf at the rear of the top turret compartment.

4. **Fuel cocks.** Two main ON-OFF cocks, one for each engine, are fitted on a shelf at the rear of the top turret compartment. These cocks may be remotely controlled by the pilot by two push-pull controls (89), marked PULL TO CLOSE, on the left-hand cockpit wall.

5. **Fuel booster pumps.** An electrically-operated booster pump is fitted to each front wing tank. The booster pump supplies fuel direct to the engine-driven pump via the main fuel cock. The booster pumps should be switched ON for starting the engines, take-off and landing, when climbing to high altitudes, and at any time should the fuel pressure fall below 6 lb/sq. in.

6. **Fuel transfer system**

(i) Fuel cannot be transferred from the port wing tanks to the starboard wing tanks, or vice versa.

(ii) *Auxiliary wing tanks transfer system.* The fuel from the auxiliary tanks in each wing may be transferred to their respective front main tanks by electric transfer pumps, the switches (31) for which are on the panel on the control pedestal. When the fuselage tanks are carried, the fuel from them may be transferred either to the port or starboard front main tanks by :

(*a*) setting the selector valve on the rear wall of the top turret compartment as required, and

(*b*) switching on the fuel transfer pump. This pump is controlled by a switch on the generator control panel. Should it fail fuel can still be transferred by means of the hand-pump at the rear of the top turret compartment.

NOTE.—It is not possible to transfer fuel from the wing tanks to the fuselage tank.

7. **Crossfeed valve.** The crossfeed valve control on the rear wall of the top turret compartment is marked ON and OFF. Normally it should be kept OFF, but should be ON when it is necessary to feed one engine from the main tanks on the other side. In this event the main cock for the failed engine should be OFF.

8. **Priming**

A single three-position switch (59) on the control pedestal switch panel operates the priming valves in each engine. The switch is spring-loaded and is held forward to prime the port engine, and back to prime the starboard engine. The appropriate booster pump must be on.

9. **Oil system**

(i) Oil is supplied from a self-sealing tank in each engine nacelle. Each tank has a capacity of 31.2 Imperial

(37.5 U.S.) gallons of oil and 3.3 Imperial (4 U.S.) gallons air space. A stackpipe in each tank retains 1.1 Imperial (1.3 U.S.) gallons as a feathering reserve.

(ii) An oil dilution system is provided. It is operated by two spring-loaded switches (36) on the left-hand switch panel.

(iii) The oil temperature is thermostatically controlled, and there are no controls for the pilot.

HYDRAULIC SYSTEM

10. **Engine-driven pumps**

Two pumps, one on each engine, supply pressure through an accumulator for operation of the :

Bomb doors
Carburettor air intake heat controls (on later aircraft only)
Cowling gills
Flaps
Undercarriage

and, through a separate accumulator, for operation of the brakes.

In the event of failure of both pumps this latter accumulator provides sufficient pressure for three applications of the brake pedals.

11. **Gauges.** A pressure gauge (23) for the general system (HYDRAULIC SYSTEM) and a pressure gauge (26) for the brake system (BRAKE SYSTEM) are fitted on the right-hand side of the instrument panel. With engines running, and equipment inoperative, brake system pressure should be between 1,000 and 1,200 lb./sq. in., and general hydraulic system pressure should be between 800 and 1,100 lb./sq. in. When the brakes are applied a drop in pressure will be indicated on both gauges, but owing to the action of a non-return valve the HYDRAULIC SYSTEM gauge only will indicate a drop in pressure when any of the other services is operated.

12. **Handpump**

A handpump (93) on the floor of the cockpit to the right of the pilot's seat is provided for use in the event of failure of both engine-driven pumps, or for the operation of any of the hydraulic services on the ground when the engines are not running.

A stackpipe in the reservoir ensures a reserve of fluid for the handpump even if all the other fluid has been lost. A three-position emergency selector valve (92) marked NORMAL, LATCH and BRAKE is fitted aft of the handpump and is used in conjunction with the latter to operate the normal hydraulic system, to engage the undercarriage main-wheel downlocks, or for braking (*see* paras. 65, 67).

13. **Emergency undercarriage hydraulic system**

A separate handpump and pipelines are provided for emergency lowering of the main wheels and the nose wheel ; the emergency handpump draws fluid from an emergency reservoir which is kept topped up automatically from the main hydraulic reservoir. The emergency handpump for this system is on the front wall of the top turret compartment (*see* para. 64).

14. **Emergency brakes hydraulic system** (only on later aircraft). A separate accumulator in the bomb bay is charged from the main hydraulic system for emergency operation of the brakes. A non-return valve prevents loss of hydraulic fluid from the emergency brakes accumulator even if all the other fluid has been lost. The emergency brakes hydraulic system is operated by two handles (permitting differential braking) between the pilot's seats (*see* para. 67).

ELECTRICAL SYSTEM

15. **Generators and batteries.** Two 1,500-watt generators, one on each engine, and two batteries supply current at 24 volts for operating :

Bomb doors control	Cabin heating controls
Bomb selection and release	Camera

Certain engine instruments	Oil dilution system
Engine starting	Pressure head heater
Fuel booster and transfer pumps	Priming system
	Propeller feathering
Fuel contents gauges	Radio
Gun turret	RI compass
Landing lamps	All normal lighting

Two generator switches and two ammeters are on the electrical control panel. The generator regulators are not reliable: the generators should, therefore, be switched OFF during taxying and the failed engine generator should be switched OFF in single-engine flight. The generator switches should be switched on just before take-off. Either battery will operate the aircraft's electrical system, but for normal operation both BATTERY DISCONNECT switches (39) should be ON. When these switches are OFF, all circuits are disconnected from the aircraft batteries. A socket for a ground starter battery is fitted on the outboard side of the starboard engine nacelle. When a ground starter battery is in use the BATTERY DISCONNECT switches must be OFF.

16. **Rotary inverter.** A rotary inverter is provided for converting D.C. to A.C. for operation of the RI compasses. An inverter cut-off switch is fitted on the generator control panel.

VACUUM SYSTEM

17. Two vacuum pumps, one on each engine, operate the instrument flying panel.

AIRCRAFT CONTROLS

18. **Trimming tabs**

The elevator trimming tab control is a large handwheel (46) on the left of the control pedestal. The rudder and aileron trimming tab controls (90, 94) are on the cockpit floor to the right of the pilot's seat. All work in the natural sense, and adjacent indicators are provided.

19. **Flying and hydraulic controls locking gear**

(i) The flying controls are locked in the neutral position by a red spring-loaded folding lever, marked PULL—LIFT TO LOCK, on the floor forward of the pilot's control column. To lock the controls, the handle of the lever is rotated backwards and the lever is then raised and pushed forward until it engages in the locked position. When the controls are then set to neutral, they will lock automatically. The controls are unlocked by pulling up the handle of the lever and releasing it.

NOTE.—The spring is very powerful and care should be taken when releasing the locking lever.

(ii) A hydraulic control locking plate is provided: when this is fitted, the undercarriage, flaps and cowling gills cannot be operated.

20. **Nose wheel**

(i) The nose wheel is not steerable but a hydraulic damper prevents shimmying. When the aircraft is towed on the ground the tow lock-pin should be disengaged from the nose wheel leg to enable it to swivel in any direction. This pin must be re-engaged and the red dust cap replaced before flight.

(ii) *Nose-wheel indicator*

Two amber lights (22), marked WARNING—NOSE WHEEL TURNED BEYOND 15°, are fitted on the right-hand side of the instrument panel. Night flying dimmer screens are incorporated in the lights.

21. **Undercarriage control.** The red two-position lever (68) marked LDG GEAR on the hydraulic control box to the right of the pilot's seat, cannot be moved until a trigger catch forward of the lever is operated. In addition a spring hook may be clipped over the lever to retain it in the DOWN position.

22. **Undercarriage and flaps indicators**

(i) A combined pictorial indicator (24) on the right-hand side of the instrument panel shows the position of the

undercarriage and flaps at all times when the BATTERY DISCONNECT switches are ON. On early aircraft, small yellow flaps on each wheel indicator disappear when the undercarriage is locked up or down. On later aircraft, the indicator shows a small image of each wheel when its respective down-lock is engaged ; when the wheels are locked up or between locks, the indicator shows red and white diagonal strips.

(ii) A red warning light (21) on the top right-hand side of the instrument panel is marked LANDING GEAR SIGNAL ; it comes on when either or both throttles are nearly closed and the undercarriage is not locked down. Two spring-loaded switches (41) on the bottom left-hand side of the instrument panel marked LDG. GEAR WARN serve to test, and to cut out, the LANDING GEAR SIGNAL light.

