A.P. 1565T & W—P.N.

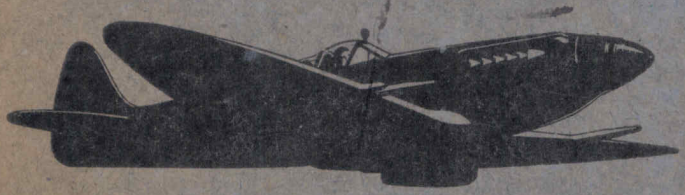
PILOT'S NOTES

FOR

SPITFIRE

XIV & XIX

GRIFFON 65 ENGINE



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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.

Incorporation of an amendment list must be certified by inserting date of incorporation and initials below.

A.L. NO.	INITIALS	DATE	A.L. NO.	INITIALS	DATE
1	Incorporated in this Reprint		7		
2			8		
3			9		
4			10		
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 from A.P.F.S., Fulham Road, S.W.3, by application on R.A.F. Form 294A, in duplicate, quoting the number of this publication in full—A.P. 1565T—P.N.

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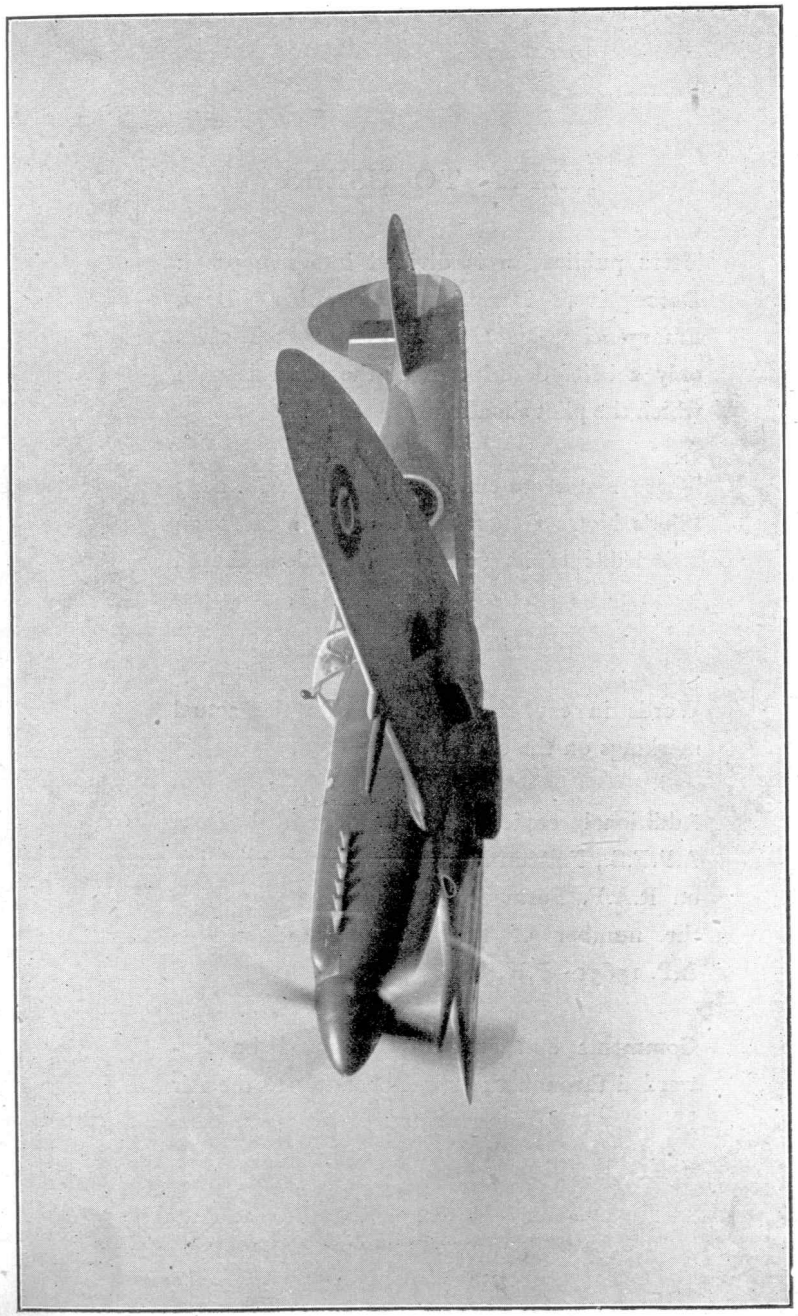

SPITFIRE F/XIV & XIX

SPITFIRE P.R. XIX

A.L. 2
Pages
2A & 2B

INTRODUCTION

1. The Spitfire P.R. Mk. XIX is basically a Mk. XIV aircraft, fitted with a Griffon 65 engine, and differs from it only in the fuel system and the special photographic equipment that is carried. Some aircraft are fitted with a pressure cabin. This supplement describes the fuel system and its management, and operation of the pressure cabin.

FUEL SYSTEM

2. **Fuel tanks.**—The two wing tanks, the capacities of which are increased to 66 gallons each, feed direct to the engine, through separate on-off cocks and non-return valves, and not into the main tanks as on Mk. XIV aircraft. The total fuel capacity is 217 gallons. As an alternative to the normal drop tanks carried on Mk. XIV aircraft, a drop tank of 170 gallons capacity can be fitted. It must not be jettisoned at speeds in excess of 250 m.p.h. I.A.S.
The pressure cabin aircraft have an additional tank of 20 gallons capacity in each wing, from which fuel is fed automatically into the top main tank by means of air pressure and a float-operated cut-off valve.

3. **Fuel cocks.**—The cocks of the two 66-gallon wing tanks are operated by two levers, one for each tank, mounted together on a bracket below the left-hand side of the instrument panel.

4. **Contents gauges.**—A contents gauge is provided for each 66-gallon wing tank on the corresponding side of the cockpit.

5. **Booster pumps.**—There is an electric booster pump in each 66-gallon wing tank and in the lower main tank. The three pumps are controlled by a master (ON-OFF) switch and a three-way (PORT, MAIN, STBD.) selector switch mounted together on the right-hand side of the cockpit. A test pushbutton for each pump is fitted below the two switches.

6. **The following drill is recommended**

(i) Start, warm up and take-off on the main tanks.

(ii) At a safe height change over to one of the wing tanks. If a drop tank is carried this should be used first.

(iii) Fly on each wing tank alternately for twenty minutes until the fuel in both has been consumed. This will be indicated by the fuel pressure warning light. Change back to the main tanks.

(iv) The following procedure must be adopted at each change of tanks:

First turn ON the cock of the next tank in sequence and select the appropriate booster pump. Then turn OFF the cock of the tank just used.

NOTE.—By operating the wing tank cocks every twenty minutes the possibility of freezing up at altitude is lessened. The master switch must be OFF when the booster pumps are not required.

PRESSURE CABIN

7. **Operation of controls**

(i) *To pressurise the cabin*

(*a*) Close the intake and extractor ventilators.

(*b*) Close the spill valve by moving the lever to TO PRESSURISE.

(*c*) Turn ON the HOOD SEAL PRESSURE cock.

NOTE.—It is recommended that the cabin be pressurised before or immediately after take-off. If the cabin is pressurised or exhausted at altitude the hood sealing control should be moved slowly to avoid the risk of damage to the ears by a sudden change of pressure.

(ii) *To exhaust cabin pressure*

(*a*) Turn OFF the HOOD SEAL PRESSURE cock.

(*b*) Open the spill valve and ventilators to cool the cabin as required.

8. **Cabin instruments.**—The cabin instruments are grouped on a small panel immediately below the right-hand side of the main instrument panel. On later aircraft the instruments are on the main instrument panel. An altimeter is provided to which the pilot refers when adjusting the oxygen supply, and visual indication of any drop in cabin pressure is given by two red warning lights which come on when the differential pressure has fallen by 1 lb./sq.in.

