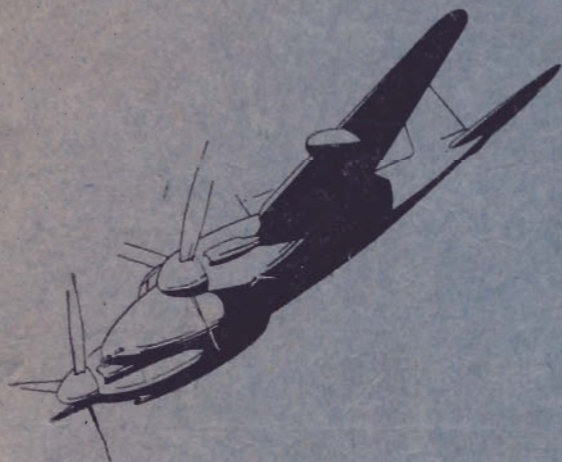


FILE STAFF

A.P. 2019E, L & T-P.N

PILOT'S NOTES
FOR
MOSQUITO
FB VI, ~~FB XVIII~~ & FB 26
TWO MERLIN 21, 23 OR 25 ENGINES



PROMULGATED BY ORDER OF THE AIR COUNCIL

[Signature]

RESTRICTED
(FOR OFFICIAL USE ONLY)

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	<i>[initials]</i>	<i>31/3/47</i>	10		
5	<i>[initials]</i>	<i>31/3/47</i>	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 pilot's controls and of other controls with which the pilot should be acquainted.

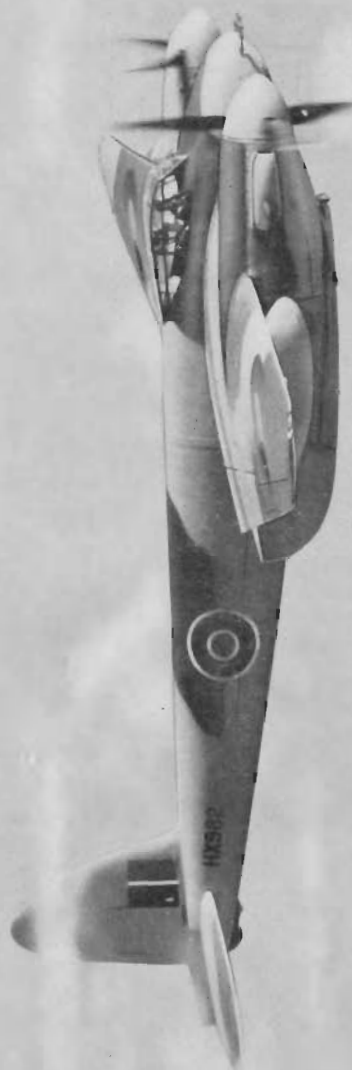
These Notes are complementary to A.P. 2095 Pilot's Notes General and assume a thorough knowledge of its contents. All pilots should be in possession of a copy of A.P. 2095 (see A.M.O. A93/43).

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

Additional copies may be obtained by the Station publication 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. A.1114/44). The number of this publication must be quoted in full—A.P. 2019E & L—P.N.

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

A.L.2
Notes to
Users



MOSQUITO FB VI

AIR MINISTRY

January 1944

(Reprinted, April 1944)

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AIR PUBLICATION 2019E, L & T—P.N.

Pilot's Notes

MOSQUITO FB VI, ~~FB VIII~~ & FB 26 PILOT'S NOTES

1st Edition. This edition supersedes Provisional Notes issued March 1943

LIST OF CONTENTS

PART I—DESCRIPTIVE

	Para.
INTRODUCTION	
FUEL AND OIL SYSTEMS	
Fuel tanks	1
Fuel pressurising	2
Immersed fuel pump	3
Fuel gauges	4
Fuel pressure	5
Priming system	6
Oil system	7
MAIN SERVICES	
Hydraulic system	8
Pneumatic system	9
Electrical system	10
AIRCRAFT CONTROLS	
Flying controls	11
Trimming tab controls	12
Flying control locking gear	13
Undercarriage	14
Undercarriage position indicator	15
Undercarriage warning horn	16
Undercarriage ground locking	17
Wing flaps	18
Brakes	19
ENGINE CONTROLS	
Throttle controls	20
Mixture control	21
Propeller controls	22
Two-speed supercharger control	23
Radiator flaps	24
Air intake filter	25
Carburettor de-icing, Mk. 26	25A

PART I—continued

OPERATIONAL CONTROLS					Para.
Bomb doors .. .. .	..	..	..	..	26
Bomb selection, fusing and release .. ..	..	..	..	..	27
Camera operation .. .. .	..	..	..	..	28
Gun controls .. .. .	..	..	..	..	29
Oxygen .. .. .	..	..	..	..	30
COCKPIT EQUIPMENT					
Heating .. .. .	..	..	..	..	31
Cockpit cooling .. .. .	..	..	..	..	32
Windscreen wiper .. .. .	..	..	..	..	33
Cockpit lighting .. .. .	..	..	..	..	34
Night flying screens.. .. .	..	..	..	..	35
LOCATION OF CONTROLS					
Aircraft controls and instruments .. ..	..	..	..	..	36
Fuel and oil system controls and equipment ..	..	..	..	..	37
Engine controls .. .. .	..	..	..	..	38
Electrical system controls .. .. .	..	..	..	..	39
Cockpit equipment .. .. .	..	..	..	..	40
Operational controls .. .. .	..	..	..	..	41
Navigational, signalling and lighting controls ..	..	..	..	..	42
Emergency equipment .. .. .	..	..	..	..	43
PART II—HANDLING					
Management of fuel system .. .. .	..	..	..	..	44
Starting engines and warming up .. .. .	..	..	..	..	45
Testing engines and installations .. .. .	..	..	..	..	46
Taxying .. .. .	..	..	..	..	47
Check list for take-off .. .. .	..	..	..	..	48
Take-off .. .. .	..	..	..	..	49
Climbing .. .. .	..	..	..	..	50
General flying .. .. .	..	..	..	..	51
Stalling .. .. .	..	..	..	..	52
Diving .. .. .	..	..	..	..	53
Aerobatics .. .. .	..	..	..	..	54
Before landing .. .. .	..	..	..	..	55
Check list for landing .. .. .	..	..	..	..	56
Approach speeds .. .. .	..	..	..	..	57
Mislanding .. .. .	..	..	..	..	58
After landing .. .. .	..	..	..	..	59

PART III—OPERATING DATA

	Para.
Engine data, Merlin 21 or 23	60
Engine data, Merlin 25 and 225	61
Position error correction	61A
Flying limitations	62
Maximum performance	63
Maximum range	64
Fuel capacity and consumption	65

PART IV—EMERGENCIES

Engine failure during take-off	66
Engine failure during flight	67
Single engine landing	68
Feathering	69
Unfeathering	70
Undercarriage and flaps emergency operation ..	71
Bomb jettisoning	72
Fire extinguishers	73
Parachute exit	74
Crash exit	75
Crash axe	76
First-aid outfit	77
Ditching	78
Failure of one 100-gallon drop tank to jettison ..	79

PART V—ILLUSTRATIONS

	Fig.
Simplified fuel system diagram	1
Instrument panel	2
Cockpit—port side	3
Cockpit—starboard side	4
Emergency equipment diagram	5

PART I

DESCRIPTIVE

A.L.3
Part I
Introduction

INTRODUCTION

Mosquito FB Marks VI, ~~XXVI~~ and 26 are fighter-bomber aircraft used for intruder duties. The Mark 26 is the Canadian built equivalent of the Mark VI. Marks VI and ~~XXVI~~ are powered by two Merlin 21, 23 or 25 engines, and the Mark 26 by two Merlin 225 engines, driving three-bladed Hydromatic propellers. There is provision for the alternative carriage of a drop tank, or a bomb, or a depth charge, or for the simultaneous carriage of tier RP and a drop tank under each wing. Marks VI and 26 also carry an internal bomb load, whilst the Mark ~~XXVI~~ is provided with different armament.

FUEL AND OIL SYSTEMS

1. Fuel tanks (See Fig. 1.)

- (i) Fuel is carried in four outer wing tanks, four inner wing tanks, and two centre tanks above the bomb bay. In addition, an auxiliary long-range tank can be carried in the bomb bay, and a drop tank can be carried under each wing.

Mk. 26—The Bendix carburettors are vented to the outer tanks.

The fuel capacities are as follows:—

MAIN SUPPLY

Centre tanks	50 galls.
Inner wing tanks	287 " (143 galls. per side)
OUTER TANKS	116 " (58 " " ")

Total permanent tanks 453

If carried:

Long-range bomb bay tank	63 galls.
Drop tanks (wood)	100 " (50 galls. per side)
(metal)	84 " (42 " " ")

Total fuel capacity 616 with wooden drop tanks
600 " metal " "
716 with 2 × 100gal. drop tanks

- (ii) The centre tanks and the inner wing tanks supply both engines through a fuel collector box, when the two fuel cocks behind the pilot's seat are set to MAIN SUPPLY;

A.L.4
Part I
Para. 1
(ii)
Page 7

PART I. DESCRIPTIVE

Fuel is transferred from the drop tanks to OUTER TANKS by air pressure from the port vacuum pump, controlled by a cock to port of the fuel cocks. If automatic transfer is not provided, the cock is marked JETTISON TANKS FUEL TRANSFER and the transfer must not be made whilst drawing from OUTER TANKS, which should be nearly emptied first, or fuel will be lost through the atmospheric vents. If it is marked ON FOR AUTO TRANSFER (and Mod. 613 is incorporated) the transfer cock may be left on whilst drawing from OUTER TANKS, which will thus be continuously replenished until the drop tanks are empty, when the contents gauge will show a fall in the level of OUTER TANKS. A premature fall, in the early part of a flight at altitude, will indicate an interruption; after an interval which will vary with atmospheric conditions, this will be cured and the fall in the fuel level will stop. The cock should be left ON during an interruption, but must be turned OFF on completion of transfer.

where the cock is marked DROP TANKS—FUEL TRANSFER COCK—" ON " FOR AUTO TRANSFER, a float valve prevents overfilling of the outer tanks during transfer, and the cock should be left ON whilst drawing from the outer wing tanks, which will thus be continuously replenished until the drop tanks have been emptied. This will be shown by a fall in the fuel level of the outer wing tanks, when the cock must be turned OFF.

A.L.1
Part I
Para. 2

2. Fuel pressurising

- (i) The permanent tanks of the MAIN SUPPLY are provided with automatically regulated pressurising to reduce fuel vaporisation at high altitudes. When the PRESSURE VENTING cock behind the pilot's seat is ON, an aneroid-operated valve so controls pressure from the starboard vacuum pump that whilst none is admitted at low altitudes, the amount is progressively increased as height is gained. When it is OFF, all tanks are vented to atmosphere at all altitudes.
- (ii) In aircraft incorporating Mod. 443 the cock is wired in the ON position because the pressurising is extended to the auxiliary bomb-bay tank; in unmodified aircraft it may be necessary to turn it OFF whilst actually using the bomb-bay tank, because the immersed fuel pump might not overcome pressurising in the fuel collector box sufficiently to ensure that fuel is in fact supplied from the auxiliary tank.
- (iii) Pressurising impairs the self-sealing properties of the tanks, and should be turned OFF in emergency. The locking wire on modified aircraft is light enough to break easily.

3. Immersed fuel pump.—When the long-range bomb bay tank is fitted, an immersed fuel pump is provided to feed the fuel to the engines via the collector box.

PART I—DESCRIPTIVE

A warning light (21) on the starboard side of the front cockpit coaming indicates when the fuselage tank is emptied. (LIGHT ON—PUMP PRESSURE LOW.) The immersed fuel pump switch (65) should be turned off immediately the light glows. The PRESSURE VENTING control should be left off when feeding from the bomb bay tank.