23. **Flaps control**

(i) The flaps are controlled by a three-position lever (67) on the hydraulic control box. Intermediate flap settings can be obtained by returning the lever to neutral when the desired setting is reached. The lever should be returned to neutral after any operation, except when landing when it should be left DOWN to prevent the flaps from creeping. A spring catch on the lever must be lifted before the lever can be moved from neutral.

(ii) In the event of complete hydraulic failure the flaps may be lowered or raised mechanically from the radio operator's compartment.

For operation of this system *see* para. 66.

24. **Brakes.** The brakes are controlled by toe-extensions on the rudder pedals. The parking brake lever protrudes through the bottom of the instrument panel on the second pilot's side, but can be reached by the first pilot. To apply the parking brake, depress the brake pedals and pull out the parking handle. Release the handle before the pedals, ensuring that both pedals remain depressed. The parking brakes are released by depressing and releasing the brake pedals. If both engine pumps fail, the brake accumulator can be

supplemented by turning the hydraulic emergency valve to BRAKE and using the handpump to maintain the pressure in the brakes accumulator. In this case pumping should be continued during the landing run and the brake pedals used in the normal manner. (For emergency brakes operation by compressed air system or emergency brakes hydraulic system *see* para. 67.)

ENGINE CONTROLS

25. **Throttle controls**

A separate friction damper (43) is provided for the throttle levers (45). No automatic boost control is fitted and care must be taken to avoid overboosting on take-off and in flight.

26. **Propeller controls**

(i) The speed control levers (44) for the Hydromatic propellers are fitted with a friction damper (65) which also serves the mixture control levers.

(ii) The feathering pushbuttons (53) are on the control pedestal switch panel.

27. **Mixture controls.** Holley 1685HA or HB carburettors are fitted ; RICH mixture is obtained with the mixture control levers (63) fully forward ; CRUISING LEAN gives a weak mixture for use at boosts and r.p.m. below maximum weak continuous ; the IDLE CUT-OFF position (fully back) is used only for stopping the engines.

28. **Carburettor air intake heat controls**

(i) On early aircraft the air intake shutters are mechanically controlled by two levers (64) on the right-hand side of the control pedestal. The levers have two positions only, NORMAL (forward) and ICING (back). In the ICING position the normal ram intake is closed and an alternative intake in the engine compartment is opened, admitting warm air to the engine. The controls should be kept at NORMAL unless flying under icing conditions—*see* A.P.2095.

(ii) On later aircraft the air intake heat controls are hydraulically operated. In this system the air is heated by allowing exhaust gases to enter the airscoop and mix with the ram air through doors which can be opened to any desired extent : the control levers have three positions, NORMAL, NEUTRAL and ICING ; normally the controls should be set at NORMAL and left there ; this prevents any possibility of the hot air doors creeping open. Under icing conditions, the control levers should be set to ICING and returned to NEUTRAL when the desired amount of heating has been obtained. With the doors fully opened, approximately 10% power will be lost.

(iii) On some early aircraft and on all later aircraft a dual-reading CARB. AIR temperature gauge (20) is fitted on the right-hand side of the instrument panel.

29. **Supercharger controls**

The two SUPERCHARGER gear change levers (42) on the control pedestal are moved up for LOW, down for HIGH gear. The quadrants are notched at either end and a safety catch must be moved before HIGH gear can be selected.

NOTE.—When changing gear the levers must always be moved smartly and without pause, and the throttles partially closed to prevent over-boosting.

30. **Cowling gills.** The selectors (66) for the hydraulically operated cowling gills should always be returned to neutral after obtaining the desired position of the gills. This will avoid pumping hydraulic fluid overboard should a cowling gill pipeline be fractured. The selector automatically locks in the neutral position and must be disengaged before operating. No position indicator is provided as the gills are visible from the pilot's cockpit.

31. **Ignition switches.** The two ignition switches and the master switch (55) are on the control pedestal switch

panel. Switching OFF the master switch cuts out the whole ignition system.

32. **Engine starting**

(i) Jack and Heintz inertia-and-direct-cranking starters are fitted. They are controlled by two spring-loaded switches (58) on the control pedestal switch panel, marked ENERGISE and MESH respectively. When the switches are held forward they energise and mesh the starter on the port engine ; when they are held back they energise and mesh the starter on the starboard engine. The MESH switch also controls the booster coils.

(ii) A hand-cranking socket is provided on the starboard side of each nacelle. A small gearbox must be inserted in the cranking socket, and the starting handle then inserted in the gear box. The gear box and handle are stowed in the port engine nacelle. An engaging cable is provided adjacent to the starter socket. Before hand-cranking the engine, pull the cable to lift the brushes off the starting motor ; when the starter has been energised, pull the cable again to start the engine. After the starter has been engaged manually, the starter cannot be electrically energised until the MESH switch in the cockpit is momentarily set to the " on " position ; this lowers the brushes on to the starter motor ; release the mesh switch again before energising.

OPERATIONAL CONTROLS

33. **Bomb controls**

WARNING. Do not open or close the bomb-bay doors on the ground without first determining that personnel are clear ; they operate very rapidly and can cause serious injury.

The bomb control panel on the left-hand cockpit wall contains the master switch (82), bomb doors switch (83), nose and tail fusing switches (85, 87), station loading test switch (88), and warning lights.

The control panel is duplicated in the bomb aimer's compartment where a train-selective switch and intervalometer controls are also fitted. On some later aircraft the station loading test switch may be fitted on the bomb-aimer's control panel instead of the pilot's.

The bomb doors are hydraulically operated, but are controlled by an electric solenoid. In emergency they may be operated by means of a handcrank just above the floor of the top turret compartment (*see* para. 68). The bomb release button (50) is on the left-hand control wheel. To release bombs normally, set

Master switch ON,

Nose fusing switch ON,

Train-selective switch as desired—if at TRAIN, set bomb counter dial at least two minutes before operating interval control.

Bomb doors switch OPEN.

When bomb doors warning light (9) comes on, press the bomb release switch once only if TRAIN release is selected, once for each bomb if SELECTIVE release is selected.

OTHER EQUIPMENT

34. Heating and defrosting

(i) Early aircraft

One Stewart Warner heater serves the cockpit, air bomber's compartment, and top turret compartment, and is fed by a fuel-air mixture from the induction system on the port engine. A second heater is provided in the radio compartment ; this is fed by fuel from the starboard engine pump, mixed with air at the heater.

The controls are as follows :

Master switch (34), on left-hand switch panel. This must be ON for operation of either heater.

Port heater controls

These are on the port wall of top turret compartment. *The air temperature control* which sets the heater in operation and regulates its heat output.

The airflow control which regulates the volume of hot or cold air in the system, and is used to provide more air when flying at low speeds or high altitudes, and to prevent the heater from overheating in temperatures above 0°C.

Starboard heater controls

The heater control in radio operator's compartment sets the heater in operation and regulates its output.

The heaters, which cannot be operated when the engines are not running, should be off during take-off and landing to avoid any possibility of upsetting carburation.

Whenever the aircraft heating system is on, the windscreen is automatically heated by hot air. A flexible tube is stowed on the cockpit floor, and can be used to apply hot air to the side windows when the control (30) on the bottom right-hand corner of the instrument panel is pulled out. A blower is installed to assist the flow of heated air to the defrosting system ; this is switched on by a switch (38) on the left-hand switch panel.

(ii) **Later aircraft**

Two heaters are provided for the pilot's and air-bomber's compartments. They burn fuel, supplied by the port engine-driven fuel pump, mixed with air at the heater. There is provision for fitting similar heaters in the upper turret and aft compartments. The forward heater may be operated on the ground, as electrically operated blowers are provided to supply air to it, but the aft heaters (if fitted) cannot be operated on the ground as they depend on ram air for operation.

The controls are as follows :

Master switch, on left-hand switch panel—this is not fitted on aircraft with only the forward heater installed. It actuates the solenoid valve which shuts off the fuel supply, and also the heating system booster pump.

Cabin heater switch — This has three positions, OFF, START AND HIGH, and LOW. This switch sets the heater in operation, and in the LOW position restricts the fuel flow to about 60% of the maximum.

Fuel pressure switch button and warning light — This is fitted on aircraft with only the forward heater installed and operates the solenoid valve, and the heating system booster pump. When starting the heater, the button should be pressed until the warning light goes out.

Heater blower switch — This is fitted on aircraft with only the forward heater installed. This switch must be ON for operation on the ground, and should be switched OFF after take-off. When the aft heater is installed the forward cabin heater switch sets the blower going, and after take-off a pressure switch operated by ram air cuts the blower out.

