FINAL CHECKS FOR TAKE-OFF

BIAS	... Lateral Longitudinal	} At positions marked with arrows
THROTTLE ...	... Friction adjusted	
MIXTURE ...	... Slow running cut-out down	
PITCH	... Catch off	
	Friction adjusted	
FUEL	... Cock ON	
	Check contents	
	Booster-pump on	
OIL COOLER ...	... Shutters open	
BRAKES	... As required	

FINAL CHECKS FOR LANDING

BRAKES	... OFF
FUEL	... Cock ON
	Check contents
	Booster pump on

2nd Edition
December 1955

A.P.4361G—P.N.

PILOT'S NOTES

SYCAMORE

H.R. MK. 14

Prepared by Direction of the Minister of Supply

Promulgated by Order of the Air Council

J. R. C. Helmore L. J. Dean

700 12/55 G.B. & Co. Ltd. (1141)

NOTES TO USERS

These Notes are complementary to A.P.129 (6th Edition). Flying, and assume a thorough knowledge of the chapters which are relevant to the operation of this type of aircraft. Additional copies may be obtained by the Station Publications Officer by application on R.A.F. Form 294A, in quadruplicate, to Command Headquarters for onward transmission to A.P.F.S. (see A.P.113A). The number of this publication must be quoted in full—A.P.4361G—P.N.

Comments and suggestions should be forwarded to the Officer Commanding, Handling Squadron, Royal Air Force, Boscombe Down, Wiltshire.

AMENDMENTS

Amendments lists will be issued as necessary and will be gummed for affixing to the inside front cover of these notes. Each amendment list 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
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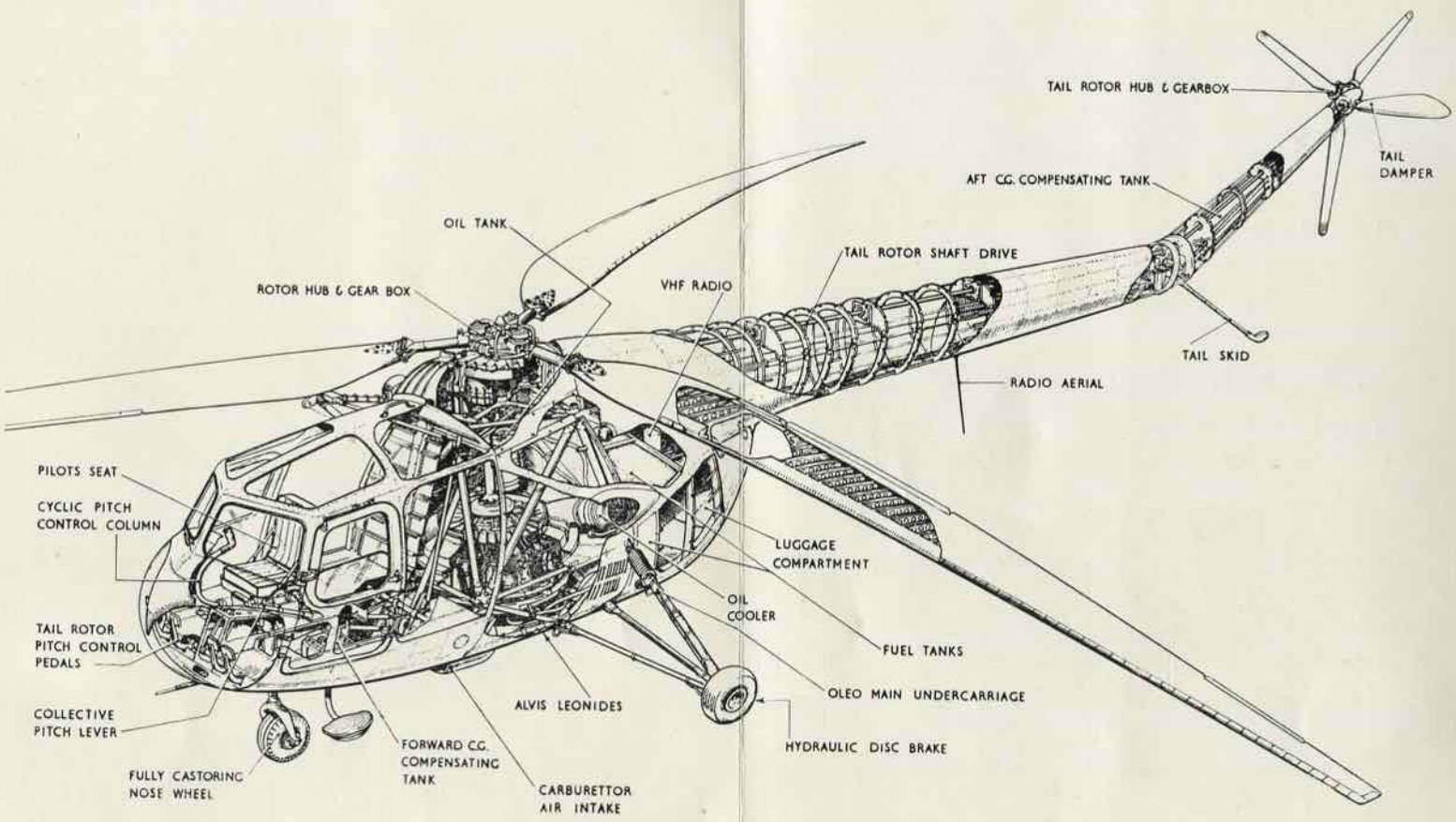
2			5		
3			6		