GUM HERE

AIR MINISTRY
April, 1944
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AIR PUBLICATION 1565T—P.N.
Pilot's Notes

SPITFIRE F/XIV PILOT'S NOTES

LIST OF CONTENTS

PART I—DESCRIPTIVE

PART I

DESCRIPTIVE

INTRODUCTION (*For PR XIX aircraft see page* 2A).

1. The Spitfire F.Mk.XIV is fitted with a Griffon 65 engine (some early aircraft have a Griffon RG5SM engine), having two-speed two-stage supercharging and a Bendix-Stromberg carburettor. The propeller is a Rotol 35° five-blader. The aircraft is fully tropicalised and the controls, including the undercarriage, flaps and brakes, are identical with those on earlier Marks.

FUEL, OIL AND COOLANT SYSTEMS

2. **Fuel tanks** (*see* Fig. 4).—Fuel is carried in four tanks, two (one above the other) forward of the cockpit and one in each wing. The lower main tank and wing tanks are self-sealing. The top tank feeds into the lower tank and fuel in the wing tanks is transferred to the top tank by means of air pressure, through a transfer valve controlled by the pilot. It is delivered to the carburettor, through a filter, by an engine-driven pump. The de-aerator in the carburettor is vented to the top tank.
The tank capacities are as follows:

Top tank	36 gallons
Bottom tank	49 gallons
2 Wing tanks (13 gallons each) ..	26 gallons
Total	111 gallons

A.L.2
Part I
Para. 2

An auxiliary drop tank of 30, 45 or 90 gallons capacity can be fitted under the fuselage. To meet the possibility of engine cutting due to fuel boiling in warm weather at high altitudes the tanks can be pressurised (operative above 20,000 feet). Pressurising, however, impairs the self-sealing of tanks and should, therefore, be turned off in the event of a tank being holed.

3. **Fuel cocks.**—The cock control for the main tanks is a lever (24) fitted below the engine starting pushbutton; the pressurising cock (65) is on the right-hand side of the cockpit, to the right of the seat. The transfer valve selector cock (41), for admitting pressure to either wing tank, is below and slightly forward of the throttle quadrant. It is important that this cock be turned to the NORMAL position after use or pressurising of the main tanks will not be effective. The cock control (75) and jettison lever (73) for the auxiliary drop tank are mounted together on the right-hand side of the cockpit, below the undercarriage control unit. The jettison lever is pulled up to jettison the drop tank, but cannot be operated until the cock control is moved forward to the OFF position.

4. **Fuel pumps.**—A hand wobble pump (78) for raising fuel pressure before starting is fitted just below the signalling switch box (79). On later aircraft this pump is replaced by an electric booster pump, operated by a switch (49) on the electrical panel. A test pushbutton (48) is also provided. The electric pump, if fitted, should be left on in flight.
NOTE.—The fuel cut-off lever must be in the fully aft position before the pump is operated with the engine stationary.

5. **Fuel contents gauge and warning light.**—The contents gauge (20) on the right-hand side of the instrument panel has two dials, one for the top tank and another for the bottom tank. A red mark (at 60 gals.) on the former indicates the level of fuel at which fuel should be transferred from the wing tanks. The fuel pressure warning light (21), below the oil pressure gauge, comes on when pressure drops to 10 lb./sq.in.; it is switched off by the undercarriage indicator switch.

6. **Oil system.**—Oil is supplied by a tank of 9 gallons oil capacity, and 3 gallons air space, housed between the upper fuel tank and the fireproof bulkhead. The tank is pressurised to 2½ lb./sq.in. and the oil passes through a filter before entering the engine. A cooler is fitted inside the fairing of the port wing radiator and oil pressure (19) and temperature (18) gauges are fitted on the instrument panel.

7. **Engine coolant system.**—The system is thermostatically controlled, the under-wing radiators being by-passed until the coolant reaches a certain temperature. The header tank is mounted above the reduction gear casing and is fitted with a relief valve. The radiator flaps are fully automatic and are designed to open at a coolant temperature of 115° C. A pushbutton on the electrical panel is fitted for ground testing, and there is a coolant temperature gauge (17) on the instrument panel.

MAIN SERVICES

8. **Hydraulic system.**—Oil is carried in a reservoir on the fireproof bulkhead and passes through a filter to an engine-driven pump for operation of the undercarriage and tailwheel.

9. **Electrical system.**—A 12-volt generator supplies an accumulator which in turn supplies the whole of the electrical installation. A voltmeter (11) across the accumulator is fitted at the top of the instrument panel and a red light (53) on the electrical panel, marked POWER FAILURE, is illuminated when the generator is not charging the accumulator.

NOTE.—If the electrical system fails or is damaged the supercharger will be fixed in M ratio and the radiator flaps will remain closed.

10. **Pneumatic system.**—An engine-driven air compressor feeds two storage cylinders for operation of the flaps, radiator flaps, supercharger operating ram, brakes and guns. The cylinders each hold air at 300 lb./sq.in. pressure.

NOTE.—If the pneumatic system fails, the supercharger will be fixed in M ratio, but the position of the radiator flaps will depend on the nature of the failure. The flaps and brakes will also be inoperative (*see* para 59).

AIRCRAFT CONTROLS

11. **Flying controls.**—The control column is of the spade-grip pattern and incorporates the brake lever (28) and gun and cannon firing control. The rudder pedals (42 & 76) have two positions and are adjustable for leg reach by rotation of star wheels (43) on the sliding tubes.

12. **Trimming tabs.**—The elevator trimming tabs are controlled by a handwheel (55) on the left-hand side of the cockpit, the indicator (27) being on the instrument panel. The rudder balance-trimming tab is controlled by a small handwheel (54) and is not provided with an indicator. The aircraft tends to turn to starboard when the handwheel is rotated clockwise.

13. **Undercarriage control.**—The undercarriage selector lever (74) moves in a gated quadrant on the right-hand side of the cockpit.

To raise the undercarriage the lever must be moved downwards and across, to disengage it from the gate, and then moved forward to the full extent of the quadrant. When the undercarriage operation is completed the lever will automatically spring into the forward gate.

To lower the undercarriage, the lever must be held forward for about two seconds, then pulled back in one movement to the full extent of the quadrant. When the undercarriage is down, the lever will spring into the rear gate.

The lever must never be moved into either gate by hand as this will cut off the hydraulic pressure. An indicator in the quadrant shows DOWN, IDLE or UP, depending on the position of the hydraulic valve. UP and DOWN should show only during the corresponding operation of the undercarriage, and IDLE when the lever is in either gate. If, when the engine is not running, the indicator shows DOWN, it should return to IDLE when the engine is started; if it does not, probable failure of the hydraulic pump is indicated. For emergency lowering of the undercarriage *see* para. 55.

14. **Undercarriage indicator.**—The electrically operated visual indicator (6) has two semi-transparent windows on which the words UP on a red background and DOWN on a green background are lettered; the words are illuminated according to the position of the undercarriage. The master switch (4) incorporates a sliding bar which prevents the ignition switches from being switched on until the indicator is illuminated. The master switch also operates the tailwheel indicator light (5) and the fuel pressure warning light.

15. **Flap control.**—The split flaps have two positions only, up and fully down. They are controlled by a finger lever (9) on the instrument panel.

16. **Wheel brakes.**—The brake lever is fitted on the control column spade grip and a catch for retaining it in the on position for parking is fitted below the lever pivot. A triple pressure gauge (2), showing the air pressures in the pneumatic system cylinders and at each brake, is mounted on the instrument panel.

17. **Flying control locking struts.**—Two struts (63) are stowed on the right-hand side of the cockpit, aft of the seat. The longer strut and the arm attached to it lock the control column to the seat and to the starboard datum longeron, and the shorter strut, attached to the other strut by a cable, locks the rudder pedals. The controls should be locked with the seat in its highest position.

ENGINE CONTROLS

18. **Throttle.**—The throttle lever (34) is gated at the take-off position. The mixture control is fully automatic and there is no pilot's control lever. The short lever (40) on the inboard side of the quadrant is a friction adjuster for the throttle and propeller control levers; forward movement increases the friction damping or locking.