Heating system —push-pull controls — These controls, at the top of the instrument panel, are used to direct warm air to the floor outlet, windscreen defroster, or auxiliary defroster tube, as desired.

Ventilating control — When the cabin heater is in operation, the temperature is automatically regulated by a thermostatic control unit. Push-pull controls on the right-hand side of the instrument panel, can be used to cut out the automatic temperature control and admit ventilating air. Adjacent controls regulate the airflow to the pilot's and bomb-aimer's compartments.

35. **Pilots' seats.** Both seats can be adjusted vertically and horizontally. The horizontal adjustment lever is on the inboard side of the seat ; the lever is held up to allow fore-and-aft movement, and must be returned to the

horizontal position to lock the seat ; it is important to ensure that the seats are locked and cannot slide backwards on take-off. The seat can be adjusted vertically by a handle under the forward end of the seat.

36. **Static source selector switch**

A two-position switch (3) on the left-hand side of the instrument panel is labelled AIRSPEED TUBE and ALTERNATE SOURCE Normally it should be set at AIRSPEED TUBE, when the static pressure for the altimeter, ASI, and rate of climb indicator is drawn from the pitot head which is the normal source. Should the normal source fail, the switch should be set to ALTERNATE SOURCE when the static pressure is drawn from the interior of the cabin. In this event the instruments will continue to function but they will not be so accurate—*see* para. 56.

NOTE.—A second switch for the bomb aimer's instruments is fitted in the nose compartment.
This switch should be wired in the ALTERNATE SOURCE position otherwise the pilot's instruments will be affected.

PART II

HANDLING

NOTE.—All handling speeds quoted apply when the static side of the pilot's ASI is connected to the pitot head, that is, with the static source selector switch at AIRSPEED TUBE. If the switch is set to ALTERNATE SOURCE the readings of the ASI and altimeter will be erratic, *see* para. 56

37. **Management of the fuel system**

(i) *Starting and take-off.* All the fuel transfer controls and the cross-feed valve should be off.

(ii) *Booster pumps.* The booster pumps should be ON for starting the engines, take off and landing, when climbing to high altitudes, and at any time when the fuel pressure falls below 6 lb./sq. in.

(iii) *Transfer of fuel from auxiliary wing tanks.* When the contents of each front main tank have fallen to 50 U.S. gallons, switch on both auxiliary transfer pumps and transfer fuel from the auxiliary wing tanks. Switch off the pumps when the contents of each front main tank have risen to 100 U.S. gallons. Three transfer operations will be necessary to empty the auxiliary wing tanks.

(iv) *Transfer of fuel from fuselage tanks*

When the fuselage tanks are carried their contents should be transferred to the front main tanks before transferring fuel from the auxiliary wing tanks.

The procedure is as follows :

(*a*) Set the Liquidometer gauge selector switch (if fitted) to the tank to be replenished.

(*b*) When its contents have fallen to 50 U.S. gallons set the transfer valve to this tank and switch on the electric transfer pump. Should this pump have failed, operate the handpump at the rear of the top turret compartment.

(*c*) When the contents of this tank have risen to 100 U.S. gallons switch off the transfer pump, set the transfer valve to the front main tank in the other wing, and replenish it in the same way.

(*d*) Continue transferring fuel as above until the fuselage tanks are exhausted.

(v) *Crossfeed valve*
For normal operation the crossfeed valve should be OFF, but *see* paras. 7 and 61.

38. **Preliminaries**

(i) *Before entering aircraft*

Check nose-wheel towing pin	Engaged (red dust cap secure)

(ii) *On entering aircraft* check :

Emergency flap crank... ...	Stowed
Emergency bomb doors crank	Stowed
Generator switches	OFF
Main fuel cocks	ON
Cross-feed valve	OFF
Inverter cut-off switch ...	ON
Hydraulic, brakes, and (if fitted) emergency brakes accumulators	Min. 400 lb./sq. in.
Emergency air brakes (if fitted) bottle pressure	550-600 lb./sq. in.
Emergency air brakes control	Wired down
Emergency hydraulic selector	Normal
Hydraulic control locking plate	Removed
Undercarriage operating lever	Down
Cabin heating controls ...	OFF

(iii) Switch ON one BATTERY DISCONNECT switch and check undercarriage indicator—DOWN, and contents of wing fuel tanks. Then switch OFF.

(iv) Test handpump by applying pressure and check the readings of HYDRAULIC SYSTEM and BRAKE SYSTEM pressure gauges.

39. **Starting the engines and warming up**

(i) Set engine controls as follows :

Ignition switches	OFF
Throttles	½ inch open
Mixture controls	FULL RICH
Propeller controls	Fully forward
Supercharger controls... ...	LOW
Carburetter air-intake controls	NORMAL
Gills	OPEN (controls neutral)
BATTERY DISCONNECT switches	OFF (when using external battery)

(ii) Have each engine turned by hand for at least three revolutions of the propeller to avoid the possibility of hydraulic shock damage.

(iii) Set fire extinguisher (if fitted) to the engine to be started.

(iv) Switch ON the booster pump of the engine to be started. Check that the fuel pressure reads about 4-5 lb./sq. in.

(v) Fill the primer lines by operating the priming switch for not more than 2 seconds.

(vi) Switch on master ignition and magneto switches and energise starter for about 20 seconds. Never exceed 30 seconds.

(vii) Keeping the energising switch on, operate the priming switch for about 3 to 4 seconds and mesh starter. When the engine fires and picks up speed, release the switches ; the energising switch must not be held on for more than 30 seconds after engaging. If the engine fires irregularly, operate the priming switch momentarily at short intervals.

(viii) *If engine fails to start :*

(*a*) Stop priming.

(*b*) Wait till propeller stops rotating.

(*c*) Switch off ignition.

(*d*) Operate the MESH switch to engage the flywheel with the engine to ensure that the flywheel stops, then release switch.

(*e*) Have the propeller turned forward through at least half a revolution by hand to disengage the flywheel from the engine. If the engine has been over-primed, have it turned by hand through several revolutions with the throttle open.

(*f*) If the full meshing period has been used, wait two or three minutes before another attempt.

(ix) Open the throttle slowly and warm up at 1,000 r.p.m.

(x) When external battery is removed check that electrical services work with either BATTERY DISCONNECT switch ON alone. Then leave both ON.

40. **Testing the engines and services**

While warming up

NOTE.—During cold damp weather conditions, warming up should be carried out with the carburettor air intake heat controls set to ICING.

(i) Switch OFF booster pumps and check fuel pressure 6 to 7 lb./sq. in.

(ii) Check operation of the hydraulic system by lowering and raising the flaps, and check HYDRAULIC SYSTEM pressure, 800 to 1,100 lb./sq. in.

(iii) Test each magneto as a precautionary check before running up.

After warming up to 40°*C.* (*oil*), 120°*C.* (*cyl.*)

(iv) At 1,000-1,200 r.p.m., exercise supercharger gear change by changing to HIGH gear and checking that oil pressure flickers ; wait 30 seconds, then change back to LOW gear.

(v) At 20 inches boost, exercise propeller speed control at least twice ; as r.p.m. fall check that boost does not rise above 29½ inches, if necessary throttling back to ensure this.

NOTE.—The following comprehensive checks should be carried out after repair, inspection other than daily, or otherwise at the pilot's discretion. Normally they may be reduced according to local instructions.

(vi) Set the carburettor air intake heat controls to NORMAL then check high gear clutch engagement by opening up to 1,700-1,800 r.p.m. and changing to HIGH gear. Check that boost rises slightly. Change back to LOW gear and check that boost falls.

(vii) Open the throttle momentarily to the take-off setting and check take-off boost and r.p.m.

(viii) Throttle back to 25 inches boost and test each magneto in turn. The single ignition drop should not exceed 100 r.p.m.

41. **Taxying**

NOTE.—During cold damp weather conditions taxying should be carried out with the carburettor air intake heat controls set to ICING.

Before leaving dispersal check :

BRAKE SYSTEM pressure...	1,000-1,200 lb./sq. in.
Hatches	Closed
Generator switches	OFF
Pilots' seats	Locked (*see* para. 35)

42. **Check list before take-off**

Nose compartment	Empty	
T —Trimming tabs	At light load (full fuel, 2 crew only)	At full normal load (full fuel, crew, ammunition, 4,000 lb. of bombs)
	27,000 lb.	32,000 lb.
	All neutral	Elevator — ½ div. N.H. Rudder — slightly right Aileron —neutral
M—Mixture controls ...		FULL RICH (locked forward)
Carburettor air intakes ...		NORMAL
P —Propeller speed controls...		Fully forward (locked forward)
Superchargers		LOW
F —Fuel		Check contents Main cocks ON Booster pumps ON
F —Flaps		15° down
Gills		CLOSED, or open as necessary ; controls neutral.
Gyro horizon		ON (if caging device fitted)
Cabin heating		OFF

43. **Take-off**

(i) Turn into the position for take-off and taxy forward for a few yards to straighten the nose wheel. Then, taking care to keep the toes clear of the brake pedals, open the throttles steadily to the take-off boost position.