4. **Fuel gauges.**—Three fuel gauges (71, 72, 73) are provided on junction box B on the starboard cockpit wall. They will indicate when the electrical services switch (20) linked with the ignition switches, is on. The forward fuel gauge (73) shows the contents of the inner wing tanks, port and starboard; the centre fuel gauge (72) shows the contents of the centre tanks (No. 10 TANK) and the long-range bomb bay tank if fitted (No. 12 TANK). The aft fuel gauge (71) shows the contents of the outer wing tanks. There is no fuel gauge for the drop tanks.

5. **Fuel pressure**

- (i) Marks VI and ~~VII~~ VIII: Two fuel pressure warning lights (5) are fitted on the port instrument panel.
- (ii) Mark 26: Two fuel pressure gauges are fitted; pressure should be 10 lb./sq.in. minimum. Two fuel booster pumps, controlled by switches at the bottom of the instrument panel, are provided, one for each engine. They are used for starting the engines, whilst changing tanks, when drawing from unpressurised tanks at altitude and at any time when fuel pressure falls or vaporisation is suspected. They must be OFF when the engines are not running and the cut-out controls are in the run position, or fuel will be injected into the engines.
6. **Priming system.**—A Ki-gass priming pump is fitted at each engine nacelle and is accessible through a hinged flap on the right-hand side. Priming cocks are fitted in each nacelle, and allow fuel to be drawn either from the outer tanks, or from an external supply of high volatility fuel for cold weather starting.

7. **Oil system**

- (i) Two 15-gallon oil tanks are provided, one in each engine nacelle.
- (ii) There are no oil cooler controls for the pilot, but the coolant radiator flaps also serve the oil coolers.
- (iii) Oil dilution is provided; the oil dilution buttons are behind the pilot's seat.

PART I—DESCRIPTIVE

MAIN SERVICES

8. **Hydraulic system**

- (i) Two engine-driven pumps, one on each engine, supply hydraulic pressure for operation of—

Undercarriage and tailwheel
Flaps
Bomb doors

The system will function on one pump only at a reduced rate.

- (ii) A handpump (55) for operating all the services through the normal system, when the engine pumps are not running, is mounted beneath the pilot's seat. The detachable handle is stowed on the cockpit door. The approximate time to lower the undercarriage by handpump is four minutes.

- (iii) The handpump may also be used to operate the separate emergency undercarriage lowering system when the emergency selector valve, marked PUSH FOR EMERGENCY, to the right of the pilot's seat, is pushed down. See Part IV, para. 71.

9. **Pneumatic system**

- (i) An air compressor on the port engine charges a bottle for operation of:

Brakes
Guns

and electro-pneumatic rams for:

Radiator shutters
Automatic supercharger control
Tropical air filters (if fitted).

The triple pressure gauge (36) is on the bottom of the main instrument panel, and the supply indicator should show 200 lb./sq.in. in flight. All services except the brakes are automatically cut off by a pressure maintaining valve if the supply pressure falls below 150 lb./sq.in.

- (ii) Two vacuum pumps, one driven by each engine, operate the instrument flying panel. If either breaks down it is automatically isolated from the suction system. There is no gauge, but each pump can be proved on the ground by alternately starting the port and starboard engines first, and checking that the artificial horizon erects properly.
- (iii) Pressure from the starboard vacuum pump is used to pressurise tanks of the main supply of the fuel system. Pressure from the port vacuum pump is used to transfer the fuel from the wing drop tanks to the outer wing tanks.

PART I—DESCRIPTIVE

10. **Electrical system.**—A generator on the starboard engine and a battery supply electrical power at 24 volts for:

Undercarriage warning lights and horn
Fuel pressure warning lights
Oil dilution valves
Engine starters and booster coils
Fire-extinguishers
Controls for operating radiator flaps, automatic superchargers, tropical air filters, guns.
Reflector gun sight
Camera gun
Bomb selection, fusing, and release gear
Radio
Pitot-head heater
Air recognition, identification and landing lights
Instrument panel and ultra-violet lighting
Windscreen wiper
Feathering pump motors.

A warning light (60) on junction box B on the starboard cockpit wall shows when the generator is not charging. On the ground and with the engine stopped the light will be on so long as the aircraft battery is connected. The current consumed is negligible. A ground starter battery socket is provided on the port side of the rear fuselage. As the instruments are not luminous, an emergency 2-volt, 20-ampere/hour accumulator is provided to supply current to the left-hand instrument floodlight in the event of complete electrical failure; this accumulator is stowed under the pilot's seat and is connected to the floodlight at all times.

AIRCRAFT CONTROLS

11. **Flying controls.**—The rudder pedals can be adjusted for reach by the toe during flight.
12. **Trimming tab controls.**—The elevator trimming tab wheel is on the left of the pilot's seat; the indicator (42) is on the port side-wall. The rudder tab control and indicator (19) is on the front cockpit coaming. The port aileron tab control and indicator is on the lower right-hand side of the main instrument panel. All trimming tab controls work in the natural sense.

PART I—DESCRIPTIVE

13. **Flying control locking gear.**—The rudder pedals are locked by a spool which fits between them and is secured by a wing nut. The spool is connected to the control column locking tube by a cable, so that one cannot be removed without the other. Controls are locked in the neutral position. The gear is stowed in the fuselage opposite the rear hatch. It should be ensured that the locking pins are attached to the gear.

14. Undercarriage

- (i) The undercarriage selector (32) has a safety catch which must be released before UP can be selected. The selector should always be moved smartly to the UP or DOWN positions, as it may become locked if it is moved slowly. For emergency operation *see* Part IV, para. 71.
- (ii) The selector should return automatically to neutral when the UP or DOWN operation is completed. If the lever does not return when it is certain that the operation is complete, it should be returned by hand. If the lever returns prematurely, the undercarriage indicator showing that the wheels are not locked UP or DOWN, the selector lever should be held UP or DOWN, for not more than five seconds. This will occur only when the system is not properly adjusted.
- (iii) In cold weather or when coming down from high altitudes the system should be exercised a few times before landing by alternately selecting UP or DOWN; owing to the hydraulic oil congealing, when the undercarriage selector is put DOWN the main wheels may come down and the selector return to neutral before hydraulic pressure reaches the tail-wheel.
- (iv) It is not desirable to hold the selector DOWN for long, as this subjects the lines to high pressures.

A.L.3
Part I
Para. 15
(Page 11)

15. Undercarriage position indicators

- (i) The undercarriage position indicator operates when the electrical services switch is on.
- (ii) The Mark 26 is provided with a pictorial indicator which shows the position of the undercarriage and flaps at all times; these are small red flags which disappear when the up or down locks of the undercarriage have engaged.
- (iii) Marks VI and ~~XXVI~~ have indicator lamps, with dimmer screens for night flying.

PART I—DESCRIPTIVE

Indications are:

- Main wheels locked up No lights
- Main wheels locked up but throttles
less than one-quarter open .. Two red lights
- Main wheels between UP and
DOWN locks Two red lights
- Main wheels locked DOWN .. Two green lights

There is no tail-wheel indicator.

When the main wheels are lowered the red lights do not go out until the down locks engage.

16. **Undercarriage warning horn.**—The warning horn sounds when the main wheels are not locked down and throttles are less than one-quarter open.
17. **Undercarriage ground locking**
 - (i) Ground locking caps are stowed in a bag on the rear bulkhead of each wheel well, and should be fitted after landing in place of the dust caps which cover the end of the locking latches. Make sure that the ground locking caps are replaced by the dust caps and stowed before taking off.
 - (ii) If the aircraft is taken off with the locking caps on, and an attempt is made to retract the undercarriage, the tail-wheel will retract. Therefore, the undercarriage selector lever should be held DOWN for five seconds before landing to ensure that the tail-wheel is down.
18. **Wing flaps.**—Operation of the wing flaps is controlled by the lever (29) marked F to the right of the undercarriage selector lever. A safety catch must be pushed to the right before flaps DOWN can be selected. The selector should return automatically to neutral on completion of a full operation. Any flap angle up to 45° can be obtained by returning the lever to neutral when the desired angle is reached according to the position indicator (37) situated next to the undercarriage position indicator. The maximum flap angle obtainable is 45° although the gauge is marked up to 70°.

PART I—DESCRIPTIVE

19. **Brakes.**—The brake control lever (46) and parking catch are on the control column. Differential braking is obtained by operating the rudder pedals with the hand-brake on.

A.L.3
Part I
Paras.
20 to
22

ENGINE CONTROLS

20. Throttle controls

- (i) The friction control is the black knob on the engine control box. The throttle levers (48) are held at the climbing boost (+ 9 lb./sq. in.) position by stops. When spring catches on the levers are pulled back, the levers can be moved fully forward, and this will give—

Merlin 21 or 23 + 12 lb./sq.in. (at sea level only).

Merlin 225 + 14 lb./sq.in.

Merlin 25 + 18 lb./sq.in.

- (ii) With Merlin 21, 23 or 225 (but not with Merlin 25) engines, a boost control cut-out (12) is provided. This is pulled out to obtain maximum permissible boost, when the throttle levers should not be advanced beyond the gate. No cut-out is provided with Merlin 25 engines.

NOTE.—When climbing with a boost setting less than + 9 lb./sq.in. the automatic boost control cannot open the throttle valve fully and the boost will begin to fall off before throttle height is reached: the throttle lever should then be progressively advanced to the stop to maintain the desired boost.

21. Mixture control and engine cut-out controls

- (i) Marks VI and ~~XVIII~~ S.U. carburettors are fitted, and mixture is automatically controlled by the boost pressure: an economical mixture is obtained when this is less than + 7 lb./sq.in.
Mk. 26: Bendix Stromberg carburettors are fitted and mixture is automatically controlled by the power delivered by the engine: an economical mixture is obtained below + 7 lb./sq.in. and 2,650 r.p.m.
- (ii) Marks VI and ~~XVIII~~ have spring loaded slow running cut-outs, which return to the run position when released, and are fitted just above the main fuel cocks. In the Mk. 26 they are either provided with triggers to hold them out in the cut-out position, or they are not spring-loaded. In these aircraft they must be in the cut-out position (pulled out) at all times when the engines are not running and the booster pumps are switched ON.

22. **Propeller controls.**—The controls (49) move forward to high and back to low r.p.m. The friction control is the larger white knob on the engine control box. The feathering buttons (25) are on the right-hand front panel. (See para. 70, Part IV.)

PART I—DESCRIPTIVE

A.L.3
Part I
Paras.
23 to
25A

23. **Two-speed supercharger control.**—When the cockpit supercharger switch (51) is set to MOD, the two-speed superchargers remain in low gear at all altitudes. They will be changed into high gear if it is set to AUTO above—

Merlin 21 or 23 engines 15,000 feet

Merlin 25 or 225 engines 12,500 feet

boost should be reduced beforehand and then readjusted. If the switch is set to AUTO below these heights when climbing, the superchargers will be automatically changed into high gear on reaching the respective altitude, and will be changed back into low gear some 1,500 feet lower when descending.

24. **Radiator flaps.**—The flaps are controlled by two switches (15) which operate electro pneumatic rams. It is not possible to set the flaps at intermediate positions between CLOSED and OPEN. The minimum operating pneumatic pressure is 150 lb./sq.in.

25. **Air intake filter.**—For tropical operation, Vokes air intake filters are provided. They are controlled by the switch (16) beside the radiator flap switches.