NOTE.—The throttle box is of a new type, having a larger range of travel of the throttle lever, and in comparison with that on earlier Marks the lever must be advanced considerably more for a corresponding increase of boost.

19. **Propeller control.**—The speed control lever (39) on the throttle quadrant varies the governed r.p.m. from 2,750 down to below 1,800. Speeds below this figure should, however, not be used except in the event of a forced landing when it is necessary to lengthen the glide.
Later aircraft will have the throttle and propeller speed control interconnected. Such aircraft will retain the propeller speed control lever in the cockpit, but in addition to its normal function the lever will effect the interconnection. With the interconnection in operation (the

propeller speed control lever moved to the Auto. fully aft position) r.p.m. will rise progressively with boost when the throttle is opened; the corresponding r.p.m. for a given boost at low altitudes will then be as follows:

Boost (lb./sq.in.)	R.p.m.
Up to + 4	1,800
At + 7	2,350
At + 9	2,500
At +12	2,750
At +18	2,750

The r.p.m., however, may be increased above these minimum values by operating the propeller speed control in the normal way; with it set to MAX. REVS. (fully forward) the propeller will be in fully fine pitch and r.p.m. will be governed at 2,750.

20. **Supercharger controls.**—The two-speed two-stage supercharger automatically changes to S ratio at about 14,500 feet on the climb. An override switch (14) is fitted on the instrument panel by means of which M ratio may be selected at any height. There is a pushbutton (47) on the electrical panel for testing the gear change on the ground, and a red light (15) on the instrument panel, next to the override switch, comes on when S ratio is engaged, on the ground or in flight.

21. **Radiator flap control.**—The pushbutton (46) for testing the radiator flaps is on the electrical panel.

22. **Fuel cut-off control.**—The fuel cut-off is operated by moving the spring-loaded lever (37) on the outboard side of the throttle quadrant to the fully aft position and engaging it in the gate.

23. **Cylinder priming pump and cock.**—A Ki-gass, Type K.40, pump (77) for priming the engine is fitted immediately forward of the undercarriage control quadrant. The priming selector cock (59) just aft of the wobble pump is marked MAIN, GROUND and ALL OFF. The first position is used for priming with normal fuel from the main fuel tanks, and the GROUND position for priming with High Volatility fuel from an outside source in cold weather. In flight the cock must be in the ALL OFF position.

24. **Ignition switches.**—These (3) are on the left-hand side of the instrument panel. They cannot be moved to the on position until the undercarriage indicator switch is switched on.

25. **Cartridge starter.**—The Coffman starter breech control is a pull-grip toggle (22) below the right-hand side of the instrument panel. The magazine for the starter holds five cartridges which are fired by the engine-starter pushbutton (23). This also operates the booster coil.

26. **Hand starting.**—No provision is made for hand starting of the engine.

27. **Carburettor air intake control.**—The NORMAL INTAKE (aft position of control lever (44)) is not filtered and is used at all times except for take-off and landing on sandy or dusty aerodromes, or when flying through sand storms, when the FILTER IN OPERATION position should be used. Filtered air is then taken from the engine bay.

28. **Oil dilution.**—The pushbutton (45) for operating the solenoid valve is on the electrical panel.

OPERATIONAL EQUIPMENT AND CONTROLS

29. **Guns and cannon.**—The machine guns and cannon are fired pneumatically by means of the pushbutton (1) on the control column spade grip. The compressed air supply is taken from the same source as the brake supply, the available pressure being shown on the gauge.

30. **Bomb release controls.**—The bomb master switch (32) and fusing switch (31) are mounted together on the left-hand side of the cockpit, just forward of the door. The bomb release pushbutton (38) is incorporated in the top of the throttle lever.

OTHER CONTROLS

31. **Cockpit door.**—The cockpit door is provided with a two-position catch (30) which allows it to be partly opened and so prevent the hood from sliding shut when taking-off and landing, and in the event of a forced landing. It will be found that the catch operates more easily when the aircraft is airborne than when on the ground.

PART II

HANDLING

A.L.2 Part II Para. 32 (i)

32. **Management of Fuel System** (for P.R. Mk. XIX aircraft, *see* pages 2A and 2B)

(i) *Flying restrictions:*

(*a*) When fitted with a 90-gallon drop tank the aircraft is restricted to "straight" flying until the tank is jettisoned.

NOTE.—This restriction does not apply when fitted with a 30- or 45-gallon drop tank.

(*b*) Drop tanks should be jettisoned only in straight flight and at a speed of not more than 300 m.p.h. I.A.S.

(ii) *Management of tanks:*

Main fuel system:

(*a*) Start and warm up on the main tanks.

(*b*) Take-off on the main tanks and when the contents of the top tank drop to the red mark on the contents gauge, fuel should be transferred from one of the wing tanks. The transfer valve selector cock should be turned to NORMAL after three minutes.

(*c*) Repeat the above procedure with the second wing tank after an interval of two minutes and then turn the selector cock to NORMAL after three minutes. It is important to leave the transfer selector cock in the NORMAL position, or pressurising of the main tanks will not be effective.

When fitted with a drop tank:

(*d*) Start, warm up and take-off on the main tanks and change over to the drop tank at a safe height (say 2,000 feet). Turn OFF the main tanks.

(*e*) At low altitudes the drop tank should not be completely emptied. At a safe height, when the fuel pressure warning light comes on, turn OFF the drop tank and turn ON the main tanks, and if maximum range is required, or in other special circumstances, jettison the tank.

(*f*) If a tank has to be jettisoned before it is empty, first turn ON the main tanks and then turn OFF the drop tank.

NOTE.—It is necessary to ensure that the drop tank cock is in the fully OFF position when the tank is empty or has been jettisoned; otherwise, air may be sucked into the main fuel system.

33. **Preliminaries**

(i) Check contents of fuel tanks and see that the wing tank selector cock is in the NORMAL position. If fitted with a drop tank, check that the cock is OFF.

(ii) Check that the undercarriage selector lever is down; switch on indicator and see that DOWN and tailwheel light show green. Check voltmeter: 12 volts minimum.

(iii) Test operation of flying controls.

(iv) In order to avoid damage to the propeller the ground immediately below it should be cleared of any small stones or rubble before starting the engine.

34. **Starting the engine and warming up**

NOTE.—The tail must be tied down if a full run-up is intended. Ensure that there are no aircraft or personnel behind.

(i) Set main fuel cock ON.

(ii) Set the controls as follows:

Throttle	1 inch open
Propeller control	Fully forward
Idle cut-off	Fully aft
Priming selector cock ..	MAIN (GROUND for H.V. fuel)
Supercharger override switch	AUTO
Carburettor air intake control	As required, see para. 27

(iii) High volatility fuel (Stores ref. 34A/111) should be used for priming at temperatures below freezing. Work the Ki-gass priming pump until the fuel reaches the priming nozzles; this may be judged by a sudden increase in resistance.

(iv) Switch on the booster pump or operate the wobble pump until the fuel pressure warning light goes out.

NOTE.—Neither the booster pump nor the wobble pump must be operated unless the cut-off valve is closed or the engine is running. The wobble

pump may be operated again, if necessary, after the engine has started and the fuel cut-off control has been moved forward.

If a booster pump is fitted, the cut-off control must be *immediately* returned to the fully aft position if the engine stops.

(v) Load the cartridge starter. The following types of cartridge should be used.

At air temperatures *above* +10°C.: No. 4, Mk. I

At air temperatures *below* +10°C.: No. 5, Mk. I.

(vi) Immediately before attempting to start, switch ON the ignition and give the following number of strokes if the engine is cold:

Air temperature °C.:	+30	+20	+10	0	−10	−20
Normal fuel:	1	1	2½	5		
High volatility fuel:				1	2	3

Leave the priming pump plunger out and press the cartridge starter pushbutton. As soon as the engine fires release the fuel cut-off control. (Keep the button pressed until the engine is running steadily, as it also controls the booster coil.) If the engine cuts after a few seconds, give one sharp stroke of the priming pump and continue to prime until the engine is running satisfactorily.