(ii) As the aircraft accelerates raise the nose wheel clear of the ground. When a speed of 100-110 m.p.h. I.A.S. has been attained pull the control column steadily further back until the aircraft takes off.

(iii) Brake the wheels and raise the undercarriage.

(iv) With the flaps 15° down safety speed at 32,000 lb. at full take-off power is 160 m.p.h. I.A.S.

(v) Raise the flaps above 200 feet and retrim.

44. Climbing

The recommended climbing speed is 160 m.p.h. I.A.S. If the aircraft is not climbing to high altitude, the booster pumps may be switched off.

45. General flying

(i) *Stability.* Stability about all axes is satisfactory, although at heavy loads and consequent aft centre of gravity positions the aircraft becomes slightly unstable longitudinally. There is no tendency to tighten up in turns at normal loadings.

(ii) *Controls*

The ailerons are light at low speeds and for small movements, but tend to become heavy as speed is increased. They are somewhat spongy throughout the speed range. The elevator is light and powerful and the rudder, while light at low speed, becomes progressively heavier as speed is increased. The elevator and rudder trimming tabs are both powerful and sensitive and must be used with care.

(iii) *Change of trim*

Undercarriage down	Nose down
Flaps down	Nose up
Gills open	Slightly nose up
Bomb doors open	No appreciable change

(iv) *Flying at low airspeeds*

Reduce speed to about 170 m.p.h. I.A.S. and lower the flaps 15°. Set the propeller speed controls to give

2,100 r.p.m. Speed may then be reduced to not less than 150 m.p.h. I.A.S.

46. **Stalling**

(i) The stalling speeds, engines off, in m.p.h. I.A.S. are :

	At light load (27,000 lb.)	At full normal load (32,000 lb.)
Undercarriage and flaps up	110	125
Undercarriage and flaps down	100	110

(ii) With the undercarriage and flaps up slight buffeting can be felt some 5 m.p.h. before the stall itself, at which the nose drops gently. If the control column is held back at the stall the left wing drops gently. There is little warning of the approach of a stall with the undercarriage and flaps down, other than that given by the lightness of feel of the controls, especially of the elevator. At the stall the right wing drops fairly steeply and this tendency is accentuated if the control column is held back. Recovery is straightforward and easy in all cases, but it may entail a moderate loss of height.

(iii) Warning of the approach of a stall in a steep turn is given by buffeting which commences some 10 m.p.h. before the stall itself. Continued backward movement of the control column will then cause the nose to drop but recovery is immediate on pushing the control column forward.

47. **Diving**

NOTE.—Before diving the throttles should be set to give not less than 15 inches boost.

(i) As speed is gained the aircraft becomes increasingly tail heavy and tends to yaw and roll to the right. This tendency should be corrected by careful use of the rudder trimming tab. As the limiting speed is approached buffeting of the tail can be felt.

(ii) No automatic boost control is fitted and boost rises rapidly with loss of height.

48. **Check list for landing**

Cabin heating	OFF
Superchargers	LOW
Gills	CLOSED
Booster pumps...	ON
Brake pressure	1,000 lb./sq. in. (If below, *see* para. 67)

Reduce speed to 170 m.p.h. I.A.S. and check :

U—Undercarriage	DOWN (check by indicator and warning light)
M—Mixture controls	FULL RICH
Carburettor air intakes ...	NORMAL
P —Propeller speed controls...	Set for 2,400 r.p.m., fully forward on final approach.
F —Flaps	Fully DOWN

49. **Approach and landing**

(i) The recommended final approach speeds, flaps down, in m.p.h. I.A.S. are :

	At light loads (up to 27,000 lb.)	At maximum landing weight (32,000 lb.)
Engine assisted ...	110-115	120
Glide	120-125	130-135

The initial straight approach should be made some 10-15 m.p.h. above these speeds.

(ii) Should it be necessary to make an approach on instruments with the static source selector switch set to ALTERNATE SOURCE, the rate of descent should not exceed 400 feet per minute ; otherwise, the altimeter will give false readings. When the switch is at ALTERNATE SOURCE the A.S.I. is also affected, *see* para. 56.

(iii) Make a normal tricycle landing, holding the nose wheel clear of the ground. The elevator is powerful and care should be taken to avoid touching down in an exaggerated tail-down attitude so that the tail comes into contact with the ground.

The brakes must not be applied until the nose wheel has settled firmly on the ground.

50. **Mislanding**

The aircraft will climb away easily with the undercarriage and flaps down at loads up to 27,000 lb. at climbing power.

(i) Raise the undercarriage and retrim.

(ii) Raise the flaps at 300 feet, retrimming as necessary.

51. **Beam approach**

27,000 lbs.	*Preliminary Approach*	*Inner Marker on Q.D.R.*	*Outer Marker on Q.D.M.*	*Inner Marker on Q.D.M.*
Indicated height (feet)	1,500	1,000	700	150-200
Action	Lower 15° flap	Lower u/c.	Lower full flap	Throttle back and commence hold-off
Resultant change of trim	Nose up	Nose down	Slight nose down	Slight nose down
I.A.S. m.p.h.	160-170	150	125-130	110-115
R.p.m.	1,900	2,100	2,400	2,400
Boost approx. (level flight)	24 in.	25 in.	28 in.	—
Boost approx. (−500 ft./ min.)	19 in.	21 in.	23 in.	—
Boost (over-shoot)	—	—	—	38 in.
Remarks	Gills may be left as set for cruising flight			

Altimeter error at take-off : Negligible

Altimeter error at touch down : +20 feet

Before preliminary approach adjust altimeter for Q.F.E. and touch-down error as follows :

Subtract 1 millibar from Q.F.E. to give zero error at touch down.

Overshoot

Open throttles to 38 in.

Raise undercarriage.

Retrim.

Maintain at least 130 m.p.h. I.A.S.

Raise flaps at 300-400 ft.

Retrim as flaps are coming up.

Adjust boost and r.p.m.

52. **After landing**

(i) Raise flaps and open gills before taxying. Return controls to neutral. Switch off generators before taxying.

(ii) Switch off fuel booster pumps.

On reaching dispersal

(iii) At 1,000-1,200 r.p.m. exercise supercharger gear-change twice.

(iv) Idle the engines at 900-1,000 r.p.m. until the cylinder temperatures fall below 190°C., then stop them by setting the mixture controls to IDLE CUT-OFF.

(v) When the engines have stopped, switch off ignition and all electrical services. Do not apply the parking brakes until the brake drums have cooled down.

(vi) *Oil dilution* (*See* A.P. 2095.)

The oil dilution period should not exceed 4 minutes.

53. **A.S.I. conversion table**

m.p.h.	knots	m.p.h.	knots
100	87	180	157
105	91	190	165
110	96	200	174
115	100	210	183
120	104	220	191
125	109	230	200
130	113	240	208
135	117	250	217
140	122	260	226
145	126	270	234
150	130	280	243
155	135	290	252
160	139	300	261
165	144	310	270
170	148	320	278
175	152	330	287
		340	295

PART III
OPERATING DATA

54. **Engine data.**—Cyclone R.2600-29.

(i) *Fuel.*—100 octane only.

(ii) *Oil.*—*See* A.P.1464/C.37.

(iii) *The principal engine limitations are as follows* :—

		R.p.m.	Boost in Hg.	Temp. Cylr. °C.	Oil °C.
MAX. TAKE-OFF TO 1,000 FEET	L	2,600	44½		
MAX. CLIMBING CONTINUOUS ...	L	2,400	38	220*	85
	H	2,400	41	220*	85
MAX. LEVEL ... CONTINUOUS ...	L, H	2,100	31½	205	85†
MAX. WEAK ... CONTINUOUS ...	L, H	2,100	29½	205	85†
COMBAT ... 5 MINS. LIMIT	L	2,600	42	260	85
	H	2,600	44½	260	85

*Climbing cylinder temperature 235°C. for 1 hour is permitted.
†Desired oil temperature 50°C. to 70°C.

OIL PRESSURES :

MAXIMUM	90 lb./sq. in.
DESIRED	80-85 lb./sq. in.
MINIMUM	60 lb./sq. in.
MINIMUM FOR IDLING	25 lb./sq. in.
MINM. TEMP. FOR TAKE-OFF... ...	Oil 40°C. Cylr. 120°C.