- 25A. **Carburettor de-icing Mark 26 (when fitted).**—Two tanks containing alcohol are fitted, one in each engine nacelle; each tank has a capacity of 9½ Imperial gallons. A single three-position switch (56) marked OFF, LOW and HIGH mounted on the right-hand cockpit wall controls the electric pumps in each engine nacelle. With the switch at LOW alcohol is injected into the carburettor air-intakes at 2-2½ gallons per hour. With the switch at HIGH the flow is increased to 7½-10 gallons per hour. The switch should be set to LOW when icing conditions prevail; it should only be set to HIGH to clear accumulated ice.

OPERATIONAL CONTROLS

26. **Bomb doors.**—The bomb doors selector lever (34) marked B, on the left of the undercarriage selector lever, should return automatically to neutral on completion of a full operation. A warning light (26) on the bomb control panel indicates when the bomb doors are open.

27. **Bomb selection, fusing and release**

- (i) The panel on the right-hand side of the main instrument panel provides the switching arrangement for the fuselage and wing bombs. The switch (28) at the top marked **BUTTON CHANGEOVER—CAMERA** and **BOMBS OR TANKS** permits the pushbutton (45) on the control column to be used for operating

PART I—DESCRIPTIVE

A.L.3
Part I
Para. 27
(i)
Page 15

either the camera or the bomb release. The bombs cannot be selected or fused until the **BUTTON CHANGEOVER** has been moved to **BOMBS OR TANKS**. Underwing stores can be jettisoned by pressing the jettison button on the left-hand cockpit wall, under a hinged safety flap.

- (ii) Each bomb can be released individually by selecting it with the appropriate switch (30) and pressing the release button (45) on the control column.
- (iii) The small bomb-containers can be jettisoned by pressing the jettison button (27) at the top of the bomb control panel. It is not necessary in this case for the **BUTTON CHANGEOVER** to be set to **BOMBS** or **TANKS**; but the bomb doors must be opened by selecting **DOWN**.
28. **Camera operation.**—The camera gun switch (61) on the starboard switch panel must be ON and the **BUTTON CHANGEOVER** switch (28) set to **CAMERA** for operation of the camera gun, which is fired by the release button (45) on the control column, or when either of the gun-firing triggers is operated. A footage indicator is provided at the bottom of the bomb control panel.
29. **Gun controls.**—Before the guns can be fired the gun master switch (33) under the hydraulic selector levers must be set to **FIRE**.

The machine-guns are fired by a thumb-operated trigger (44) and the 20-mm. guns are fired by a fore-finger operated trigger. The gun heating control is on the right of the observer's seat; the heat is derived from the starboard coolant radiator air.

Minimum pneumatic operating pressure 200 lb./sq.in.

A.L.3
Part I
Para. 30

30. **Oxygen.**—Mark VIII regulators and indicators for the pilot and observer, and one high pressure control valve, are provided. On some Mk. 26 aircraft, American type low pressure demand regulators may be fitted instead; their use is fully described in A.P.2695, III, F.7.

COCKPIT EQUIPMENT

31. **Heating.**—The cabin heat control is behind the pilot's seat, and is rotated forward to permit hot air from the port coolant radiator to enter the cabin.

PART I—DESCRIPTIVE

32. **Cockpit cooling.**—There are two controlled vents (24). The pilot's is on the lower middle of the main front panel, and the observer's on the right-hand front panel. The most effective means of cooling the cockpit is by opening the roof clear-view panel.
33. **Windscreen wiper.**—The windscreen wiper should not be used on a dry screen as it may injure the surface. When not in use, make sure that the rheostat (78) on junction box B is turned fully off; it is possible for the rheostat to be slightly on without the wiper functioning, and this wastes battery power.
34. **Cockpit lighting**
- (i) *Ultra-violet lighting.*—Ultra-violet lighting (17) is provided for the flying instruments; one lamp is above the throttles and another lamp is below the gunsight. To operate the ultra-violet lamps, turn ON the master switch (63) on junction box B on the starboard cockpit wall, press the exciter button (11) on the port wall near the top of the instrument panel, until the lamps begin to glow, and adjust the intensity of the lighting by rotating the screens on the front of the lamps.
- (ii) Floodlights (7) are provided above the compass, above the instrument flying panel, and above the DF indicator. Each is controlled by an adjacent rheostat (9).
- (iii) If the electric supply should fail, the top left-hand floodlight can be switched on; it is supplied by the emergency accumulator beneath the pilot's seat.
35. **Night flying screens.**—There are dimmer screens on the warning lights for generator and immersed fuel pump. When flying by day these screens must be opened; otherwise, indications will not be noticed.

LOCATION OF CONTROLS (Marks VI & XVIII)

36. Aircraft controls and instruments

- | | |
|--|------------------------------------|
| Elevator trimming tab control wheel | On left-hand side of pilot's seat. |
| Elevator trimming tab control wheel indicator (42) | On port cockpit wall. |

PART I—DESCRIPTIVE

- | | |
|---|--|
| Rudder trimming tab control and indicator (19) | On front cockpit coaming. |
| Aileron trimming tab control and indicator | On lower part of main instrument panel. |
| Flaps selector lever (29) .. | Right-hand lever on main instrument panel. |
| Undercarriage selector lever (32) | Centre lever on main instrument panel. |
| Undercarriage position indicator (38) | On centre of main instrument panel. |
| Wheel brakes control (46) and parking catch | On control column. |
| Brake pressure gauge (36) .. | Bottom of main instrument panel. |
| Pitot-heater switch (64) .. | Junction box B on starboard cockpit wall. |
| Electrical services switch (20) (controls u/c position indicator and fuel gauges) | On right-hand front panel. |

37. Fuel and oil system controls and equipment

- | | |
|---|--|
| Fuel cocks | Behind pilot's seat. |
| Immersed fuel pump switch (65) for long-range bomb bay tank | Junction box B on starboard wall. |
| Air pressure cock to the drop tanks | Behind pilot's seat. |
| Warning light (21) for long-range bomb bay tank | On right-hand side of front cockpit coaming. |
| Fuel pressurising (PRESSURE VENTING) cock | Behind pilot's seat. |
| Fuel pressure warning lights (5) | Left-hand instrument panel. |
| Fuel gauges (71, 72, 73) .. | On junction box B on starboard wall. |
| Priming pumps and cocks .. | In each engine nacelle. |
| Oil dilution buttons | Behind pilot's seat. |

38. Engine controls

- | | |
|--|------------------------------------|
| Boost control cut-out (12) (if fitted) | Top of left-hand instrument panel. |
|--|------------------------------------|

PART I—DESCRIPTIVE

- Supercharger switch (51) .. Engine control box.
 Vokes air intake filter switch (16) (if fitted) On front cockpit coaming.
 Feathering buttons (25) .. On right-hand front panel.
 Radiator flap switches (15) .. On front cockpit coaming.
 Engine starter switches (22) On right-hand front panel.
 Booster-coil switches (23) .. On right-hand front panel.
39. **Electrical system controls**
- Generator warning light (60) On junction box B on starboard cockpit wall.
 Voltmeter (59) Junction box B on starboard wall.
 Fusebox On starboard side of cockpit behind observer.
40. **Cockpit equipment**
- Pilot's seat height-adjusting lever (53) On left of pilot's seat.
 Pilot's harness release lever (54) On right of pilot's seat, or between pilot's legs.
 Windscreen de-icing pump At bottom of main instrument panel.
 Windscreen wiper rheostat (78) On junction box B on starboard cockpit wall.
 Ventilation Cold air control knob (77) on starboard cockpit wall.
 Ventilators (24) on right-hand front panel and left of main instrument panel.
 Cockpit heat control .. Behind pilot's seat.
 Cockpit roof light and control knob Above pilot's head.
 Instrument floodlights (7) and rheostats (9) One above compass.
 One under centre cockpit coaming.
 One above junction box B.
 One behind pilot's seat.
 Emergency floodlight .. Under left side of front cockpit coaming.

PART I—DESCRIPTIVE

- Ultra-violet lighting .. Master switch (63) on junction box B.
 Exciter button (11) above left - hand instrument panel.
 One lamp (17) below centre coaming.
 One lamp (17) above elevator trim indicator.
 Sanitary funnel Under pilot's seat.
 Desert equipment (if carried) In rear fuselage.
41. **Operational controls**
- Bomb doors selector (34) (if fitted) Left-hand lever on main instrument panel.
 Bomb doors warning light (26) Top of bomb control panel.
 Camera/bombs-or-tanks selector switch (28) Top of bomb control panel to right of instrument panel.
 Bomb selector (30) and fusing (31) switches Bomb control panel.
 Bomb - release and camera firing button (45) On control column.
 Bomb containers jettison button (27) Top of bomb control panel.
 Camera gun master switch (61) On junction box B on starboard cockpit wall.
 Footage indicator for camera gun Bottom of bomb control panel.
 Gun master switch (33) .. On main instrument panel
 Machine gun trigger (44) .. On control column.
 Cannon firing trigger .. On control column.
 Gun heat control Starboard cockpit wall beside observer's seat.
 Reflector gunsight switch (66) On junction box B.
 Pilot's oxygen regulator (35) On main instrument panel
 Observer's oxygen regulator Behind pilot's seat.
 High-pressure oxygen control valve Behind pilot's seat.

PART I—DESCRIPTIVE

42. Navigational, signalling and lighting controls

- R.1155 and TR. 1143 .. On later aircraft, master switches (75) on starboard cockpit wall.
On early aircraft, GP/VHF switch for pilot on port cockpit wall forward of pilot's seat.
GP/VHF switch for observer on starboard cockpit wall.
Pushbutton unit (52) for TR. 1143 on left-hand side of floor.
- Beam approach switch (40) On port cockpit wall.
- R.I compass switches (41) .. On port cockpit wall.
- R.I compass indicator (10) .. At top of left-hand instrument panel.
- Transmitter type "F" (74) Switch and warning lamp on starboard cockpit wall.
- Trailing aerial winch .. On starboard cockpit wall.
- Signal pistol Roof behind pilot's head.
- Signal cartridges (79) .. On front of observer's seat.
- Identification lights selector, (58) switchbox and key (57) On junction box B on starboard cockpit wall.
- Air recognition lights switch (56) On starboard side of cockpit.
- Navigation lights switch (62) On junction box B on starboard wall.
Headlamp switch (67) on junction box B on starboard wall.
- Landing lights switches (39) Bottom of left-hand instrument panel.

43. Emergency equipment

- Hydraulic handpump .. Socket (55) on right side of pilot's seat; handle (81) stowed on door.

PART I—DESCRIPTIVE

- Undercarriage emergency selector Beside pilot's seat.
- Graviner fire - extinguishers (70) Junction box B on starboard wall.
- Hand fire-extinguishers .. One on right of pilot's seat.
- Fireman's axe Back of pilot's seat.
- First-aid kit Under pilot's seat.
- IFF destruction switches (69) Junction box B on starboard wall.

PART II HANDLING

44. Management of the fuel system

NOTE.—During warm ground temperatures when the fuel inter-cooler blanking plate is removed, a flight in very cold atmosphere may cause ice to form in the filters, with consequent engine fading. Power should be reduced as much as possible and a warmer altitude sought.

44. Management of the fuel system

(i) Start the engines, warm up, taxi and take-off on **OUTER TANKS**.

(ii) Mark 26; always reduce the level in **OUTER TANKS** by 12 galls. on each side, after take-off or transfer from the drop tanks, to provide for the vapour return from the Bendix carburettors.

(iii) Mark 26; The booster pumps should be kept **ON** during take-off: whilst changing tanks: when drawing from **OUTER TANKS**, or from an auxiliary bomb-bay tank which is unpressurised, at altitude; and whenever fuel pressure falls or vaporisation is suspected.

(iv) Do not rely on **OUTER TANKS**;

(a) *when flying at very low altitudes or during local practice flights:* their capacity is small, and the gauges diminish in accuracy as the fuel level falls. (Should a Merlin 21, 23 or 25 engine cut through fuel starvation, a pick-up can be effected in one second if the fuel cock is instantly changed to **MAIN SUPPLY**, but the interval will be progressively greater with delay. Merlin 225 engines should not be allowed to cut at very low altitudes).