(vii) Screw down the priming pump and turn OFF the priming selector cock.

(viii) If the engine fails to fire on one cartridge, no further priming should be given except for half a sharp stroke as each subsequent cartridge is fired.

NOTE.—If the engine is overprimed and fails to start, operate the fuel cut-off control and fire one cartridge with it in the fully aft position (switch off the booster pump if fitted). Failing this have the engine cleared by turning through two or three revolutions.

(ix) Open up slowly to 1,000 r.p.m., then warm up at this speed.

35. Testing the engine and installations

While warming up:

(i) Check temperatures and pressures.

(ii) Press the radiator test pushbutton and have ground crew check that shutters open.

After warming up to at least 15°C. oil temperature and 60°C. coolant temperature:

NOTE.—The following comprehensive checks should be carried out after repairs, inspection other than daily, or otherwise at the pilot's discretion (when the tail must be tied down). Normally they may be reduced in accordance with local instructions (the tail need not be tied down).

(iii) Open up to +4 lb./sq.in. boost and exercise and check operation of the two-speed supercharger by operating the test pushbutton. R.p.m. should fall when S ratio is engaged and the red light should come on.

(iv) At +4 lb./sq.in. boost, exercise and check operation of the constant-speed propeller. R.p.m. should not be reduced below 1,800. Check that generator is charging; the power failure light should be out and the voltage 14 or over.
Check operation of the interconnection device by opening up to +4 lb./sq.in. boost with the propeller speed control lever at MAXIMUM REVS. (fully forward). Move the lever to the AUTOMATIC position, when r.p.m. should fall to 1,800. Return to the MAX. REVS. position.

(v) With the propeller control fully forward, open the throttle to the gate and check take-off boost and static r.p.m. which should be 2,750 at take-off boost.

(vi) Throttle back to +9 lb./sq.in. boost and test each magneto in turn. The drop should not exceed 100 r.p.m.

(vii) Before taxying, check brake pressure (80 lb./sq.in.) and pneumatic supply pressure (220 lb./sq.in.).

36. Check list before take-off

T —Trimming tabs	Elevator: Neutral Rudder: *Fully left* (handwheel fully back)
P —Propeller control	Fully forward
Interconnection (if fitted)	MAX. REVS.
F —Fuel	Check contents of main tanks Main tank cock—ON Transfer cock—NORMAL Drop tank cock—OFF Booster pump (if fitted)—ON
F —Flaps	UP
Supercharger	Override switch—AUTO Red light—Out
Carburettor air intake.. ..	As required, see para. 27

NOTE.—It is particularly important on this aircraft to clear the engine before take-off.

37. Take-off

(i) Open the throttle slowly up to +9 lb./sq.in. boost only. This is important, as otherwise there is a strong tendency to swing right in the initial stages and tyre wear is severe on runways (note that the swing is opposite to that of Merlin marks). +12 lb./sq.in. boost may be used on becoming airborne, but +9 lb./sq.in. is sufficient for a normal take-off.

(ii) Care must be taken not to get the tail too high as there is very little clearance between the propeller and the ground.

(iii) After raising the undercarriage see that the red indicator light—UP—comes on and the tailwheel light goes out. It may be necessary to hold the lever hard forward against the quadrant until the red indicator light does come on. Failure of the wheels to lock up will spoil the airflow through the radiators and oil cooler and result in excessive temperatures.

(iv) If the interconnection is fitted set the propeller speed control lever to AUTOMATIC and then adjust it to give the desired r.p.m. for climbing.

38. **Climbing**

(i) The recommended speed for a normal climb is 180 m.p.h. I.A.S. from sea level up to 22,000 feet, reducing by 3 m.p.h. per 1,000 feet above this height.

(ii) On a combat climb the supercharger will automatically change to S ratio at 14,500 feet, but under normal climbing conditions (2,600 r.p.m. and +9 lb./sq.in. boost) the maximum rate of climb is obtained by delaying the gear change until the boost has dropped to +5 lb./sq.in. To do this, fly with the over-ride switch in the M.S. position until this boost is reached.

(iii) Use of the air intake filter considerably reduces the full throttle height.

(iv) The fuel tank pressure cock should normally be kept OFF, but should be turned ON if the fuel pressure warning light comes on.

39. **General flying**

(i) *Stability.*—The aircraft is stable laterally and longitudinally in all conditions of flight. Changes of power and speed cause changes in directional trim which require adjustment of the rudder trimming tab.

(ii) *Change of trim:*

Undercarriage down	Nose down
Flaps down	Initially nose up
	Finally no change
Flaps up	Strongly nose down

(iii) In bad visibility near the ground, flaps should be lowered and the propeller control set to give 2,400 r.p.m. Speed may then be reduced to 160 m.p.h. I.A.S.

40. **Stalling**

(i) The stalling speeds (engine off) in m.p.h. I.A.S. at 8,375 lb. are as follows:

Undercarriage and flaps up	85
Undercarriage and flaps down	75

(ii) *High speed stall :*

If excessive " g " is applied in a turn (either left or right) or in recovery from a dive there is considerable buffeting and the aircraft flicks over to the right. Recovery is immediate if the control column is eased forward.

41. **Spinning**

(i) Spinning is permitted and recovery is normal, but the loss of height involved may be very great and the following limits are to be observed:

(*a*) Spins are not to be started below 10,000 feet.

(*b*) Recovery is to be initiated before two turns are completed.

(ii) A speed of 180 m.p.h. I.A.S. should be attained before starting to ease out of the resultant dive.

(iii) Spinning is not permitted when fitted with a drop tank or when carrying a bomb.

42. **Diving**

(i) The aircraft should be trimmed into and out of the dive.

(ii) Any tendency to yaw should be corrected by use of the rudder trimming tab.

(iii) When carrying a bomb the angle of dive must not exceed 60°.

43. **Aerobatics**

(i) The following speeds (m.p.h. I.A.S.) are recommended:

Loop	320–350
Roll	220–250
Half-roll off loop	350–400
Upward roll	350–450

(ii) Flick manœuvres are not permitted.

44. **Check list before landing**

(i) Reduce speed to 160 m.p.h. I.A.S. and open the cockpit hood.

U	—Undercarriage	DOWN (Check indicator)
	Tailwheel	Green light on
P	—Propeller control ..	Fully forward
	Interconnection (if fitted)	MAX. REVS.
	Supercharger	Red light out
	Carburettor air intake..	As required, see para. 27
F	—Flaps	DOWN

(ii) Check brake pressure (80 lb./sq.in.) and pneumatic supply pressure (220 lb./sq.in.).

NOTE.—The undercarriage operation takes considerably longer with engine off than with engine on.

45. Approach and landing

(i) Approach speeds in m.p.h. I.A.S. at 8,375 lb.:

		(flaps up)
Engine assisted	100	(110)
Glide	110	(115)

NOTE.—In all cases speed may be reduced by 5 m.p.h. when cannon ammunition or considerable fuel has been expended.

(ii) The angle of glide is rather steep and the rate of descent rapid; it is important, therefore, to maintain speed constant, particularly after increasing r.p.m. Very little engine is required to stop sink, but if the engine is throttled right back or has failed the rate of descent is rapid. If the engine has failed, the propeller speed control can be used to regulate the rate of descent (provided oil pressure has not been lost).

46. Mislanding

(i) On opening up, the aircraft can be held straight by the rudder; it is not necessary, therefore, to use the trimming tab.

(ii) Raise the undercarriage.

(iii) Climb at about 160 m.p.h. I.A.S. with flaps fully down.

(iv) Raise flaps at a safe height of about 300–400 feet.

(v) Retrim.

47. After landing

(i) Raise the flaps before taxying.