(iv) Fuel pressure ... ...6-7 lb./sq. in.

(v) Maximum cylinder temperature for stopping engines, 190°C.

55. Flying limitations

(i) *Maximum speeds in m.p.h. I.A.S. :*

Diving	340
Bomb doors open	290
Undercarriage locked down	200
Undercarriage, normal lowering	170
Flaps down, hydraulic lowering	170
Undercarriage or flaps, lowering by emergency systems	150

(ii) *Maximum weights :*

Take-off from runways, and gentle manoeuvres only	34,000 lb.
Landing	32,000 lb.

Violent evasive action should be avoided at all times since the aircraft structure might be strained.

56. Position error corrections

(i)

From	135	175	215	255	}	m.p.h. I.A.S.
To	175	215	255	280	}	
Add	5	6	7	8		m.p.h.

(ii) When the static source selector switch is set to ALTERNATE SOURCE the A.S.I. and altimeter readings are affected as follows :

At AIR-SPEED TUBE readings	110	120	140	160	180	200	220	240	m.p.h. I.A.S.
The ALTERNATE SOURCE readings are:	115	125	149	170	190	220	240	260	m.p.h. I.A.S.
And the altimeter over-reads by	20	50	100	125	200	300	330	400	feet

57. **Maximum performance**

(i) *Climb*

The speeds for maximum rate of climb are :

150	m.p.h.	I.A.S.	from	SL	to	6,000 feet
145	,,	,,	,,	6,000	,,	11,000 ,,
140	,,	,,	,,	11,000	,,	16,000 ,,
135	,,	,,	,,	16,000	,,	19,000 ,,
130	,,	,,	,,	19,000	,,	21,500 ,,
125	,,	,,	,,	21,500	,,	24,000 ,,
120	,,	,,	above	24,000	,,	

Change to high gear when the boost in low gear has dropped to 30 inches, throttling back partially as the change is made to avoid overboosting when high gear engages.

(ii) *Combat*

Use high gear if the maximum obtainable boost in low gear is less than 31½ inches.

58. **Maximum range**

Climb. Climb in weak mixture at 29½ inches boost and 2,100 r.p.m. at 150 m.p.h. I.A.S. Change to high gear when boost has fallen to 23½ inches. Should the engines show any tendency to overheat, increase I.A.S. before opening gills as the drag effect of open gills is considerable.

Cruising. Fly in weak mixture in low gear at maximum obtainable boost not exceeding 29½ inches, and r.p.m. as required to maintain the desired speed. The recommended speeds are :

Out	...	...	...	...	175 m.p.h. I.A.S.
Home	...	...	...	...	160 ,, ,,

NOTE.—At low r.p.m. rough running may occur and the rate of charge of the generators may be inadequate ; the r.p.m. must be increased as necessary to overcome this. In this case the recommended speed on the homeward journey may be exceeded.

At high altitudes, if at 2,100 r.p.m. the recommended speed cannot be obtained in low gear at full throttle,

accept a speed 10 to 15 m.p.h. lower than recommended speed rather than change to high gear. The use of hot air intakes will not greatly reduce range.

59. Fuel capacities and consumptions

(i) *Fuel capacities :*

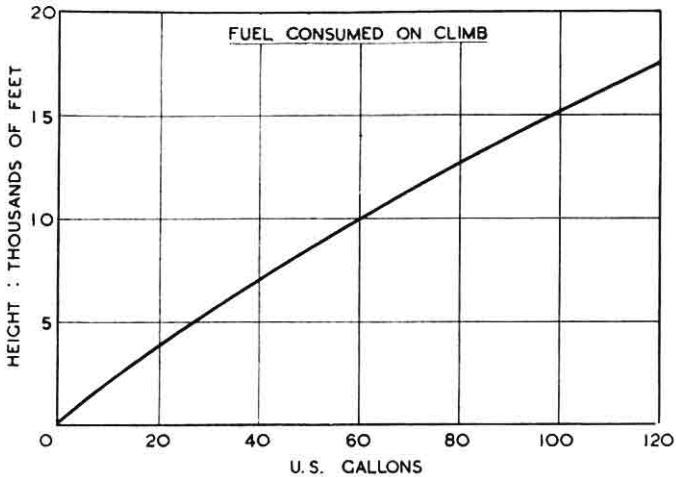
	U.S. gallons per side	Total U.S. gallons
2 front wing tanks	184	368
2 rear wing tanks	151	302
2 groups of aux. wing tanks ...	152	304
Fixed fuselage tank	—	215
Total permanent tanks ...	487	1,189
Ferrying drop tank		335

(ii) *Weak mixture total consumption in U.S. gallons/hour :* (To convert to Imperial gallons, divide by 1.2.)

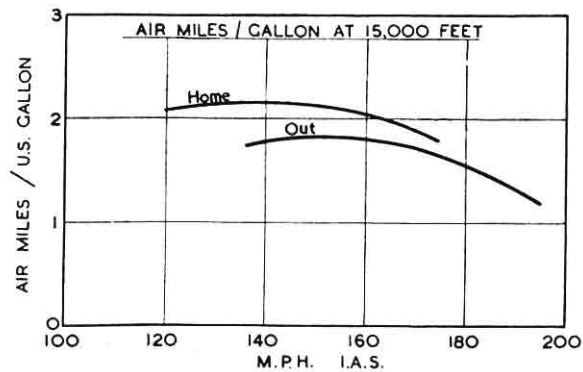
Boost inches	LOW gear at 10,000 ft.					HIGH gear at 15,000 ft.				
	R.P.M.					R.P.M.				
	2100	2000	1900	1800	1700	2100	2000	1900	1800	1700
29	183	164	152	140	133	188	166	155	149	145
27	170	150	140	133	130	167	150	139	130	121
24	143	128	119	109	103	146	133	124	114	105
22	132	118	108	100	92	132	121	113	106	98
20	119	107	98	92	88	117	108	102	95	89

(iii) *Approximate total rich mixture consumptions :*

Boost inches	R.P.M.	Total U.S. gallons/hour
38	2,400	336
31½	2,100	250



NOTE—These curves are given in terms of U.S. gallons To convert U.S. gallons to Imp. gallons, divide by 1·2.



The air miles per gallon at 5,000 feet will be about 4% less.

NOTE: Large variations in air miles per gallon are to be expected owing to variations in carburettor settings.

PART IV

EMERGENCIES

60. Engine failure during take-off

(i) With the flaps 15° down, safety speed at full normal load (32,000 lb.) at full take-off power is 160 m.p.h. I.A.S.

(ii) If safety speed has been attained, the aircraft will climb away slowly at 155-160 m.p.h. I.A.S. provided that :

(*a*) the propeller of the failed engine is feathered ;

(*b*) the bombs are jettisoned and the flaps are up.

61. Engine failure in flight

(i) Feather the propeller of failed engine (*see* para. 62) and close the gills on that side.

(ii) Switch OFF the failed engine generator ; turn OFF the main fuel cock and open the crossfeed valve. Switch on both booster pumps ; the live engine can then draw fuel from both sets of wing tanks.

(iii) At full normal load (32,000 lb.) height can just be maintained on either engine at 150 m.p.h. I.A.S. at full climbing power. Under these conditions the aircraft can be trimmed to fly hands and feet off. Speed should not be allowed to fall below this figure ; otherwise, the rudders hunt noticeably, become very light and may tend to overbalance. In view of this tendency it is recommended that the bomb load should be jettisoned wherever possible.

(iv) *Single engine landing.* At loads up to 27,000 lb. maintain at least 150 m.p.h. I.A.S. during preliminary manoeuvring. At this speed gentle turns can comfortably be made in either direction, and a left-hand circuit, therefore, is recommended irrespective of which engine has failed. Keep extra height in hand if possible and lower the undercarriage later than normally, aiming to have it locked down just before the final straight

approach. The flaps may be lowered 15° when across wind preparatory to turning into the airfield but should not be lowered fully until it is certain that the airfield is within easy gliding reach. The live engine may be used carefully to regulate the rate of descent throughout the approach, the final stage of which should be made at 120-125 m.p.h. I.A.S.

62. **Feathering**

(i) Close the throttle.

(ii) Hold the feathering pushbutton in only long enough to ensure that it stays in by itself and then release it so that it can spring out when feathering is complete.

(iii) Set the mixture control to IDLE CUT-OFF and switch OFF the booster pump if in use.

(iv) Switch OFF the ignition when the propeller has stopped, or nearly stopped, rotating.

(v) Switch OFF the generator.

63. **Unfeathering**

NOTE.—It is preferable not to unfeather at speeds above normal cruising speed to avoid any risk of overspeeding.

(i) Set throttle closed or slightly open, propeller control fully back and ignition on.