(b) *in combat and at high altitudes;* they are not pressurised and, although booster pumps reduce the tendency, engine cutting may occur through vaporisation, at high power, or during evasive action when they are less than half full.

(v) *Climbing and Cruising.*

(a) *Without wing drop tanks or auxiliary fuselage tank;* It is not possible to cross-feed from the **OUTER TANKS** should one engine fail and they should therefore be used first. When they are nearly empty, change to **MAIN SUPPLY**.

(b) *With wing drop tanks but without auxiliary fuselage tank;* The fuel from the drop tanks should be transferred early to avoid loss of fuel if they should have to be jettisoned.

If automatic transfer is provided: as soon after take-off as convenient, turn **ON** the transfer cock. When the drop tanks have been emptied, turn it **OFF**. Continue on **OUTER TANKS** until they are empty, then change to **MAIN SUPPLY**.

If automatic transfer is not provided: the **OUTER TANKS** must first be exhausted before attempting to transfer, or fuel may be lost through the atmospheric vents of **OUTER TANKS**. As soon as they are nearly empty, change to **MAIN SUPPLY** and turn **ON** the transfer cock. When the **OUTER TANKS** contents gauge shows that 50 gallons have been transferred, which will take about 20 minutes, turn **OFF** the transfer cock and revert to **OUTER TANKS** until they are again almost empty. If 100-gallon drop tanks are carried, repeat the complete sequence. When **OUTER TANKS** have been finally emptied, change to **MAIN SUPPLY**.

PART II—HANDLING

(c) *With wing drop tanks and auxiliary fuselage tank:*

As soon as the transfer of fuel from the wing drop tanks has been completed, the auxiliary tank should be emptied in order to improve trim and stability. In aircraft without automatic transfer the auxiliary tank should also be used during the transfer. Set the fuel cocks to **MAIN SUPPLY** and switch **ON** the immersed fuel pump; when the warning light comes on, switch it **OFF** at once. After exhausting the auxiliary fuselage tank, revert to **OUTER TANKS** until they are finally empty, and then use the permanent tanks of the **MAIN SUPPLY**. In a few early aircraft which do not incorporate Mod. 443, the immersed fuel pump may not overcome pressurising in the rest of the **MAIN SUPPLY** above 15,000 ft. and fuel would not be drawn from the auxiliary fuselage tank. At altitude in these aircraft, compare the reading of the fuel gauge of this tank with those of the centre section and inner wing tanks at frequent intervals and, if necessary, turn **OFF** the **PRESSURE VENTING** cock; turn it **ON** again when the auxiliary fuselage tank is empty.

(d) *With auxiliary fuselage tank but without wing drop tanks:*

The auxiliary fuselage tank should be used as soon as the **OUTER TANKS** are nearly empty; proceed as in (c) above.

45. Starting engines and warming up

(i) Switch on electrical services switch.

(ii) Check the following:

Voltmeter	Should show 24 volts if battery is fully charged.
Bomb doors	Shut, selector neutral.
Bomb control panel	All switches off. Guard closed.
Undercarriage	Emergency knob in normal position, safety catch engaged.
	Selector neutral, safety catch engaged.
Air pressure	Normal pneumatic pressure, 200 lb. sq.in.
	Radiator flaps and automatic super-charger gear change will not operate below 150 lb./sq.in.

(iii) Set fuel cocks to **OUTER TANKS**.

(iv) Set the controls as follows:

Throttles	1/2 inch open
Propeller levers	fully forward
Supercharger switch	MOD
Radiator flap switches	CLOSED
Pressure venting cock	ON
Fuel transfer cock	OFF
Immersed fuel pump switch	OFF

Mark 26: Set, or hold, the cut-out control of the engine to be started in the cut-out position and switch **ON** the fuel booster pump for 5 seconds, to prime the Bendix carburettor. Then switch it **OFF**, and set the cut-out control to the run position.

(v) High volatility fuel (Stores ref. 34A/111) should be used, if a three-way priming cock is fitted, for priming at air temperatures below freezing. The ground crew will work the priming pump until the fuel reaches the priming nozzles: this may be judged by a sudden increase in resistance.

PART II—HANDLING

- (vi) Switch on ignition and press the starter and booster-coil buttons. The ground crew will work the priming pump as rapidly and vigorously as possible while the engine is being turned; it should start after the following number of strokes when cold.

Air temperature °C. +30 +20 +10 0 -10 -20

No. of strokes, normal fuel 3 4 7 12

No. of strokes, high volatility fuel 4 8 18

- (vii) At temperatures below freezing it will probably be necessary to continue priming after the engine has fired and until it picks up on the carburettor.

- A.L.3 Part II Para. 45 (viii) As soon as the engine is running satisfactorily, ~~push the engine cut-out control (M-26) to the run position~~, and instruct the ground crew to screw down the priming pump, close the priming cock, and fasten the priming panel. *PK 26 SWITCH ON BOOSTER PUMP.*
(ix) Open the throttle slowly and warm up at 1,200 r.p.m.
(x) When both engines are running, put the radiator flap switches to OPEN.

A.L.5 Part II Para. 46 (i) to (v) Page 24

46. Testing engines and services

While warming up

- (i) Check all temperatures and pressures and the operation of the flying controls.

Test each magneto as a precautionary check.

After warming up to 15°C (oil) and 60°C (coolant)

- (ii) Check the operation of each engine-driven hydraulic pump, open up one engine to 2,000 r.p.m. and lower and raise the flaps. Throttle back, open up the other engine to 2,000 r.p.m. and again lower and raise the flaps. Failure of one engine-driven pump will be indicated by sluggish movement of the flaps during one of these tests.

- (iii) Open up to zero boost and thoroughly exercise the propellers by moving the speed control levers over their full range at least twice. Return the speed control levers to the fully forward position.

- (iv) At the same boost check the operation of the supercharger gear change by setting the cockpit switch to AUTO and having the ground crew press the testing pushbutton in each engine nacelle. R.p.m. should drop slightly and boost should rise when the change to high gear is made.

NOTE.—The following comprehensive checks should be carried out at any time at the pilot's discretion and in accordance with local instructions.

- (v) Open the throttle to the take-off position (see Part I para. 20) and check the take-off boost, and r.p.m. which should be 3,000.

PART II—HANDLING

A.L.5 Part II Para. 46 (vi) Page 25

- (vi) Throttle back to +9 lb./sq. in. boost or further if necessary to ensure that the r.p.m. drop below 3,000, then test each magneto in turn.

The single ignition drop should not exceed 150 r.p.m.

NOTE.—Prolonged ground running is likely to damage the exhaust system and should be avoided.

47. Taxiing

Check:

Brake pressure .. 200 lb./sq.in.; if the pressure is low ensure that the pump is definitely building up pressure; if not, the aircraft should not be flown.

Undercarriage ground locking caps Removed and replaced by dust caps.

Flaps .. Fully up. Selector neutral.

A.L.1 Part II Para. 48

48. Check list for take-off

T—Trimming tabs:

Elevator:

Mark ~~XVIII~~ .. Neutral.

Mark VI, Flaps up

Lightly loaded .. ½ div. nose heavy.

Heavily loaded .. 1 do.

Flaps 15° down, all loads .. 1½ do.

Rudder .. Slightly right.

Aileron .. Neutral.

P—Propeller .. Speed controls fully forward.

F—Fuel .. Check contents and cocks to OUTER TANKS.

F—Flaps .. UP, or 15° down. Do not open up engines separately after setting flaps down.

Superchargers .. MOD.

Radiator flap switches OPEN.

NOTE.—15° flap is recommended to improve the take-off, when necessary, but up to 25° may be used with the same trim setting, for the shortest run. If flaps are used, the lowering should be done after clearing engines and turning into wind, and with both engines throttled to the same idling speed.

PART II—HANDLING

A.L.2 49. Take-off

Part II (i) There is a slight tendency to swing to port which can be checked

A.L.4 49. Take-off

- Part II
Para. 49
(i) to (iii)
- (i) There is a slight tendency to swing to port which can be checked by opening the port throttle slightly ahead. Raise the tail by a light forward pressure on the control column. When load and take-off run permit, the throttles need only be opened to the climbing gate. Keep hand on the throttles until well under way.
 - (ii) When comfortably airborne, brake the wheels and raise the undercarriage. If the red indicator lights do not go out, hold the selector UP for five seconds.
 - (iii) Safety speed at full load, flaps up or 15° down, at +12 lb./sq. in. boost is 200 m.p.h. (174 knots) I.A.S. At +18 lb./sq. in. boost it is 215 m.p.h. (186 knots) I.A.S. It is therefore recommended that when, with Merlin 25 or 225 engines, it is necessary to use +18 lb./sq. in., boost should be reduced to +12 lb./sq. in. as soon after take-off as possible. (See also para. 66 (iv).)

50. Climbing

- (i) For the reasons given in para. 66, Part IV, it is recommended that an initial climbing speed of 200 m.p.h. (174 knots) I.A.S. be maintained at least until boost begins to fall in low gear, and further if the maximum rate of climb is not essential. The reduction in rate of climb is very slight.
- (ii) The speed for maximum rate of climb is 170 m.p.h. (148 knots) I.A.S. up to 20,000 feet.

51. General flying

- (i) *Stability.*—The directional and lateral stability is satisfactory. Fore-and-aft stability is satisfactory on the climb and neutral on the glide. At low speeds in level flight the aircraft is slightly unstable.

(ii) Change of trim

Undercarriage up	Nose up slightly
Flaps up	Nose down sharply
Radiator flaps open	Nose up
Bomb doors open	Nose up slightly

- (iii) *Controls.*—The controls are light and effective. When two-tier R.P. or rails are carried, aileron control becomes ineffective at slow speeds, as during take-off and approach to land.

- (iv) *Flying at reduced airspeeds.*—In bad visibility near the ground flaps should be lowered 10° and the propellers set to give 2,650 r.p.m. Speed may then be reduced to 150 m.p.h. I.A.S. (130 knots). Coolant temperatures should be watched.

- (v) *Propellers.*—Paddle bladed propellers tend to overspeed when power is increased rapidly or during dives. Rapid movements of the propeller speed controls or of the throttle levers should be avoided when this type is fitted.

- (vi) The following recommendations apply when 150 grade fuel is used:

(a) Whenever possible, not less than 2,300–2,400 r.p.m. should be used on any sortie.

(b) When maximum endurance or range is required, 2,000 r.p.m. may be used provided that the engines are frequently opened up for 15 seconds to 2,650 r.p.m. and +12 lb./sq. in.

(c) The engines should be opened up to full combat power at 3,000 r.p.m. once during every sortie.

PART II—HANDLING

52. Stalling

The stalling speeds at full load are as follows:

Flaps and undercarriage up 130 m.p.h. I.A.S. (113 knots)

„ „ „ down 110 „ „ (96 knots)

With undercarriage and flaps both up or down there is considerable vibration prior to the stall with the stick slightly back. When the stick is moved firmly right back, the aircraft pitches a little and then stalls gently, dropping the nose and either wing. Control is quickly regained when speed is increased.

53. Diving

The aircraft becomes very tail-heavy at high speeds and should be trimmed forward before entering the dive; further trimming may be done during the dive. With bomb doors open a slight vibration occurs on the controls. The aircraft is very steady in the dive, but when yawed, the outer wing tends to rise.

54. Aerobatics

The following speeds in m.p.h. I.A.S. are recommended for aerobatics:

Roll 220 to 270 (190 to 235 knots).

Climbing roll .. 350 plus (304 knots).

Rolls should be barrelled sufficiently to keep engines running.