(ii) To stop the engine, idle for ½ minute at 800–900 r.p.m., then move the fuel cut-off control to the fully aft position. If fitted with an electric booster pump switch it off.

(iii) Turn OFF the fuel cock and switch OFF the ignition.

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

The correct dilution period for this aircraft is:

Atmospheric temperature *above* —10° C: 1 minute

Atmospheric temperature *below* —10° C: 2 minutes

48. Beam approach

Aircraft Type Spitfire XIV	Preliminary Approach	Inner Marker on Q.D.R.	Outer Marker on Q.D.M.	Inner Marker on Q.D.M.
Indicated height* (ft.)	1,500	1,000	700–800	150
Action	Reduce speed	Lower u/c.	Lower flaps	Throttle back slowly and commence hold-off
Resultant change of trim	Slight nose down and left yaw	Nose down	Initially nose up. Finally slight nose down	Slight nose down
I.A.S.	170	160	115–120	110
R.P.M.	2,400	2,400	2,750	2,750
Boost (Level flight) (approx.)	—4	—4	—2	—
Boost (—500 ft./min.) (approx.)	—5	—5	—4	—

* Altimeter adjusted for Q.F.E. and touch-down error as follows:
At take-off, with no flap, the altimeter reads —50 feet.
At touch-down, with flaps down, the altimeter reads —80 feet, so *add* 2·7 millibars to Q.F.E. to give zero reading at touch-down.

OVERSHOOT
Open up to +6 boost.
Retrim
Raise u/c.
Raise flaps at 400 feet after trimming nose heavy.

Aircraft can be held straight on rudder at +6 boost.

PART III

OPERATING DATA

49. **Engine Data:** Griffon 65 and Griffon RG.5.SM.

(i) *Fuel.*—100 octane only.

(ii) *Oil.*—See A.P.1464/C.37.

(iii) *Engine limitations*

		R.p.m.	Boost lb./sq.in.	Temp. °C. Clnt.	Oil
MAX. TAKE-OFF TO 1,000 FEET	M	2,750	+12	—	—
MAX. CLIMBING 1 HR. LIMIT	M S	2,600	+ 9	125	90
MAXIMUM CONTINUOUS	M S	2,400	+ 7	105 (115)	90
COMBAT 5 MINS. LIMIT	M S	2,750	+18	135	105

NOTE.—The figure in brackets is permitted for short periods.

IMPORTANT.—Combat boost must not be used at less than 2,600 r.p.m. and preferably only at 2,750 r.p.m.

OIL PRESSURE:
NORMAL .. .. 60–80 lb./sq.in.
MINIMUM .. .. 45 lb./sq.in.

MINM. TEMP. FOR TAKE-OFF:
OIL .. .. 15° C.
COOLANT: .. .. 60° C.

FUEL PRESSURE .. .. 16–18 lb./sq.in.

50. **Flying limitations**

(i) *Maximum speeds:*

Diving .. .. 470 m.p.h. I.A.S.
Undercarriage down .. .. 160 m.p.h. I.A.S.
Flaps down .. .. 160 m.p.h. I.A.S.

(ii) *Restrictions:*

(*a*) Take-off with three bombs or a drop tank and bombs fitted should be made from a smooth runway.

(*b*) Spinning and aerobatics are not permitted and violent manœuvres must be avoided when any bomb load is carried, or when a 90-gallon drop tank is carried. Spinning is not permitted with any drop tank.

(*c*) Before commencing dive-bombing, the 90-gallon drop tank (if carried) must be jettisoned.

(*d*) The angle of dive when releasing a bomb or bombs must not exceed 60°.

(*e*) Except in an emergency the fuselage bomb or drop tank should be jettisoned before landing with wing bombs fitted.

NOTE.—For restrictions when jettisoning a drop tank *see* Para. 32 (i).

51. **Position error corrections.**

From To	130 160	160 180	180 210	210 240	240 260	260 300	300 340	340 380	380 420	m.p.h I.A.S.
Add Subtract	4 —	2 —	0 0	— 2	— 4	— 6	— 8	— 10	— 12	m.p.h.

52. **Maximum Performance**

(i) The speeds for maximum rate of climb are as follows:

From S.L. to 22,000 feet .. .. .. 175 m.p.h. I.A.S.
At 27,000 feet .. .. .. 160 m.p.h. I.A.S.
At 32,000 feet .. .. .. 145 m.p.h. I.A.S.
At 37,000 feet .. .. .. 130 m.p.h. I.A.S.
At 42,000 feet .. .. .. 115 m.p.h. I.A.S.

For intermediate heights reduce speed by 3 m.p.h. per 1,000 feet.

(ii) On a combat climb the supercharger will automatically change to S ratio at 14,500 feet, but under normal climbing conditions (2,600 r.p.m. and +9 lb./sq.in. boost) the maximum rate of climb is obtained by delaying the gear change until the boost has dropped to +5 lb./sq.in. To do this, fly with the over-ride switch in the M.S. position until this boost is reached.

(iii) Use of the air-intake filter considerably reduces the full throttle height.

53. **Economical Flying**

(i) *Climbing.*—Climb at 2,400 r.p.m. and +7 lb./sq.in. boost at the speeds recommended for maximum rate of climb. (*See* Para. 52.)

(ii) *Cruising.*—Set the supercharger override switch to AUTO and the propeller speed control to 1,800 r.p.m. and obtain the desired speed by adjusting boost up to +7 lb./sq.in. If the desired speed cannot be obtained, increase r.p.m. as necessary up to 2,400. The recommended speed for maximum range is 200–210 m.p.h. I.A.S.

54. **Fuel capacities and consumption**

(i) *Normal fuel capacity:*

Top tank	36 gallons
Bottom tank	49 gallons
Two wing tanks (13 gallons each)	26 gallons
Total ..	111 gallons

(ii) *Long-range fuel capacities:*

With 30-gallon drop tank	141 gallons
With 45-gallon drop tank	156 gallons
With 90-gallon drop tank	201 gallons

(iii) *Fuel consumption (approx. galls./hr.):*

(*a*) Weak mixture (as obtained at +7 lb./sq.in boost and below) and M ratio at 5,000 feet:

Boost lb./sq.in.	R.p.m.			
	2,400	2,200	2,000	1,800
+7	88	85	80	—
+4	74	71	67	60
+2	65	63	59	52
0	57	55	51	46
−2	50	47	43	41

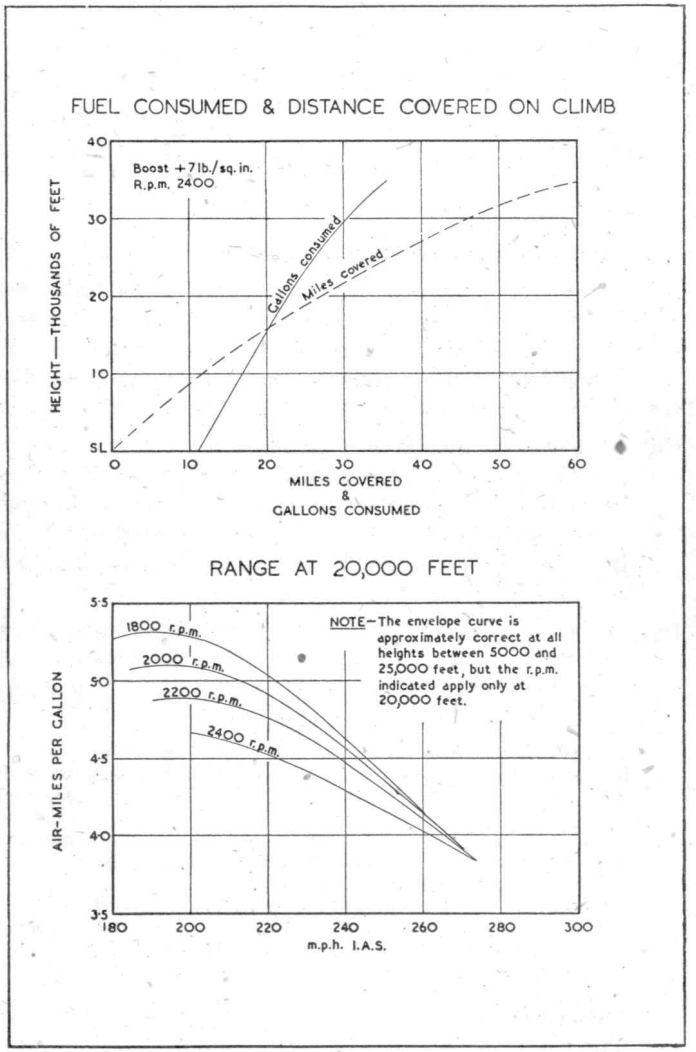
NOTE.—For every 5,000 feet increase in height *add* 4 gal./hr.