(ii) Hold the pushbutton in until r.p.m. reach 800 to 1,000.

(iii) If the propeller does not return to constant-speed operation, open throttle slightly.

64. **Undercarriage emergency operation**

A separate hydraulic system is provided for lowering simultaneously the main wheels and the nose wheel. The emergency handpump is on the front wall of the top turret compartment. Note that excessive loads should not be applied to the handpump (force on the handle should not be greater than 70 lb.). To lower undercarriage by emergency system :

(*a*) Leave the undercarriage lever DOWN.

(*b*) Release the catch on the pump handle.

(*c*) The first stroke of the hand-pump must be a full one, as this movement mechanically releases the nose wheel uplock. Check by reference to the pictorial indicator that the nose wheel does in fact unlock ; if not, give the pump another full stroke.

(*d*) Continue pumping until the undercarriage is locked down, then replace the catch on the pump handle.

NOTE.—(i) If the undercarriage indicator shows that the nose wheel is fully down but not locked, it is safe to land and taxy if pressure is maintained continuously by the emergency hand-pump.

(ii) The undercarriage cannot be raised by this system.

65. **Emergency operation of main wheel down-locks**

If the main wheel down-locks fail to engage automatically (regardless of the method used to lower the undercarriage), they may be engaged by :

(i) Setting the emergency selector valve to LATCH (*see* para. 12).

(ii) Operating the main handpump until pictorial indicator and warning light show that the main wheels are locked down.

NOTE.—Once the lock pins have been pumped into the latched position they cannot be withdrawn. It is most important therefore to ensure that the undercarriage is fully extended before using this system.

66. **Flaps emergency operation**

In the event of complete hydraulic failure the flaps may be lowered or raised mechanically by a hand-crank which, when not in use, is stowed on the rear bulkhead of the bomb bay. The handcrank engages with a shaft fitted under a cover on the shelf above the crank stowage.

To lower flaps :

(i) Reduce speed to 150 m.p.h. I.A.S.

(ii) Set flaps selector neutral.

(iii) Insert the crank handle and rotate clockwise until the flaps are lowered as desired. When the crank handle is removed the flaps remain locked.

NOTE.—Before it is possible to return to hydraulic flap operation the crank handle must be rotated anti-clockwise until the shaft is against the stop (the flaps then being fully retracted). If this is not done the hydraulic system cannot be operated.

67. **Brakes emergency operation**

(A) **Early aircraft**

(i) If the BRAKE SYSTEM gauge reads less than 1,000 lb./sq. in. build up pressure in the brakes accumulator as follows :

(*a*) Set the emergency selector valve to BRAKE.

(*b*) Operate the handpump until pressure builds up to 1,000 lb./sq. in. ; do not exceed 1,450 lb./sq. in.

The handpump must be worked continuously during the landing run as the accumulator is not large enough for repeated applications of the brakes. Normal differential operation of the brake pedals should then be possible.

(ii) If adequate braking is still not obtained the emergency air brake system should be used as follows :

(NOTE that this system does not permit differential braking.)

(*a*) Pull up sharply on the control handle (in order to break safety wire) and lower it halfway almost immediately. Repeat the operation, applying brakes by a succession of quick upward pulls on the handle as required. Finally return the handle to the halfway (intermediate) position—do not release suddenly or the handle will spring back to normal position and all pressure will be released. At the halfway position, the air pressure to the brakes will be maintained.

(*b*) To release the emergency air brakes it is only necessary to return the handle to its normal position.

(*c*) If the air brake control is released, a second application can be made but with considerably less braking effect.

(*d*) After using the air brake system, the hydraulic brake system must be bled.

(B) **Later aircraft**

The normal brake accumulator may be built up as described in (A) (i).

Alternatively the emergency brakes hydraulic system may be used. This is sufficient for 4 brake applications and can be used differentially.

(*a*) Pull up each control handle until desired braking effect is obtained.

(*b*) To release brakes, push down on handles.

68. **Bomb doors emergency operation**

A red painted T handle at the base of the top turret can be used to override the solenoid switch in the event of electrical failure. When the handle is pulled the doors should open. If they fail to do so they can be wound open by a handcrank, the socket for which is beside the override handle at the base of the top turret ; the crank handle is stowed on the lower starboard wall of the top turret compartment. The crank is rotated clockwise to open, and anti-clockwise to close, the doors.

NOTE.—1. After closing the bomb doors with the crank, tie the strap which is on the crank handle through the loop on the floor just below, and tighten. This is necessary in order to hold the doors closed, but is unnecessary when the doors are in the fully open position.

2. If it is necessary to abandon aircraft after the bomb doors have been manually operated, the crank handle must be removed in order to open the emergency hatch. The bomb doors will then fall partly open and they should be cranked to the fully open position before baling out.

69. **Bomb jettisoning**

Bombs (or fuselage drop tank) can be jettisoned, fused or unfused, by operating the salvo switch, which opens the doors and releases bombs. The master switch need not be ON. The doors must be closed after jettisoning by switching ON the master switch and setting the spring-loaded BOMB DOORS switch to CLOSE.

NOTE.—The time taken to jettison the bombs is very short.

70. **Parachute exits**

There are three parachute exits, the main entrance hatches and the tail gunner's escape hatch. A red T-handle on the port side of the compartment above each entrance hatch, marked EMERGENCY—PULL, is provided for jettisoning the hatch.

NOTE.—In the event of fire in the engine during flight it is important that the roof escape hatches should NOT be opened, owing to the risk of sucking the flames into the aircraft.

71. **Crash exits**

Cockpit roof panel : (pull down the red T-handle and push panel outwards).
Bomb aimer's escape hatch.
Radio operator's escape hatch.
Tail gunner's escape hatch.

72. **Fire-extinguishers**

(i) *Engine nacelle extinguishers.* Two extinguishers, one in each nacelle, are manually operated from the cockpit by the controls on the right-hand side of the instrument panel. To operate, set the valve to the engine on fire and then pull the red handle.

(ii) Hand extinguishers are installed in the nose compartment, the top turret compartment and the waist compartment.

73. **Ditching and dinghy** (*see* A.P. 2095.)

(i) The aircraft should ditch satisfactorily if conditions are favourable.

(ii) In the event of having to ditch :

(*a*) Ensure that bomb aimer's compartment is empty and that cockpit roof panel is open.

(*b*) Jettison bombs (or fuselage drop tank) provided there is time to close the bomb doors before making the final approach.

(*c*) Lower flaps fully but keep the undercarriage retracted.

(*d*) Keep safety harness tight and ensure that R/T plugs are disconnected.

(*e*) The engines, if available, should be used to ensure touch-down in a tail-down attitude at as low a forward speed as possible.

(*f*) Normally ditching should be along the swell or into wind if the swell is not steep.

(iii) The dinghy stowed in the roof of the radio operator's compartment may be manually released either by the control on the port side of the cockpit roof, or by the control on the port side of the radio operator's compartment. Release by either of these controls automatically inflates the dinghy. The dinghy may also be released from outside the aircraft by the control on the door of the dinghy stowage. When this release is used the dinghy must be inflated by pulling the cord attaching it to the aircraft.

74. **Dinghy pack.** Stowage for two packs is provided in the compartment aft of the rear entrance hatch.

75. **Dinghy radio.** This is stowed in the waist compartment.

76. **Crash axes.** One in bomb aimer's compartment.
One in top turret compartment.
One in waist compartment.

77. **First-aid stowage.** One in top turret compartment.
One in waist compartment.

78. **Incendiary bombs.** One in top turret compartment.
One in waist compartment.

79. **I.F.F. destruction pushbuttons.** Left-hand side of cockpit.