Loop 350 plus (304 knots).

Roll off 380 (330 knots).

The nose should be kept down on the horizon when rolling off.

A.L.2
Part II
Para. 55

55. Before landing

- (i) If the flight has been of any duration, operate the undercarriage up and down for a few times before finally lowering for landing. (See para. 14 (iii).)

- (ii) If 150 grade fuel is used, maintain as much power as possible during the approach, to prevent the sparking plugs fouling.

PART II—HANDLING

56. Check list for landing

Brake pressure 200 lb./sq.in. minimum.

Superchargers MOD.

Radiator flaps Open.

Reduce speed to 180 m.p.h. I.A.S. (157 knots).

U—Undercarriage DOWN. Selector should return to neutral.

Check by indicator that undercarriage is down.

P—Propeller Speed controls fully forward.

F—Fuel Turn cocks to fullest tanks.

Mk. 26 Booster pumps ON

Reduce speed to 160 m.p.h. (138 knots) I.A.S.

F—Flaps Fully down: considerable nose down trim will be required.

After lowering flaps fully, re-select undercarriage DOWN to ensure that it is positively locked. This is not necessary if Mod. 663 is incorporated, but is recommended on all aircraft.

57. Approach speeds

- (i) The approach speeds at 17,000 lb. (approximately half fuel and no bombs) are:

	<i>Flaps down</i>	<i>Flaps up</i>
Engine assisted ..	125 (109 knots)	140 (122 knots)
Glide	140 (122 knots)	150 (130 knots)

At full load these speeds should be increased by about 10 m.p.h. (9 knots).

- (ii) With the undercarriage and flaps lowered, the aircraft has a high rate of descent. Until used to this, pilots will tend to undershoot and correction entails the use of much more power than might be expected. Mk. XVIII tends to nose over if brakes are used heavily.

58. Mislanding

- (i) Open throttles to take-off position.
 (ii) Raise undercarriage immediately.
 (iii) Climb at about 140 m.p.h. I.A.S. (122 knots).
 (iv) The flaps come up quickly and should not be raised until a safe height is reached. They may be kept at 25° to complete the circuit; there is then no need to retrim.

PART II—HANDLING

A.L.2
 Part II
 Para. 59
 (i) (ii)

59. After landing

(With 150 grade fuel, avoid idling the engines or taxiing at low r.p.m. as much as possible.)

- (i) After landing and before taxiing, raise flaps. Mk. 26—switch booster pump OFF.
 (ii) Idle the engines at about 800 r.p.m. for a short time, then pull out the slow-running cut-outs and hold until engines stop, then release smartly. Switch OFF ignition after engine stops and turn OFF fuel. Switch off electrical services switch.

- (iii) Oil dilution. See A.P. 2095.

The oil dilution period is:

One minute at temperatures above -10°C .

Two minutes at temperatures below -10°C .

Pilot's Notes.

PART III

OPERATING DATA

60. Engine Data, Merlin 21 or 23

(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 lb./sq.in.	Temp. °C Coolant	Oil
MAX. TAKE-OFF TO 1,000 FEET .. M	3,000	+14*		
MAX. CLIMBING .. M } 1 HOUR LIMIT .. S }	2,850	+ 9	125	90
MAX. .. M } CONTINUOUS .. S }	2,650	+ 7†	105 (115)	90
COMBAT .. M	3,000	+14*	135	105
5 MINS. LIMIT .. S	3,000	+16*	135	105

NOTE.—The temperature shown in brackets may be used if necessary for short periods.

* Obtainable by pulling the boost control cut-out.

† On Merlin 23 engines, weak mixture is obtained at boosts up to +7 lb./sq.in. On Merlin 21 engines the mixture richens up progressively above +4 lb./sq.in.

OIL PRESSURE:

MINM. IN FLIGHT 30 lb./sq.in.

MINM. TEMP. FOR RUN-UP AND TAKE-OFF:

OIL	15°C.
COOLANT	60°C.

PART III—OPERATING DATA

A.L.1
Part III
Paras.
60 (iv)
(v), 61 &
61A(iv) *Fuel pressure*.—6 to 10 lb./sq.in.(v) *Fuel temperature*.—Every endeavour should be made to keep fuel in the aircraft and in storage tanks as cool as possible by shielding the wing and storage tanks from direct rays of the sun. If this is not done fuel is likely to vaporise in the pipelines at high altitudes.A.L.2
Part III
Para. 61

61. Engine data, Merlin 25 & 225

(i) *Fuel*.—100 octane or 150 grade.(ii) *Oil*.—See A.P. 1464/C.37.

(iii) The principal engine limitations are as follows:

			Boost lb./sq.in. 100 150 octane grade	Temp. °C. Coolant	Oil
MAX. TAKE-OFF TO 1,000 FEET	M	3,000	+18†	+18†	
MAX. CLIMBING 1 HOUR LIMIT	M } S }	2,850	+ 9	+ 9	125 90
MAX. CONTINUOUS	M } S }	2,650	+ 7	+ 7	105(115*) 90
COMBAT 5 MINS. LIMIT	M } S }	3,000	+18†	+25†	125 105

* Permissible for short periods if necessary.

† May not be used at r.p.m. below 2,850.

OIL PRESSURE:

MINIMUM IN FLIGHT 30 lb./sq.in.

MINM. TEMP. FOR RUN UP AND TAKE OFF:

OIL	15°C.
COOLANT	60°C.

61A. Position error correction

With single De Havilland static vent, on the starboard side of the nose:

Between

140 to 170 m.p.h. I.A.S.	subtract	.. ..	4 m.p.h. (4 knots)
(122 to 148 knots)			
170 to 290 m.p.h. I.A.S.	"	.. ..	2 m.p.h. (2 knots)
(148 to 252 knots)			
290 to 340 m.p.h. I.A.S.	"	.. ..	4 m.p.h. (4 knots)
(252 to 296 knots)			

Individual aircraft may differ \pm 4 m.p.h.

PART III—OPERATING DATA

A.L.2
Part III
Page 32

62. Flying limitations

- (i) The aircraft is designed for the duties of long-range intruder, long range day-fighter or long-range night fighter. Intentional spinning is prohibited. Although aerobatics are permitted to experienced pilots at weights below 19,100 lb. without bomb load or underwing stores or wing drop tanks, they are not recommended owing to the possibility of damaging the special equipment.
- (ii) The controls are light and effective and care must be taken to avoid excessive accelerations in steep turns and in recovery from dives. It is important not to impose large angles of yaw at high speeds. Violent reversal of the rudder must be avoided.

A.L.4
Part III
Para. 62
(iii)

(iii) Limiting speeds in m.p.h. (knots) I.A.S. are :

Diving :

- (a) Without underwing stores, or with 2 × 250 or 500 lb. G.P. bombs with standard wing bomb fairings.
- (b) With 2 × 100-gal. wing drop tanks.
- (c) With underwing R.P. or Depth Charges.
- (d) With other underwing stores.

Altitude, in thousands of feet	(a)	(b)	(c)	(d)
S.L. to 10 ...	425 (370)	380 (330)	400 (348)	350 (304)
10 to 15 ...	400 (348)	380 (330)	400 (348)	350 (304)
15 to 20 ...	370 (320)	370 (320)	370 (320)	350 (304)
20 to 25 ...	335 (295)	335 (295)	335 (295)	335 (295)
25 to 30 ...	300 (260)	300 (260)	300 (260)	300 (260)
30 to 35 ...	270 (235)	270 (235)	270 (235)	270 (235)
Bomb doors open	...	...	...	350 (304)
Undercarriage down	...	...	...	180 (156)
Flaps not more than 25° down	...	...	...	200 (174)
Flaps fully down	...	...	...	150 (130)

(iv) Maximum weights (FB VI and 26) :

Take-off and gentle manoeuvres ...	...	...	20,500 lb. *
All forms of flying ...	...	...	19,000 lb.
Landing ...	...	...	20,500 lb.

* but may be increased to 22,000 lb. with jettisonable load, i.e. wing bombs and wing drop tanks.

(v) (a) Release of depth charges, underwing or internal:

Angle of dive, not to exceed ..	..	..	20°
Angle of climb " " "	..	..	5°
Angle of bank " " "	..	..	0°

(b) Firing of R.P.: prohibited whilst carrying wing drop tanks and until at least one minute after they have been jettisoned.

- (c) Wing drop tanks should only be jettisoned in level flight without yaw, at speeds between 200 and 300 m.p.h. (174 and 260 knots) I.A.S. Recommended speed is 230 m.p.h. (200 knots) I.A.S.

63. Maximum performance

- (i) Climbing. The speeds for max. rate of climb in m.p.h. (knots) I.A.S. are: 170(148) from S.L. to 20,000 ft.; 165(144) from 20,000 ft. to 25,000 ft.; 160(139) above 25,000 ft. Set r.p.m. to 2,850, throttles to the stops, and supercharger switch to AUTO.
- (ii) Combat.—Set r.p.m. to 3,000, supercharger switch to AUTO, and throttles to give combat boost, if obtainable. (See para. 20, Part I.)

A.L.5
Part III
Para. 62 (v)

A.L.4
Part III
Para. 62
(v) (c)

PART III—OPERATING DATA

64. Maximum range (see Curves, pages 35 and 36)

Climb.—Fly at +4 lb./sq.in. boost with Merlin 21 engines, +7 lb./sq.in. with Merlin 23, 25 or 225 engines, and 2,650 r.p.m. at about 170 m.p.h. I.A.S. (148 knots). Set supercharger gear change switch to AUTO.

Cruising.

(a) Set supercharger gear change switch to MOD. Set r.p.m. to 2,000, and adjust throttle lever to give +4 lb./sq. in. boost, if obtainable. (On Merlin 23, 25 and 225 engines, the mixture is weak up to +7 lb./sq.in. boost; but at heights where +7 lb./sq.in. boost can be obtained at 2,000 r.p.m. the resulting I.A.S. would be too high for maximum range.)

Do not reduce boost below +4 lb./sq.in. even if these engine conditions give speeds above the recommended speeds given in sub. para. (b). If the speed falls below the recommended I.A.S., increase r.p.m. as necessary. At high altitudes, change to AUTO if at 2,600 r.p.m. in MOD the recommended speed cannot be obtained.

(b) The recommended speeds in m.p.h. I.A.S. for greatest range are as follows:

	Out (fully loaded)	Home (lightly loaded)
Up to 20,000 feet	220 (191 knots)	210 (182 knots)
At 25,000 feet	200 (174 knots)	190 (165 knots)
Above 25,000 feet	—	180–190 (157–165 knots)

65. Fuel capacity and consumptions

(i) Fuel capacity.

MAIN SUPPLY	337 gallons
OUTER TANKS ..	116 "
Total permanent tanks	453 "
Long-range bomb bay tank ..	63 "
Drop tanks (wood) ..	100 "
(metal) ..	84 "
Total fuel capacity ..	616 " with 2 × 50 drop tanks
	600 " with 2 × 84 drop tanks
	716 " with 2 × 100 drop tanks

PART III—OPERATING DATA

- (ii) The total fuel consumption in the weak mixture range at medium and high altitudes in gallons per hour is as follows:

Boost lb./sq.in.	R.P.M.		
	2,650	2,300	2,000
+7*	130*	115*	106*
+4	114	102	94
+2	106	94	86
0	96	86	78
-2	86	78	70
-4	76	68	62

*Merlins 23, 25 and 225 only.

These figures are constant between 8,000 and 20,000 feet in M gear and between 14,000 and 30,000 feet in S gear.

- (iii) The total fuel consumption in gallons per hour in the weak mixture range at 2,000 feet is as follows:

Boost lb./sq.in.	R.P.M.		
	2,650	2,300	2,000
+7*	126*	112*	102*
+4	106	94	86
+2	94	84	78
0	84	74	70
-2	74	66	62
-4	66	60	

*Merlins 23, 25 and 225 only.