SYCAMORE Mk. 14

Associated Air Publications

Electrical manual	4343 series
Engineering manual	1464 series
External finish	2656A
Fuel injection and metering equipment for piston engines, Hobson R.A.E. ...	2239A
Fuel pumps	2241
Hydraulic and undercarriage equipment—general	1803A
Hydraulic equipment—Dowty	1803D
Hydraulic equipment—Integral	1803J
Hydraulic and undercarriage equipment—Miscellaneous	1803P
Hydraulic and undercarriage equipment—British Messier	1803T
Instrument Manual	1275 series
Leonides, Mk.17300 series, Engine change unit	4300C
Lifting equipment and haulage accessories	2817A
Radiators, oil coolers, etc. aircraft ...	2850A
Radio, electrical equipment	1186
Wheels, tyres and brakes	2337

Associated Air Diagrams

Electrical installation	5783

AIR MINISTRY
December, 1955

A.P.4361G—P.N.
Pilot's Notes
2nd Edition

SYCAMORE H.R. MK. 14

This edition supersedes A.P.4361G—P.N. (1st edition) issued in September, 1954.

LIST OF CONTENTS

PART I
DESCRIPTIVE

NOTE.—Throughout this publication the following conventions apply:—

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

(b) The numbers quoted in brackets after items in the text refer to the illustrations in Part VI.

(c) Unless otherwise stated, all airspeeds quoted are indicated airspeeds.

INTRODUCTION

The Sycamore H.R. Mk. 14 is a helicopter designed to operate in the following roles:—

(a) Air to sea/ground rescue.

(b) Communication and visual reconnaissance.

(c) Flight and crew training.

(d) Transport, light freight and lowering of personnel by rope.

(e) Aerial crane, for the transport or lifting by the winch of external loads.

(f) Carriage of external loads under the fuselage.

(g) Ambulance with special cabin blisters provided.

The helicopter is powered with a Leonides Mk. 173 engine rated at 500/520 B.H.P. for take-off conditions and which powers a three-bladed main rotor and an anti-torque tail rotor.

The flying controls are conventional. V.H.F. radio and homing aids, and a hydraulic hoist are fitted. The pilot flies the aircraft from the right-hand seat. The observer (or 2nd pilot) sits in the left-hand seat.

FUEL AND OIL SYSTEMS

1. Fuel tanks

Two fuel tanks are fitted aft of the engine. The main tank holds 65 gallons and the auxiliary tank underneath holds 24 gallons. The tanks are filled independently; the filler caps are on the port side of the fuselage. Both tanks are vented to atmosphere. A fuel contents gauge (5) at the centre of the instrument panel gives the contents of the main tank only. Fuel may be drained from both tanks as required, by servicing personnel, the drain cocks being normally wired shut.