(*b*) Weak mixture (as obtained at +7 lb./sq.in. boost and below) and S ratio at 20,000 feet:

Boost lb./sq.in.	R.p.m.			
	2,400	2,200	2,000	1,800
+7	95	92	87	—
+4	82	78	74	70
+2	73	70	66	63
0	66	63	59	56
−2	59	56	52	49

(*c*) Rich mixture (as obtained above +7 lb./sq.in. boost) and M ratio at 5,000 feet:

Boost lb./sq.in.	R.p.m.	Gals. hr.
+18	2,750	180
+12	2,750	130
+9	2,600	103



SPITFIRE XIV

PART IV

EMERGENCIES

55. **Undercarriage emergency operation**

(i) If the lever jams and cannot be moved to the fully down position after moving it out of the gate, return the lever to the fully forward position for a few seconds, to take the weight of the wheels off the locking pins and allow them to turn freely, then move it to the DOWN position.

(ii) If, however, the lever is jammed so that it cannot be moved either forward or downward, it can be released by taking the weight of the wheels off the locking pins either by pushing the control column forward sharply or inverting the aircraft. The lever can then be moved to the DOWN position.

(iii) If the lever springs into the gate and the indicator shows that the undercarriage is not locked down, hold the lever fully down for a few seconds. If this is not successful, raise and then lower the undercarriage again.

A.L.2 Part IV Para. 55 (iv)

(iv) If the undercarriage still does not lock down, ensure that the lever is in the DOWN position (this is essential) and push the emergency lever (68) forward and downward through 180°. (The CO_2 cylinder will lower only the main wheels, not the tail-wheel.) It should not be returned to its original position and no attempt must be made to raise the undercarriage until the emergency bottle has been replaced.

NOTE.—If the CO_2 cylinder has been accidentally discharged with the undercarriage selector lever in the up position, the undercarriage will not lower unless the pipeline from the cylinder is broken, either by hand or by means of the crowbar.

56. **Hood jettisoning**

The hood may be jettisoned in an emergency by pulling the rubber knob inside the top of the hood in a forward and downward movement, and pushing the lower edge of the hood outboard with the elbows.

57. **Forced landing.**—In the event of having to make a forced landing, the glide may be lengthened considerably (provided oil pressure has not been lost) by moving the propeller speed control fully back and gliding at about 140 m.p.h. I.A.S. Just before touch-down, however, the lever should be moved fully forward in order to shorten the landing run. With flaps UP the approach should be made on a gentle turn. The cockpit hood should be opened and the door put on the catch. The drop tank (if fitted) should be jettisoned, but only in straight flight.

58. **Ditching**

(*See* A.P.2095, Pilot's Notes General)

(i) In general, the pilot should if possible abandon the aircraft by parachute.

(ii) In the event of having to ditch, the auxiliary drop tank (if fitted) should be jettisoned, but only in straight flight, and the following procedure should be observed:

(*a*) The cockpit hood should be jettisoned.

(*b*) Flaps should be lowered in order to reduce landing speed as much as possible.

(*c*) The undercarriage should be retracted.

(*d*) Safety harness should be kept on, with straps tight, and the R/T plug disconnected.

(*e*) The engine, if available, should be used to help make the touch-down in a tail-down attitude at as low a speed as possible.

(*f*) Ditching should be along the wave crests or wave tops.

59. **Failure of pneumatic system**

(*a*) If the flaps fail to lower when the control is moved to the DOWN position, it is probably due to a leak in the pipe line, resulting in complete loss of air pressure and consequent brake failure.

(*b*) Alternatively, if a leak develops in the flap control system the flaps will lower, but complete loss of air pressure will follow and the brakes will become inoperative. (In this case a hissing sound may be heard in the cockpit after selecting flaps DOWN.)

(*c*) In either case the flap control should immediately be returned to the UP position in order to allow sufficient pressure to build up, so that a landing can be made with the brakes working but without flaps.

NOTE.—As a safeguard pilots should always check the pneumatic pressure supply after selecting flaps DOWN.

60. **First-aid outfit.**—The first-aid outfit is accessible through a hinged panel on the starboard side of the fuselage.

61. **Crowbar.**—A crowbar (29) for use in an emergency is stowed on the left-hand side of the cockpit.

PART V
ILLUSTRATIONS

Key to *Fig. 1*

INSTRUMENT PANEL

1. Gun firing pushbutton.
2. Pneumatic pressure gauge.
3. Ignition switches.
4. Undercarriage indicator master switch.
5. Tailwheel indicator.
6. Undercarriage indicator.
7. Radio pushbutton controller.
8. Oxygen regulator.
9. Flap control.
10. Instrument flying panel.
11. Voltmeter.
12. Engine speed indicator.
13. Cockpit ventilator control.
14. Supercharger override switch.
15. Supercharger warning light.
16. Boost gauge.
17. Coolant temperature gauge.
18. Oil temperature gauge.
19. Oil pressure gauge.
20. Fuel contents gauge.
21. Fuel pressure warning light.
22. Starter breech reloading control.
23. Engine starter pushbutton.
24. Fuel cock control.
25. Cockpit floodlight switches.
26. Camera gun pushbutton.
27. Elevator tab indicator.
28. Brake lever.