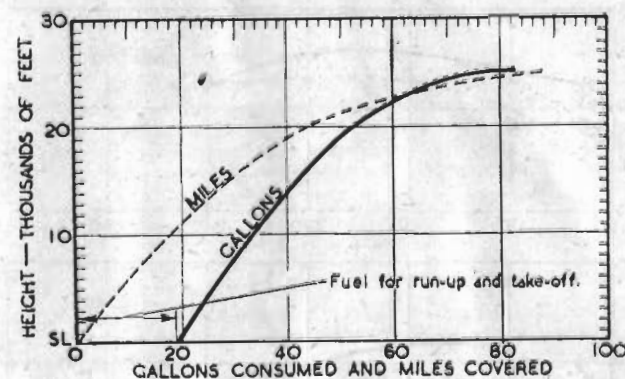
- (iv) The total fuel consumption in the rich mixture range is approximately as follows:

Boost lb./sq.in.	R.P.M.	gallons/hour
+14	3,000	250
+12	3,000	230
+9	2,850	190
+7*	2,650*	160*

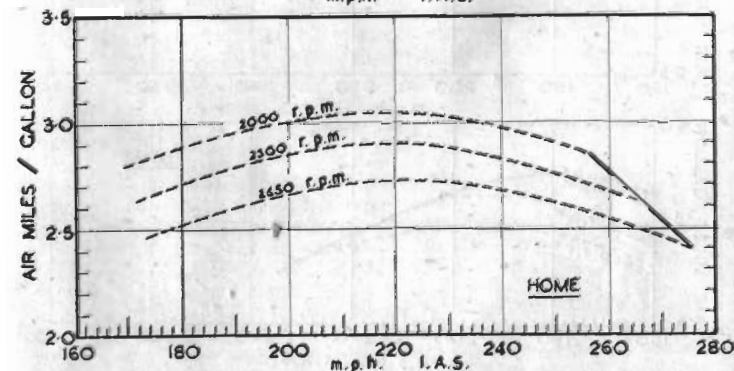
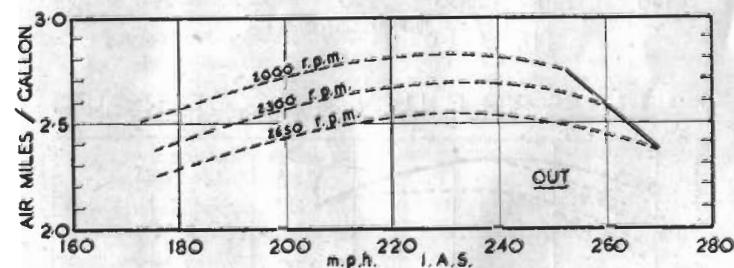
*Merlin 21 only.

PART III—OPERATING DATA

FUEL CONSUMED & DISTANCE COVERED ON CLIMB

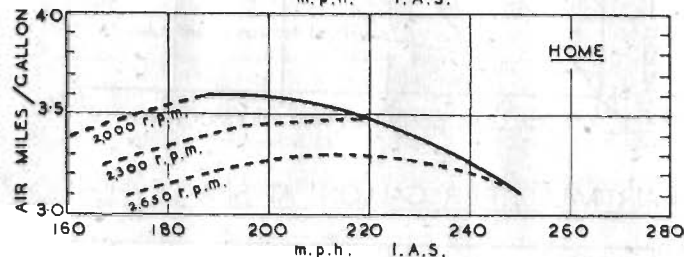
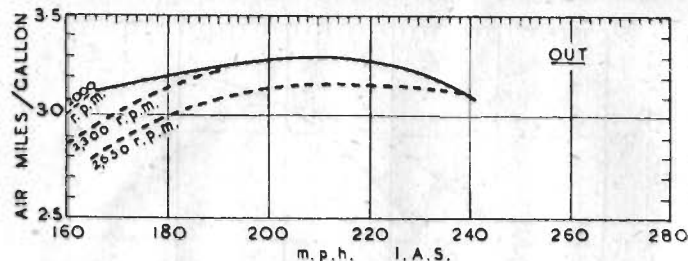


AIR MILES PER GALLON AT SEA LEVEL—MOD

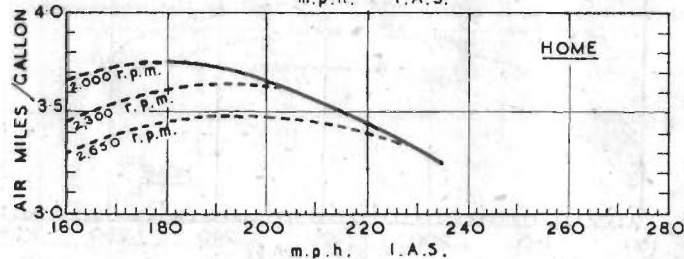
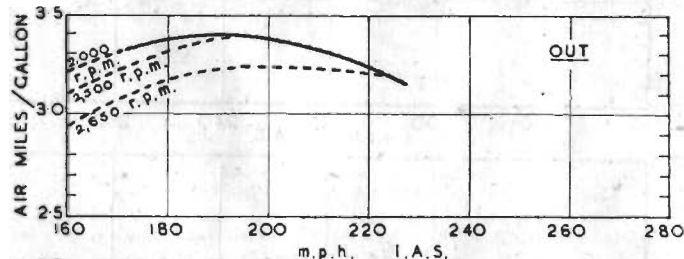


PART III—OPERATING DATA

AIR MILES PER GALLON AT 20,000 FEET—MOD



AIR MILES PER GALLON AT 25,000 FEET—AUTO



PART IV EMERGENCIES

A.L.2
Part IV
Paras.
66 & 67

66. Engine failure during take-off

- The handling characteristics of individual aircraft differ considerably according to load and type of propeller, and it is therefore recommended that, except in cases where it is known to be less, as with narrow blade propellers and at light loads, safety speed should be assumed to be 200 m.p.h. (174 knots) I.A.S.
- If safety speed has been attained, the aircraft will climb away at full normal load on one engine provided that:
 - the propeller of the failed engine is feathered and the radiator flap closed, and
 - the flaps are fully up.
- If flaps have been used for take-off, they should not be raised unless a height of at least 250 feet by day and 300 feet by night has been reached.
- The drag of a windmilling paddle-bladed propeller is very high and, unless feathering action is instantly taken when this type is fitted, control of the aircraft can only be retained at the expense of a rapid loss of height. This will be aggravated if the live engine is at +18 lb./sq.in.

A.L.3
Part IV
Para. 67
(i)

67. Engine failure during flight

- Close the throttle, feather the propeller and close the radiator of the failed engine. (Mk. 26: switch off the booster pump.) When the engine has stopped, switch off the ignition and turn off the fuel. Mk. 26: pull out the engine cut-out control.
- Open the radiator flap of the live engine and keep a careful watch on the temperatures.
- Jettison bombs if carried, and close the radiator flap.
- Maintain a speed of at least 170 m.p.h. (148 knots) I.A.S. and up to 200 (174) knots I.A.S. if possible, using 2,650 r.p.m. and up to +7 lb./sq.in. boost. Unfavourable weather conditions may make it necessary to use 2,850 r.p.m. and +9 lb./sq.in. Below 12,000 feet, it should be possible to maintain height at any load.
- Due to the very high drag of a windmilling paddle-blade propeller, when this type is fitted control difficulties may follow engine failure if it is not immediately recognized and feathering action taken.

A.L.4
Part IV
Para. 68
Page 37

68. Single-engine landing

- While manoeuvring with the flaps and undercarriage up, speed must not be allowed to fall below 160-170 m.p.h. (140-150 knots) I.A.S. At this speed turns can be made comfortably in either direction but, where it is necessary to carry out a circuit, this should be made left-handed irrespective of which engine has failed.
- Operation of the undercarriage should be left as late as practicable, but it should be locked down just before the final straight approach. It will take much longer to lower on one engine (approx. 30

PART IV—EMERGENCIES

A.L.4
Part IV
Para. 68
Page 38

- seconds at 2,850 r.p.m.) and owing to its high drag, height will be lost rapidly when it is down.
- (iii) When across wind lower partial flap. The live engine should be used carefully to regulate the rate of descent. Speed must not be allowed to fall below 155 m.p.h. (135 knots) I.A.S. with the undercarriage down and the flaps lowered partially, until it is clear that the airfield is within easy reach. Flaps may then be lowered fully and power and speed reduced as height is lost, aiming to cross the airfield boundary at, or a little above, the speed for an engine assisted landing (see para. 57).
 - (iv) Going round again is only possible if the decision is made in the early stages of the approach, before full flap has been lowered. Plenty of height is then available to raise the undercarriage and flaps, and to maintain a speed above the critical figure for the high power required.

NOTE.—If the cloud base is very low, and the aircraft cannot be diverted to a suitable airfield where more favourable conditions exist the landing should be made with the undercarriage retracted.

A.L.2
Part IV
Paras.
69 & 70

69. Feathering

- (i) Close the throttle immediately.
 - (ii) Hold the button in only long enough to ensure that it stays in by itself, then release it so that it can spring out when feathering is complete. Mk. 26: switch OFF the booster pump.
 - (iii) Switch off only when the engine has stopped, and close the radiator flap. *Mk 26. CUT OUT CONTROL TO CUT OFF POSITION*
- ### 70. Unfeathering
- (i) It is preferable to unfeather at speeds below 200 m.p.h. (174 knots) I.A.S. to avoid any risk of overspeeding the propeller.
 - (ii) Turn on the fuel, set the throttle slightly open, propeller speed control fully back, and ignition on. Mk. 26: cut-out control to run position (pushed in).
 - (iii) Hold the button in until r.p.m. reach 800 to 1,000
 - (iv) If the propeller does not return to normal constant speed operation, ~~open the throttle slightly~~. Mk. 26: when the engine is running satisfactorily, switch ON the booster pump.

A.L.4
Part IV
Para. 71
Page 38

71. Undercarriage and Flaps Emergency Operation

- (i) If the undercarriage has lowered but not locked down :
 - (a) Re-select DOWN, check that the selector lever returns to neutral, and check the position of the undercarriage by the indicator and warning horn.
 - (b) If the undercarriage is still not locked down, but the selector lever springs back to neutral, this indicates functioning of the hydraulic pumps but no positive operation of the undercarriage down locks. Leave the selector in the neutral position until the flaps have been lowered, then hold the undercarriage selector lever in the

PART IV—EMERGENCIES

A.L.4
Part IV
Para. 71
Page 39

DOWN position until the units can be locked down by the ground crew.

Until this has been done avoid raising the flaps, taxiing, turning or the use of brakes.

- (ii) If the indicator fails to show that the undercarriage is locked down, and the selector lever does not spring back to neutral :

(a) Return the selector lever to neutral and push the emergency knob down. Operate the handpump until the indicator shows that the wheels are locked down, or until considerable resistance is felt for several strokes.

NOTE.—This will not lower the tail wheel.

(b) Return the emergency knob to the UP position.

Put the flap selector lever DOWN and handpump until the flaps are 25° down, then return the selector lever to neutral.

(c) Select undercarriage DOWN, and handpump in an attempt to lower the tail-wheel. Increased resistance to the handpump indicates that the operation is complete.

(d) Lower the flaps fully, or as required, using the handpump. Return the flaps selector lever to neutral.

(e) If the main wheels fail to lock down, or to remain locked down, push the emergency knob down again and maintain pressure on the undercarriage by using the handpump during the landing. (See sub-para. (i) (b)).