2. Fuel transfer

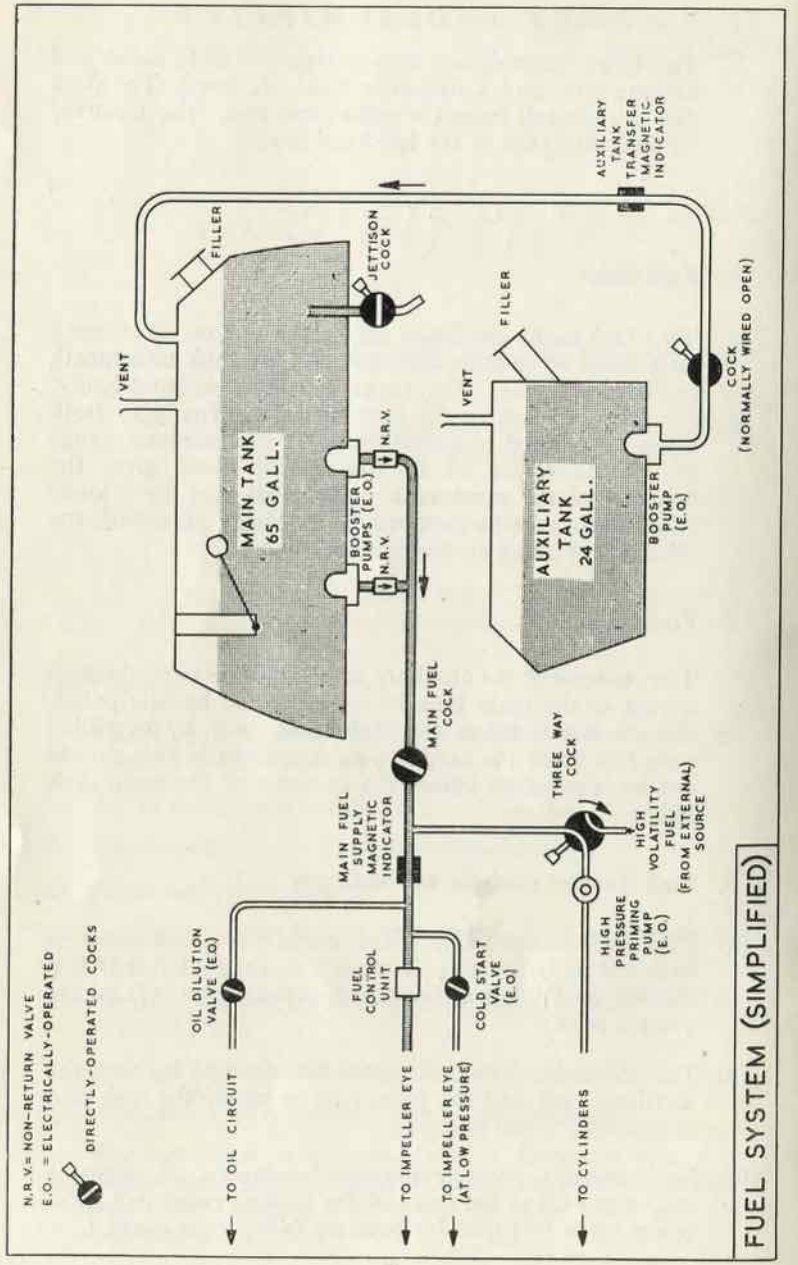
The contents of the auxiliary tank are transferred through a cock to the main tank by an immersed booster-pump. If care is not taken the main tank may by overfilled with fuel from the auxiliary tank; normally fuel should not be transferred before the contents of the main tank fall to 35 gallons.

3. Fuel transfer controls and indicator

(a) *Transfer booster-pump.* The transfer booster-pump is switched on by the circuit-breaker marked AUXILIARY PUMP, on the left of the circuit-breaker row (47) on the control panel.

(b) *Transfer cock.* The cock in the transfer line between the auxiliary tank and the main tank is beside the tank and is normally wired open.

(c) *Fuel transfer pressure magnetic indicator.* A warning indicator (45) at the front of the control panel will show *white* when fuel transfer pressure falls *below normal.*



4. **Fuel feed to the engine**

The fuel feed to the engine is normally provided by a booster-pump, through a main fuel cock to the engine-driven pump. Twin fuel booster-pumps are fitted; only one of these is normally used, the other being reserved for emergency. In the case of failure of both booster-pumps however, fuel will feed by gravity to the engine-driven pump. Fuel is taken from the main fuel feed line for cold starting, engine priming and oil dilution. (See paras. 7 and 11).

5. **Fuel controls and indicators**

(a) *Main tank normal booster-pump.* The main tank normal booster-pump is switched on by the right-hand circuit-breaker (at 47) marked MAIN TANK PUMP NORMAL.

(b) *Main tank emergency booster-pump.* The emergency booster-pump is switched on by the circuit-breaker marked EMERGY. to the left of the normal booster-pump circuit-breaker.

(c) *Fuel cock.* The fuel supply to the engine is controlled by the cock (37) marked FUEL ON-OFF on the control panel. It is moved forward to ON. This lever also controls the oil supply to the engine.

(d) *Fuel pressure gauge.* The fuel pressure gauge (14) at the top centre of the instrument panel under-reads by 2 lbs./sq. in. The figures given in the Notes, however, apply to the gauge readings.

(e) *Fuel pressure warning magnetic indicator.* A warning indicator (49) for the main tank booster-pump above the circuit-breaker row shows *white* when pressure falls *below normal.*

6. **Fuel jettisoning**

(a) Until Mod. 779 is embodied fuel cannot be jettisoned whilst airborne. When the Mod. is embodied however, fuel may be jettisoned by operation of the lever marked

FUEL JETTISON CONTROL, at the rear of the control panel, until the auxiliary tank is empty and there is a minimum of 25 gallons remaining in the main tank. In order to ensure jettisoning of the contents of the auxiliary tank, the transfer booster-pump must be switched on. (See para. 48 (e).)