PART V

ILLUSTRATIONS

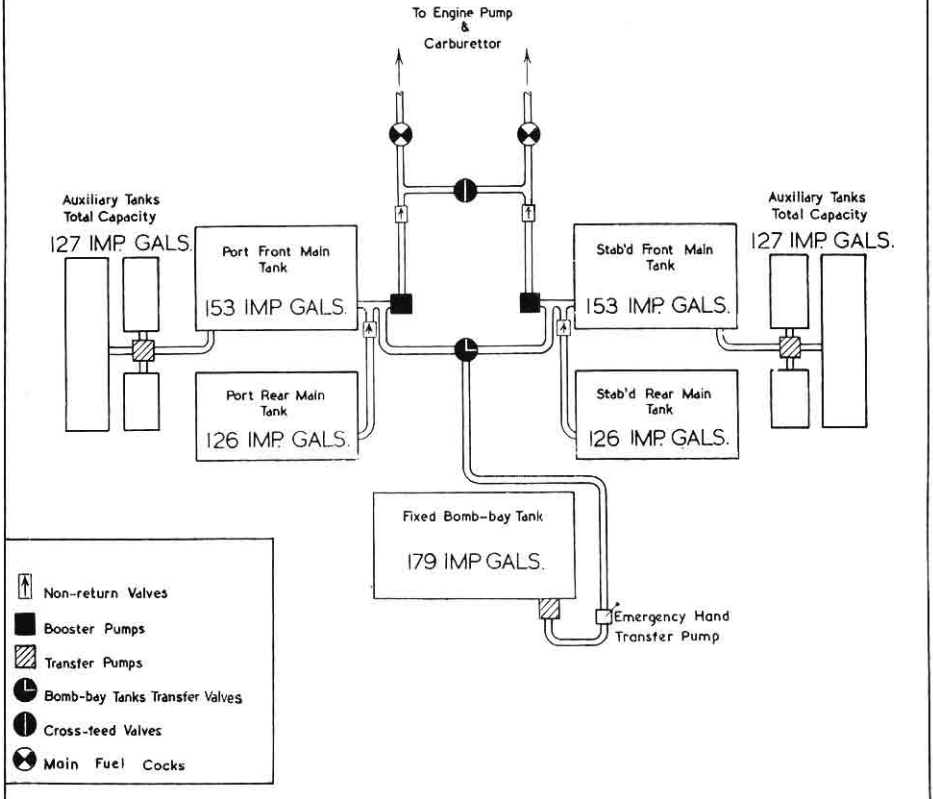


FIG. 1 SIMPLIFIED FUEL SYSTEM DIAGRAM FIG. 1

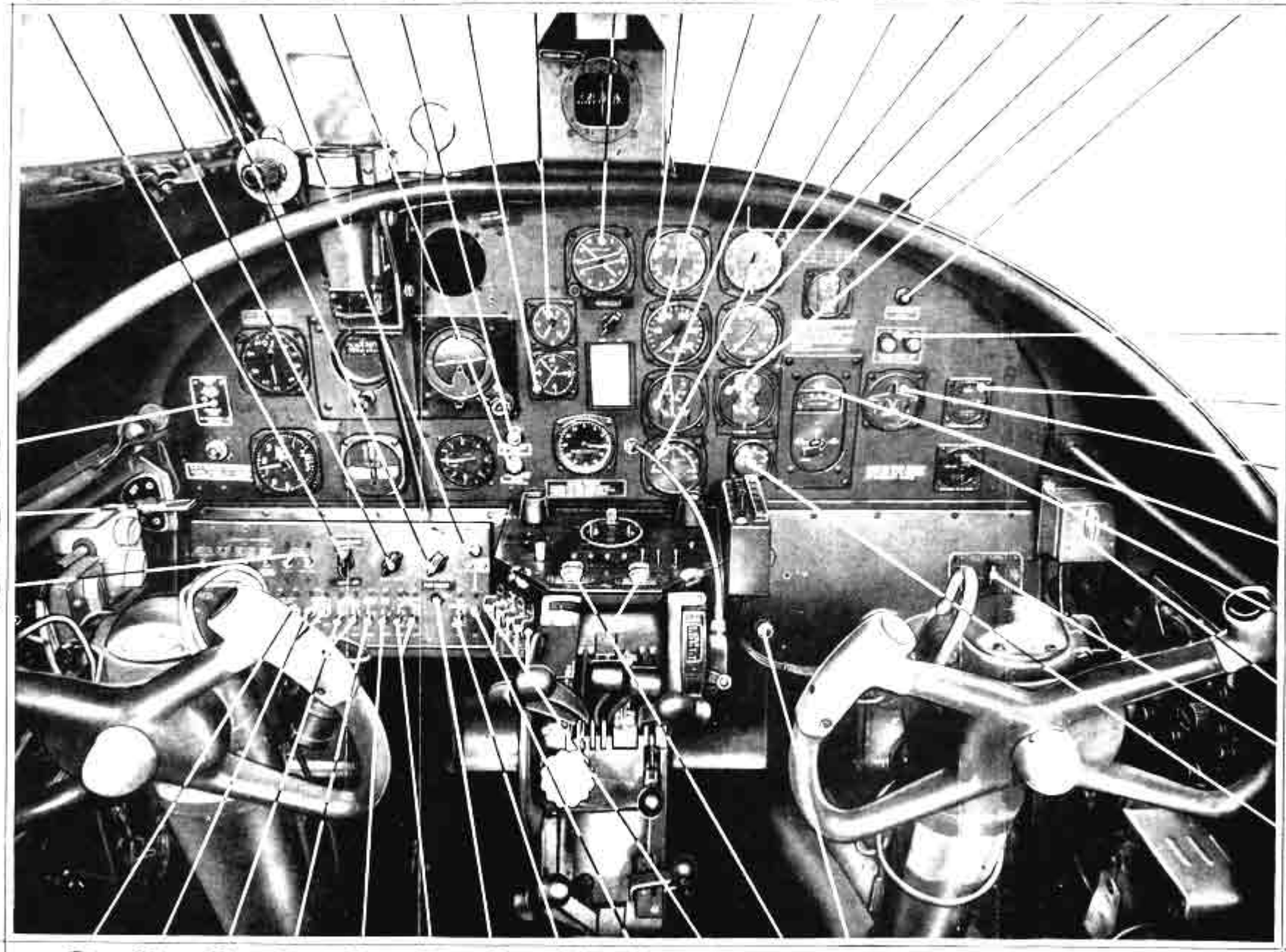


FIG. 2

INSTRUMENT PANEL

FIG. 2

KEY TO *Figs. 2 and 3.*

1. Heated clothing circuit breakers.
2. Leading edge de-icer control.
3. Static source selector switch.
4. Compass light switch.
5. Propeller anticer rheostat (inoperative).
6. Torpedo director rheostat (inoperative).
7. Crew call light.
8. Bomb release warning light.
9. Bomb doors warning light.
10. Clock.
11. Suction gauge.
12. RI compass indicator.
13. Boost gauge.
14. Oil pressure gauge.
15. Oil temperature gauge.
16. Cylinder temperature gauge.
17. R.p.m. indicator.
18. Fuel pressure gauge.
19. Auxiliary wing tanks fuel gauge.
20. Carburettor air temperature gauge.
21. Undercarriage warning light.
22. Nosewheel turn indicator.
23. Hydraulic system pressure gauge.
24. Undercarriage and flaps position indicator.
25. Main tanks liquidometer fuel gauge.
26. Brake system pressure gauge.
27. Intercom. filter box.
28. Engine nacelle fire extinguisher.
29. Air temperature gauge.
30. Windscreen defroster control.
31. Auxiliary wing tanks transfer switches.
32. Recognition lights switches.
33. Crew call switch.
34. Cabin heaters master switch.
35. Camera master switch.
36. Oil dilution switches.
37. Pressure head heater switch.
38. Windshield defroster blower switch.
39. Battery disconnect switches.
40. Position light switches.
41. Undercarriage warning light test switch.
42. Supercharger gear change levers.
43. Throttle levers. friction damper.
44. Propeller speed control levers.
45. Throttle control levers.
46. Elevator trimming tab control.
47. Recognition lights key.
48. Recognition lights circuit breaker.
49. Propeller feathering circuit breaker.
50. Bomb release and camera operating button.
51. Push-to-transmit button.
52. Ultra-violet light.
53. Propeller feathering buttons.
54. Radio push-button unit.
55. Master electrical and ignition switches.
56. Ultra-violet lighting switch.
57. Starter and primer circuit breaker.
58. Starter switches.
59. Primer switch.
60. Booster pump switches.
61. Landing light switches.
62. T1 course control handle.
63. Mixture control levers.
64. Carburettor air intake heat controls.
65. Mixture and propeller control friction damper.
66. Cowling gill control levers.
67. Flaps control lever.
68. Undercarriage control lever.