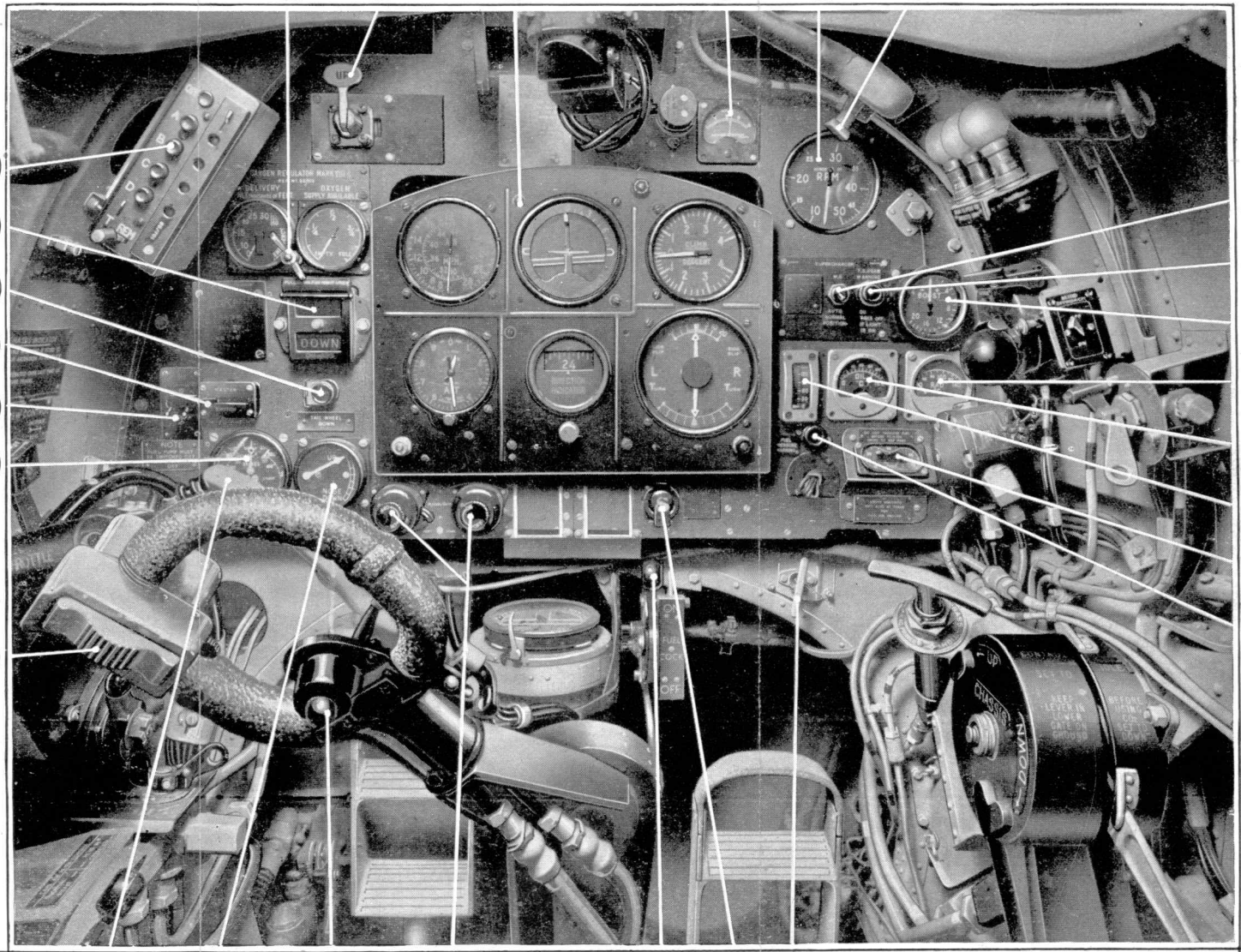


FIG. 1 INSTRUMENT PANEL FIG. 1

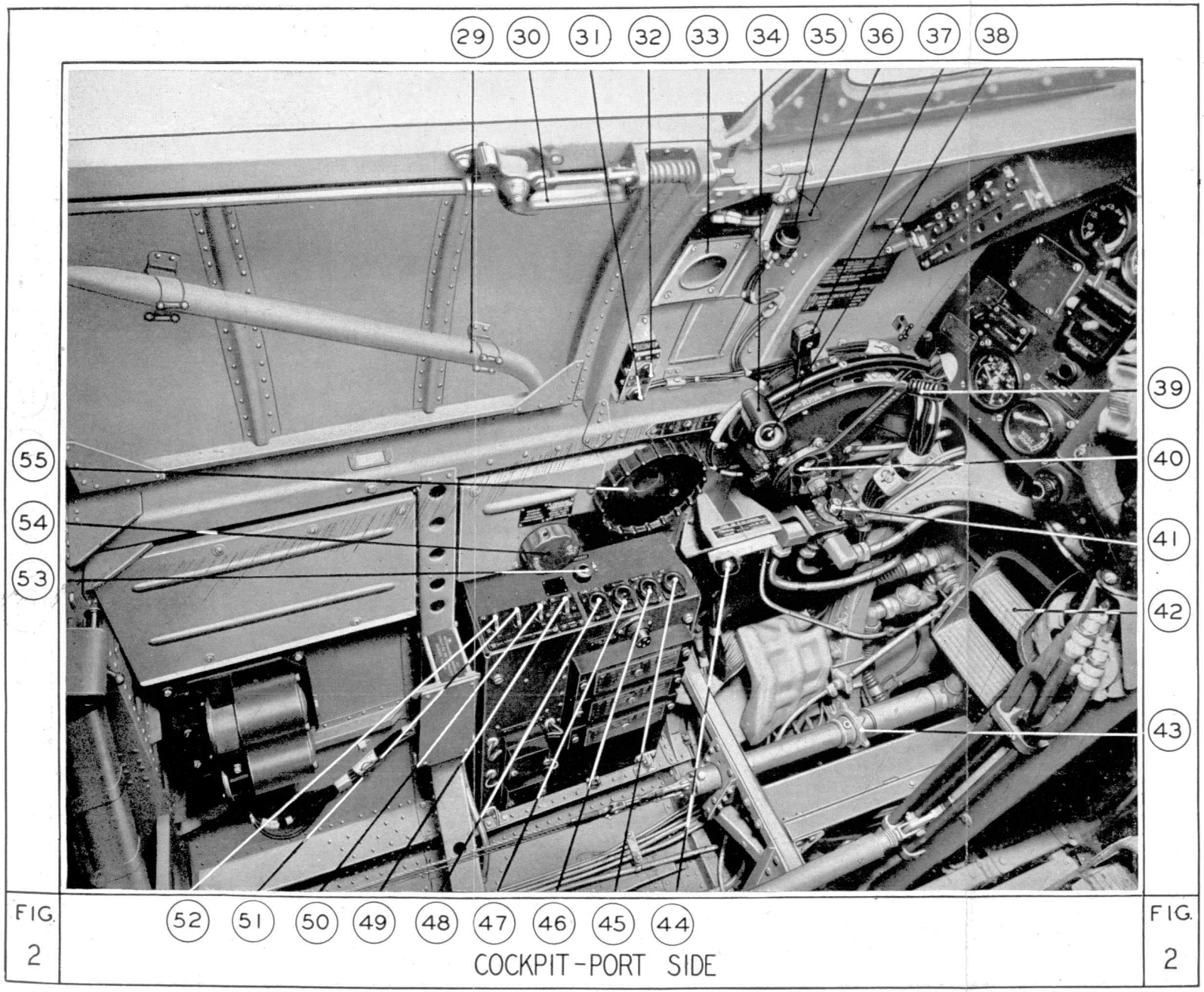


FIG. 2

COCKPIT - PORT SIDE

FIG. 2

Key to *Fig. 2*

COCKPIT—PORT SIDE

29. Crowbar.
30. Two-position door catch lever.
31. Bomb fusing switch.
32. Bomb master switch.
33. Wedge plate for camera gun footage indicator.
34. Throttle lever.
35. Socket for footage indicator plug.
36. Floodlight.
37. Fuel cut-off control.
38. Bomb release pushbutton.
39. Propeller speed control.
40. Friction adjuster.
41. Fuel transfer selector cock.
42. Rudder pedal.
43. Rudder pedal adjustment star-wheel.
44. Carburettor air intake control.
45. Oil dilution pushbutton.
46. Radiator ground test pushbutton.
47. Supercharger ground test push-button.
48. Fuel booster pump test push-button.
49. Fuel booster pump switch.
50. Camera gun heater switch.
51. Pressure-head heater switch.
52. Navigation light switch.
53. Power failure warning light.
54. Rudder trimming tab handwheel.
55. Elevator trimming tab handwheel.