A.L.5
Part IV
Para. 72
& 73

- 72. Bomb jettisoning.—Bomb doors selector DOWN—check doors open with warning light. First jettison small bomb-containers by pressing jettison button (27) then select all bombs and press release button (45) on control column ; this will release fuselage bombs unfused and wing bombs or drop tanks.

- 73. Fire-extinguishers.—The engine fire-extinguisher buttons (70) are on junction box B on the starboard cockpit wall. The extinguishers operate automatically in the event of a crash. A hand fire-extinguisher is provided to the right of the pilot's seat. Modification 1145 for Mk. FB VI and Modification 672 for Mk. FB 26 introduce a fire-warning light which is positioned in the centre of each feathering pushbutton. When this light glows red it indicates an outbreak of fire at the appropriate engine and action is to be taken as stated in A.P.2095, Part IV, Chap. 10, Para. 4. At a later stage a semi-automatic fire-extinguisher system will be introduced.

PART IV—EMERGENCIES

74. **Parachute exit.**—Through entrance door, which must be jettisoned by pulling the red handle (80) on the door and kicking out. Do not touch the normal handle. If possible, feather starboard propeller before baling out.
75. **Crash exit.**
Roof panel—pull down red lever in front of panel and push panel out.
76. **Crash axe** is stowed at the back of pilot's seat.
77. **First-aid outfit** is stowed under pilot's seat.
78. **Ditching**
(i) The aircraft has been successfully ditched by day, but whenever possible, bale out rather than ditch.
(ii) *When ditching*, jettison roof panel but keep entrance door closed.
(iii) Lower flaps 25°.
(iv) If one engine has failed, the final approach should be made without engine.
- (v) An L-type dinghy, with a manual control as well as an automatic immersion switch, is provided. There is also provision for K-type dinghies, in an A-pack for the pilot and in a C-pack for the observer.

A.L.1
Part IV
Para. 78
(v) & 79

79. **Failure of one 100-gallon drop tank to jettison or to transfer fuel.**

The handling characteristics of the aircraft are satisfactory even in the worst case of one full 100-gallon drop tank and no tank on the other side. The aircraft can be trimmed to fly "hands off" at speeds down to 160 m.p.h. I.A.S. but at lower speeds some aileron control will be necessary in addition to full trim. Great care must be exercised on the approach to land, which should be made at an indicated speed 10 m.p.h. higher than normally.

80. **Belly landing.**

Cases have occurred of paddle bladed propellers breaking on impact and of the port propeller causing injury to the pilot's legs. When this type of propeller is fitted, the engines should therefore be throttled fully back before touch-down.

A.L.4
Part IV
Para. 80

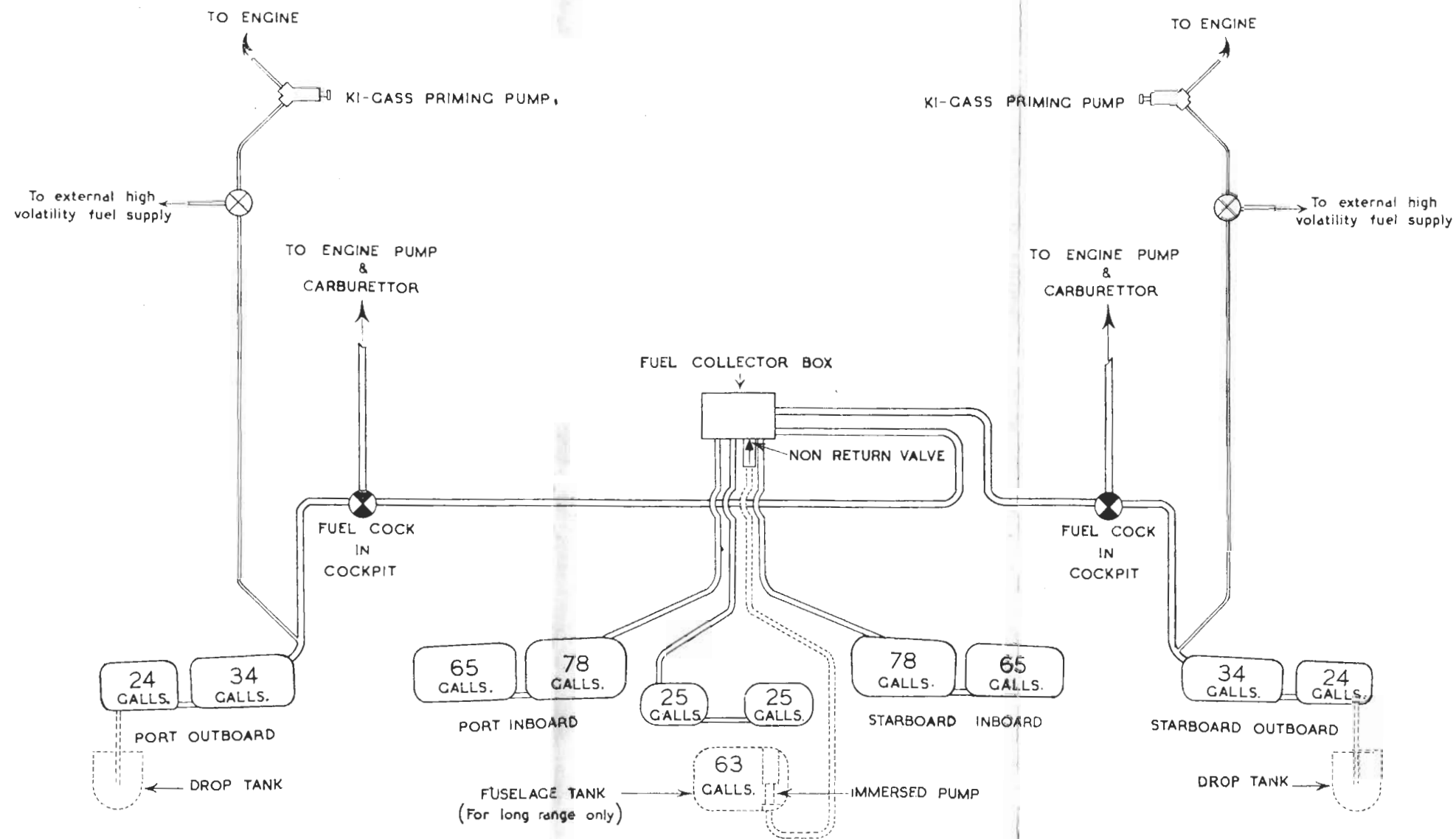


FIG.

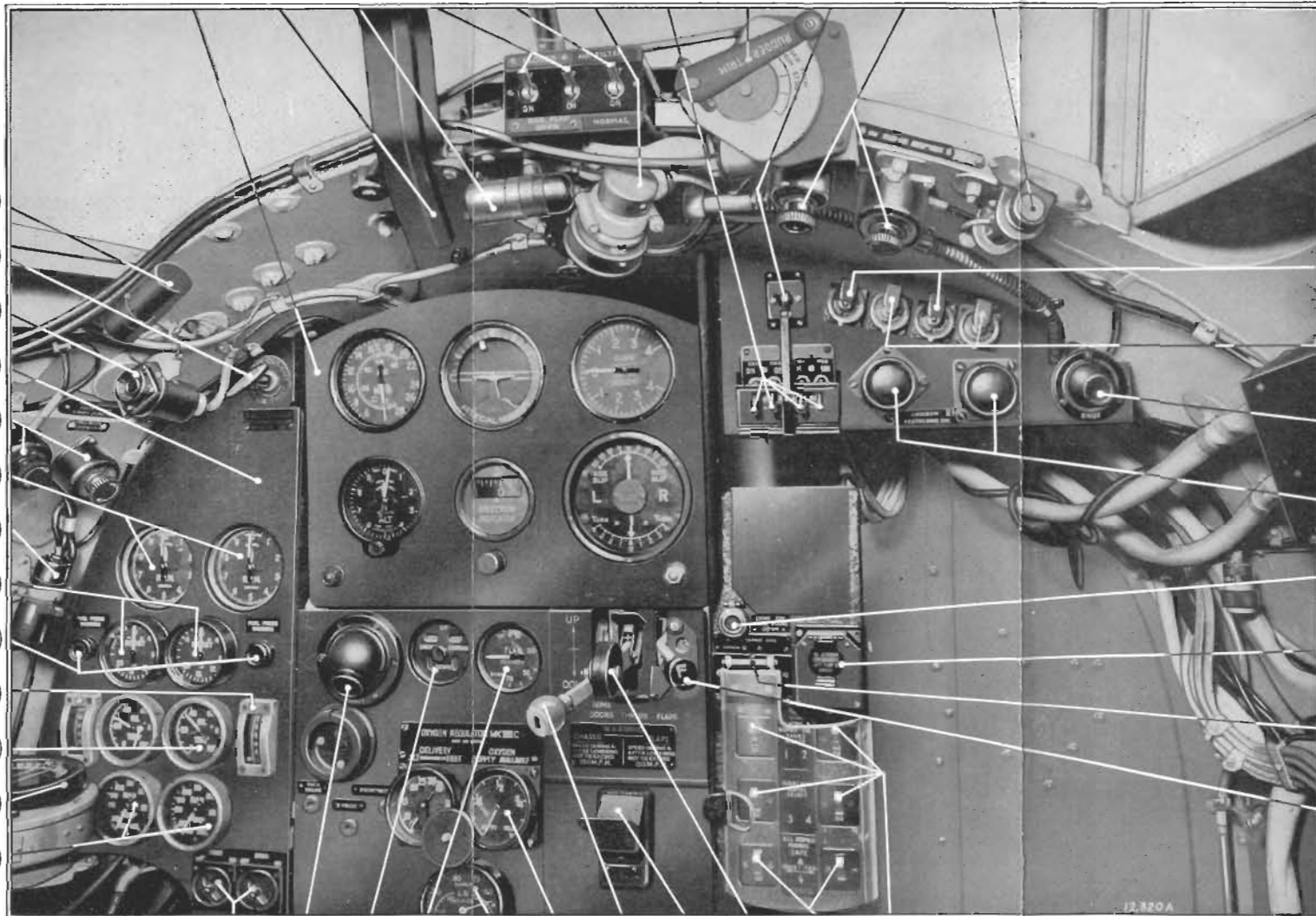
I

SIMPLIFIED FUEL SYSTEM DIAGRAM

FIG.