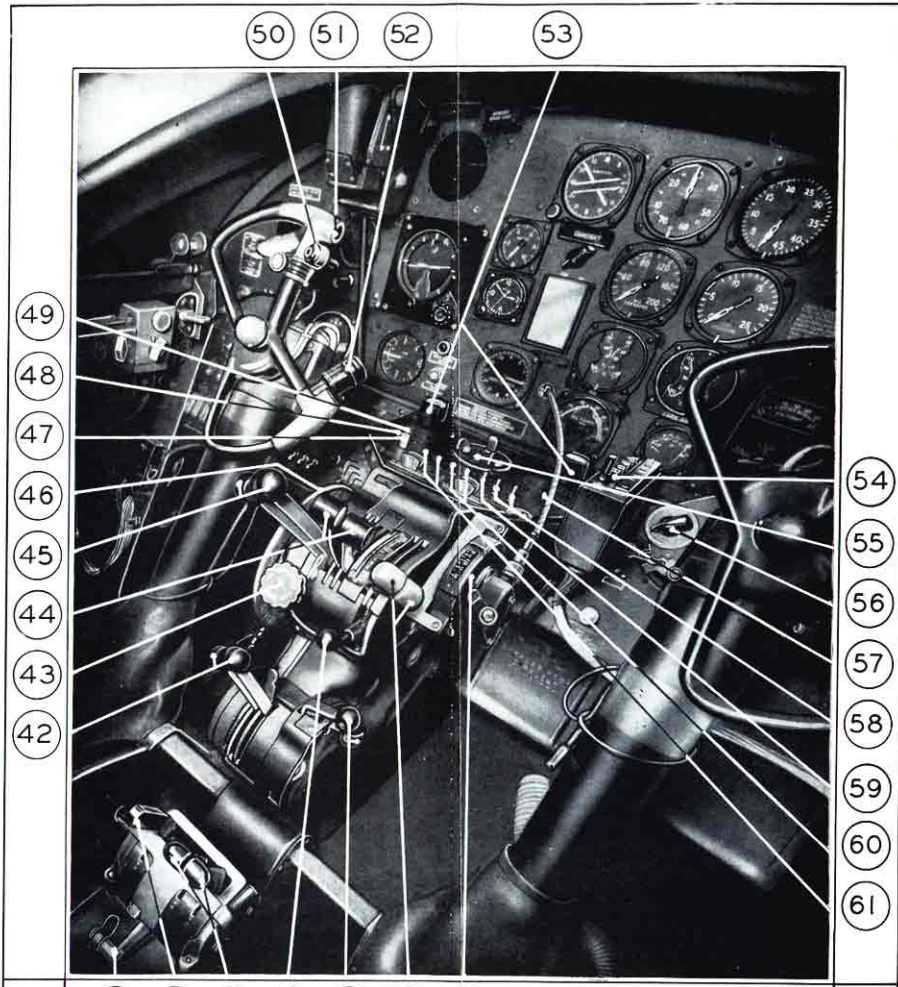


FIG. 3

CONTROL PEDESTAL

FIG. 3

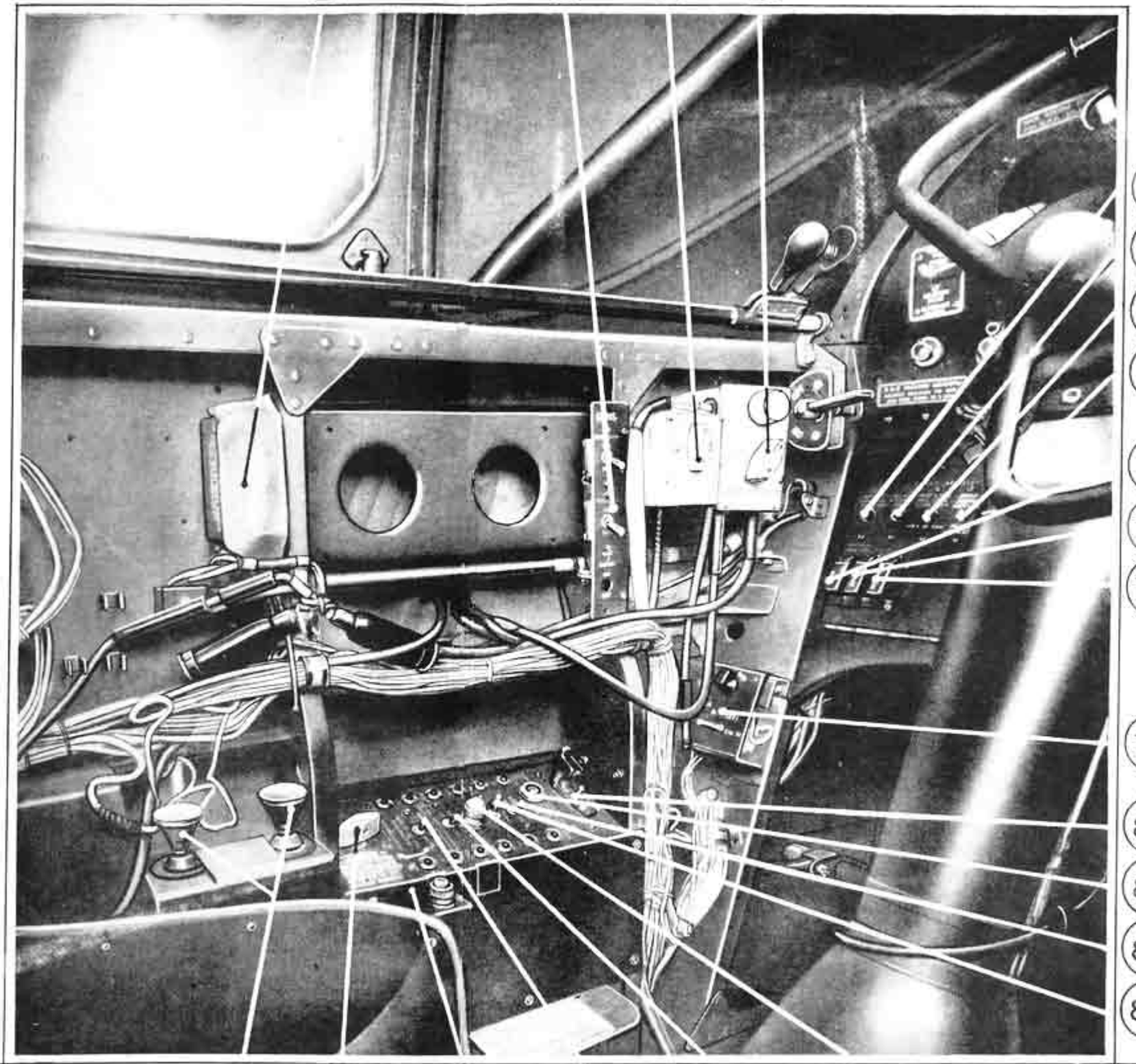


FIG. 4

COCKPIT - PORT SIDE

FIG. 4

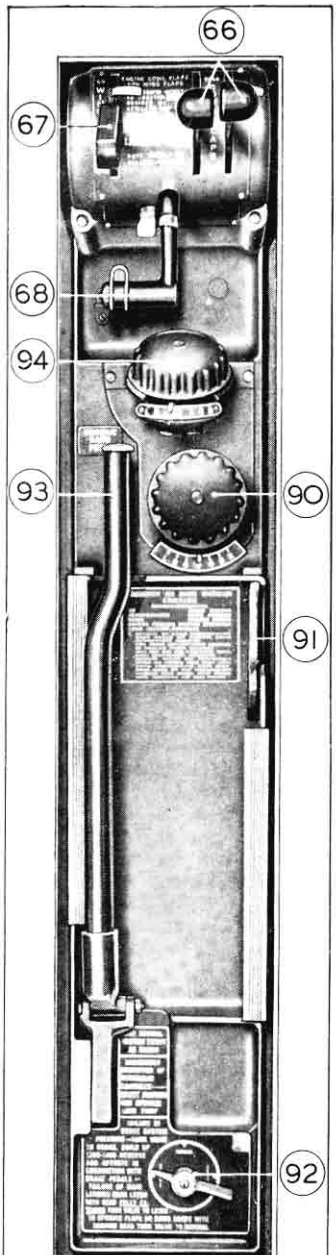


FIG 5 PILOT'S HYDRAULIC CONTROLS ETC FIG 5

KEY TO *Figs.* 4 *and* 5.

66. Cowling gill control levers.
67. Flaps control lever.
68. Undercarriage control lever.
69. IFF destruction buttons.
70. Gun control panel (inoperative).
71. Intercom. station box.
72. Torpedo director circuit breaker.
73. Oil and carburettor temperature gauge circuit breaker.
74. Propeller anticer and position lights circuit breaker.
75. Intercom. and cockpit lighting circuit breaker.
76. Internal chemical tank release switch.
77. Alarm switch.
78. Flare release switch.
79. Beam approach switchbox.
80. Bomb salvo switch.
81. Salvo warning light.
82. Bomb master switch.
83. Bomb doors switch.
84. Nose fusing warning light.
85. Nose fusing switch.
86. Bomb indicator lights test switch.
87. Tail fusing switch and warning light.
88. Station loading switch.
89. Pilot's fuel shut-off controls.
90. Rudder trimming tab control.
91. Emergency brakes lever.
92. Emergency hydraulic selector valve.
93. Hydraulic handpump.
94. Aileron trimming tab control.