Key to *Fig. 3*

COCKPIT—STARBOARD SIDE

56. Reflector sight spare lamps.
57. Beam approach master switch.
58. Floodlight.
59. Cylinder priming selector cock.
60. Sutton harness release control.
61. Heated clothing socket.
62. Oxygen supply cock.
63. Flying control locking struts.
64. Micro/telephone socket.
65. Fuel tank pressure cock.
66. Windscreen de-icing pump.
67. Windscreen de-icing needle valve.
68. Undercarriage emergency lowering control.
69. IFF main switch.
70. IFF distress switch.
71. IFF pushbuttons.
72. Windscreen de-icing cock.
73. Drop fuel tank jettison control.
74. Undercarriage control lever.
75. Fuel drop tank cock control.
76. Rudder pedal.
77. Cylinder priming pump.
78. Fuel wobble pump.
79. Signalling switchbox

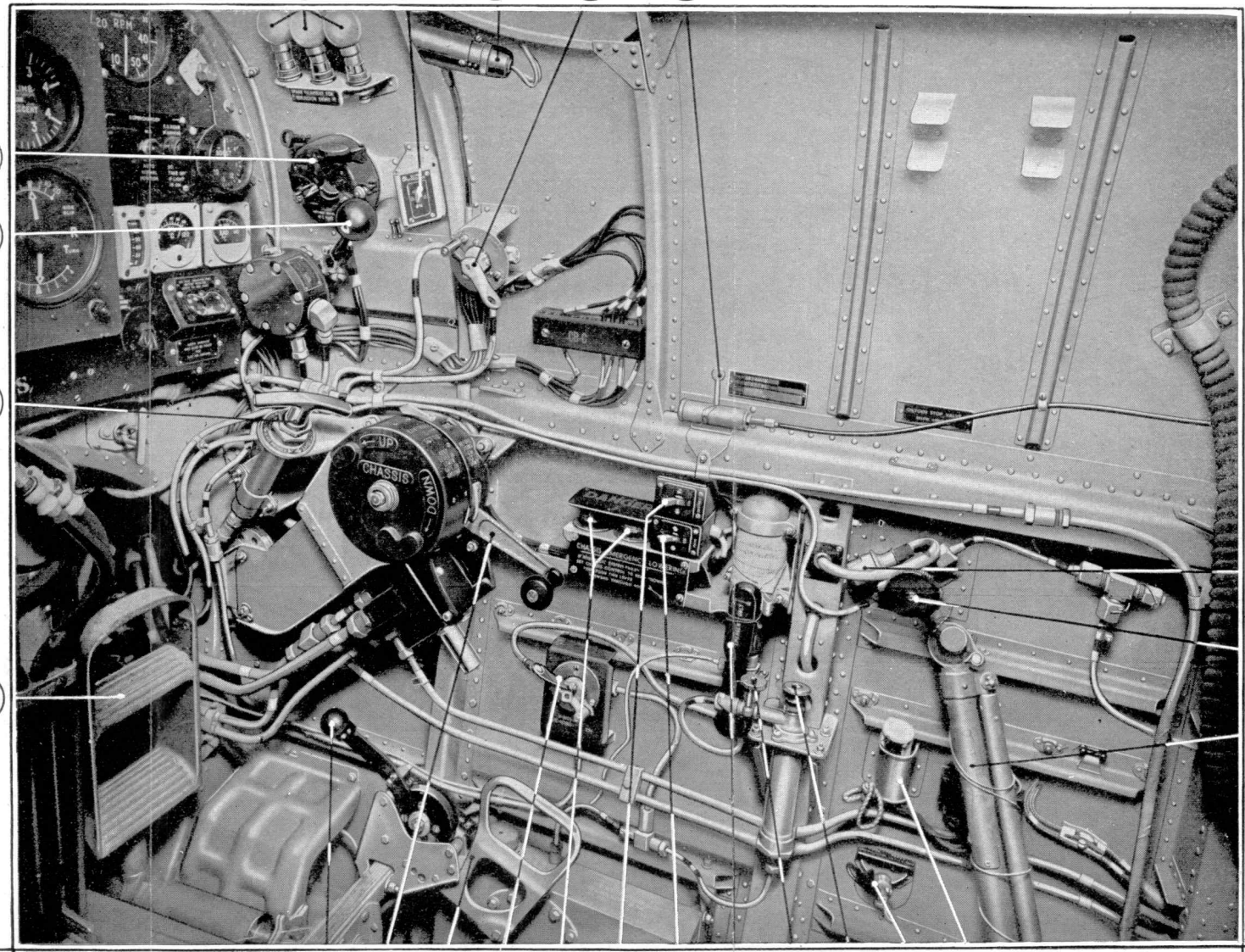
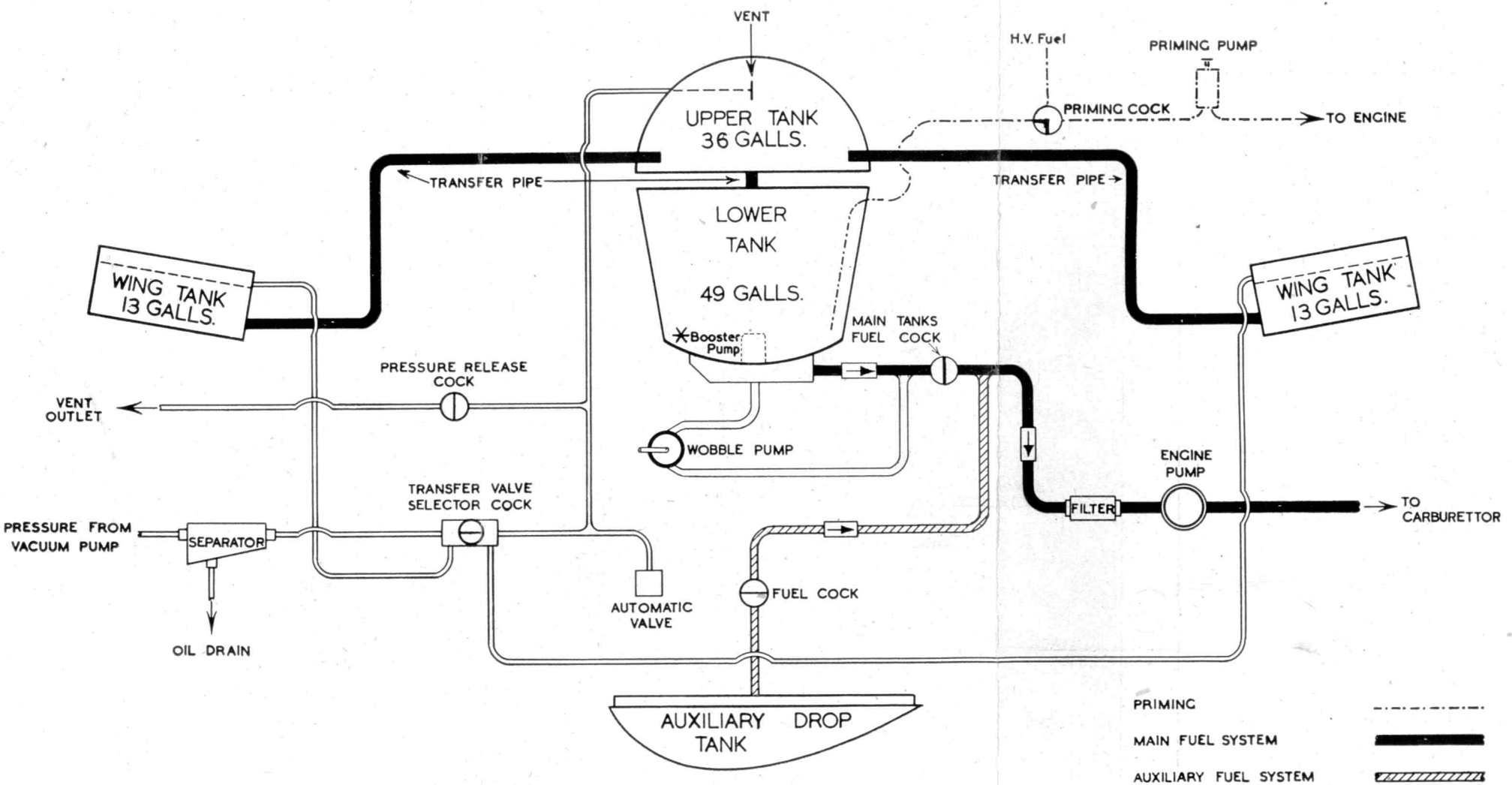


FIG. 3

COCKPIT - STARBOARD SIDE

FIG. 3



*Fitted on later aircraft only.

FIG. 4

SIMPLIFIED FUEL SYSTEM DIAGRAM

FIG. 4

1965 8214/N974 IM 6/45 C.P. Ltd. Gp. 9. 8. 2.


These are being listed for the
benifit for people interested
in British or Commonwealth
Aircraft
While it did cost me a great
sum of money to aquire
these documents, all I ask in
return is some credit.
~JimSan