I

13 14 7 15 16 17 18 19 20 9 21



39 24 38 37 36 35 34 33 32 31 30

INSTRUMENT PANEL

KEY TO Fig. 2

INSTRUMENT PANEL

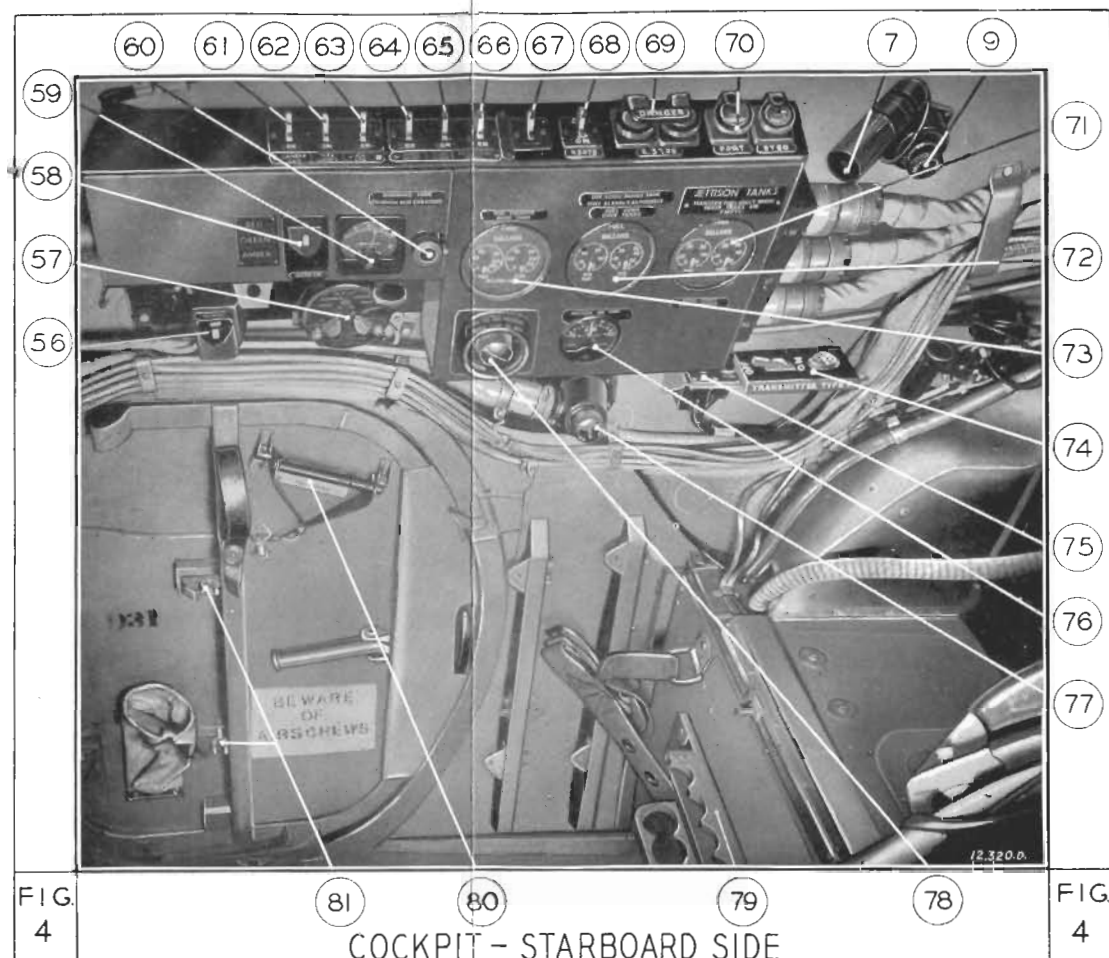
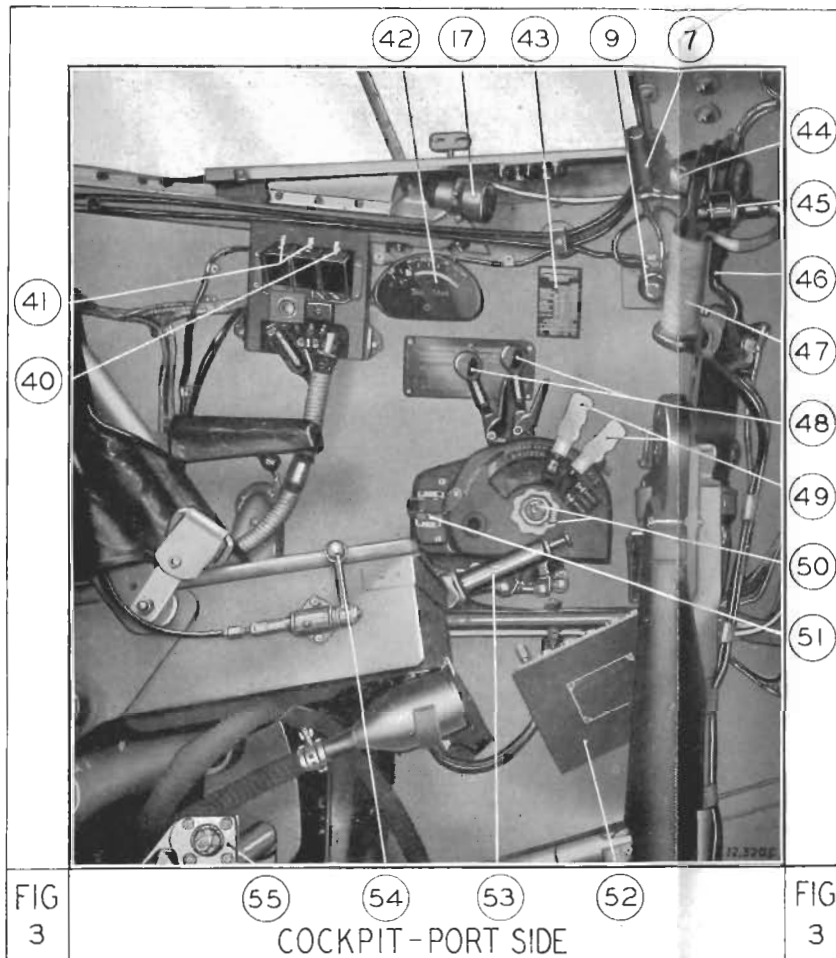
1. Coolant temperature gauges.
2. Compass.
3. Oil temperature gauges.
4. Oil pressure gauges.
5. Fuel pressure warning lights.
6. Boost pressure gauges.
7. Floodlights.
8. R.P.M. indicators.
9. Floodlight rheostats.
10. Stowage for R.I. compass repeater.
11. Exciter button for U.V. lighting.
12. Boost control cut-out.
13. Instrument flying panel.
14. Gun sight bracket.
15. Radiator flap switches.
16. Air intake filter switch.
17. Ultra-violet lamp.
18. Magneto switches.
19. Rudder trimming tab and indicator.
20. Electrical services switch.
21. Immersed pump warning light.
22. Engine starter switches.
23. Booster-coil switches.
24. Ventilators.
25. Feathering buttons.
26. Bomb doors warning light.
27. Bomb containers jettison button.
28. Bombs or tanks/camera change-over switch.
29. Flaps selector.
30. Bomb selector switches.
31. Bomb fusing switches.
32. Undercarriage selector.
33. Gun master switch.
34. Bomb doors selector.
35. Oxygen regulator.
36. Triple pressure gauge.
37. Flaps position indicator.
38. Undercarriage position indicator.
39. Landing lamp switches.

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FIG
2

FIG.
2



KEYS TO Figs. 3 and 4

- 40. Beam approach switch.
- 41. R.I. compass switches.
- 42. Elevator trimming tab indicator.
- 43. Engine limitations data plate.
- 44. Machine gun firing control.
- 45. Bomb release button.
- 46. Brake control lever.
- 47. Control column.
- 48. Throttle levers.
- 49. Propeller controls.
- 50. Friction controls.
- 51. Supercharger gear change switch.

- 52. T.R.1143 pushbutton unit.
- 53. Seat height-adjusting lever.
- 54. Harness release lever.
- 55. Socket for hydraulic hand pump.
- 56. Air recognition lights switch.
- 57. Identification lights switchbox and key.
- 58. Identification lights colour selector switch.
- 59. Voltmeter.
- 60. Generator warning light.
- 61. Camera gun master switch.

- 62. Navigation lights switch.
- 63. U.V. lights switch.
- 64. Pitot-head heater switch.
- 65. Immersed fuel pump switch.
- 66. Reflector gun sight switch.
- 67. Navigation headlamp switch.
- 68. IFF master switch.
- 69. IFF detonator buttons.
- 70. Fire-extinguisher switches.
- 71. Fuel contents gauges, outer wing tanks.
- 72. Fuel contents gauges, centre tank and bomb bay tank (if fitted).

- 73. Fuel contents gauges, inner wing tanks.
- 74. Switch and warning light for transmitter type F.
- 75. Master switches for R1155 and TR1143.
- 76. Outside air temperature gauge.
- 77. Cold air control knob.
- 78. Windscreen wiper rheostat.
- 79. Stowage for signal cartridges.
- 80. Emergency door release handle.
- 81. Stowage for hydraulic handpump handle.

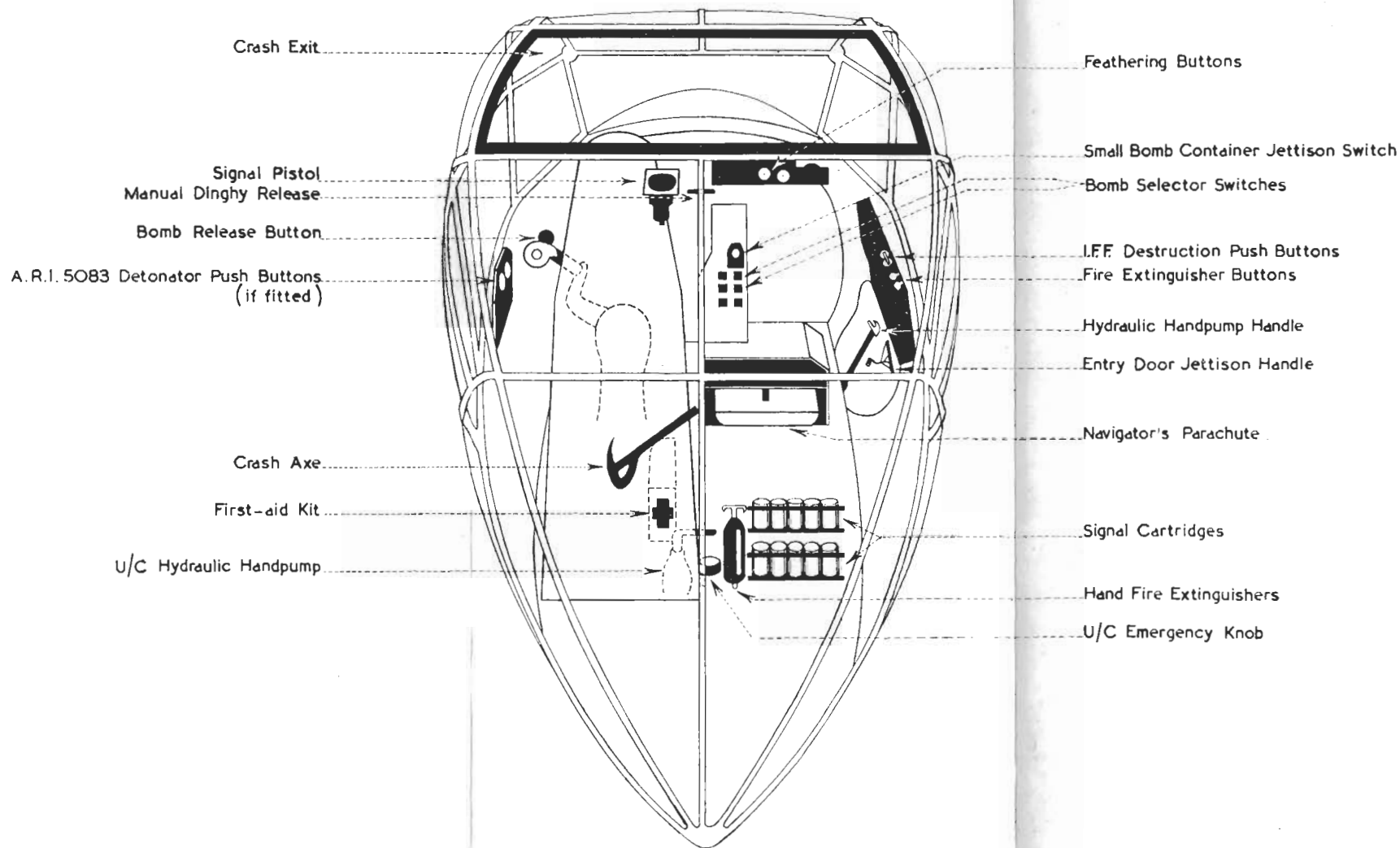


FIG.
5

EMERGENCY EQUIPMENT DIAGRAM

FIG.
5

**These are being listed for the
benefit for people interested
in British or Commonwealth
Aircraft**

**While it did cost me a great
sum of money to acquire
these documents, all I ask in
return is some credit.
~JimSan**