(b) If fuel is jettisoned on the ground the aircraft should be moved to a safe distance before starting the engine. Fuel may be drained from both tanks when on the ground whether the Mod. has been embodied or not, by use of the drain cocks which are normally wired shut. This is a very slow process, and it may be quicker to fly the fuel off. The drain cocks are accessible through a hinged panel at the forward end of the luggage bay.

7. **Engine oil system**

(a) *Tank.* The oil tank on the forward face of the bulk-head aft of the engine holds 6½ gallons oil, plus a 2½ gallon air space. The filler cap and the dipstick are accessible on the starboard side of the fuselage. Two cocks, one at the bottom of the sump and the other at the bottom of the tank, are provided to enable any accumulation of water to be drained; the cocks are normally wired shut.

(b) *Circulation*

The oil flows from the tank sump through a cock to the engine. The return pipe divides at an anti-surge valve; one pipe goes straight to the top of the oil tank hot-pot; the other goes through an oil cooler. If, due to low temperature, the oil pressure exceeds 62-66 lb./sq. in., the anti-surge valve opens and the oil by-passes the cooler.

(c) *Controls and gauges*

(i) *Cock.* The oil cock is operated by the same control (37) as is used for the fuel cock.

(ii) *Oil temperature and pressure gauge.* The oil temperature and pressure are registered on a combined gauge (25) on the instrument panel.

(iii) *Oil cooler shutters control.* The oil cooler shutters control (9) is mounted on the cabin roof. It is pushed forward to close the shutters, and pulled back to open them. There are three intermediate positions.

(iv) *Oil dilution control.* The oil dilution valve is opened by depressing the switch labelled OIL DIL in the switch row (48). The switch should be set to ON for one second for each degree Centigrade ambient temperature below zero.

NOTE.—When the oil cooler shutters are set in the fully open position they still blank off approximately half the area of the cooler. It may be necessary to remove the shutters completely for tropical operation, in which case the shutter control will be inoperative. On later aircraft with Mod. 642 embodied the oil coolers can be fully opened or closed.

ENGINE AND TRANSMISSION

8. **Engine**

The Leonides Mk. 173 engine is fitted with a Hobson injection carburettor. There is no hot air control, and mixture control is automatic. A slow running cut-out control (36) at the rear of the control panel is pulled up to stop the engine.

9. **Throttle control**

The throttle is opened either by raising the collective-pitch lever, or, independently, by rotating the twist-grip at the end of the collective-pitch lever. The throttle linkage from the collective-pitch lever ensures that sufficient boost is applied to keep the r.p.m. approxi-

mately constant as the collective-pitch is increased. Final adjustments to r.p.m. may be made with the throttle twist-grip (40). The twist-grip (40) is rotated clockwise (looking from the pilot's seat) to open the throttle and increase boost—and consequently r.p.m. The friction control (39) is at the left-hand side of the twist-grip.

NOTE.—Only about 24 in. Hg. boost can be obtained by opening the twist-grip throttle on the ground with the collective-pitch lever at minimum.

10. **Ignition**

Two ignition switches (51) are at the front of the control panel.

11. **Engine priming**

(a) A high-pressure engine priming system may be fitted for use in low temperature conditions. Fuel is taken from the engine side of the fuel cock and passed through a three-way cock and an electrically-operated priming pump to the engine cylinders. The three-way cock is on the port side of the engine and has two positions marked NORMAL and HIGH VOLATILE FUEL: the NORMAL position is used when injecting the engine fuel and the HIGH VOLATILE FUEL position when injecting high volatile fuel from an external source (at the cock itself). The priming switch is at the right-hand side of the switch row (48) on the control panel.

(b) When the spring-loaded engine COLD START switch (56) on the control panel is pressed, fuel is injected into the eye of the supercharger impeller.

12. **Engine starting**

(a) The engine is started by a direct-cranking electric motor, operated by a guarded switch (57) on the control panel.

(b) A socket for inserting a cranking handle is on the starboard side of the fuselage just aft of the exhaust outlet. The handle may be used to check for hydraulicing and in an emergency to start the engine. It is normally stowed in the luggage compartment.

(c) The booster-coil isolation switch is in the switch row (48) on the control panel.

13. **Engine instruments**

The following engine instruments are on the instrument panel:

Combined engine and rotor r.p.m. indicator (18) incorporating a synchroscope (duplicated).
Boost gauge (19) (duplicated).
Combined engine oil pressure and temperature gauge (25)
Cylinder head temperature gauge (4).

When Mod. 838 (Introduction of turn-and-slip indicator), is embodied the turn-and-slip indicator is positioned in place of (25) which is re-positioned in place of the clock. The clock is re-sited to the left of the cylinder head temperature gauge.

14. **Transmission system**

(a) The transmission sequence from engine to main rotor is:—

(i) *Clutch*: engages between 1,000-1,200 r.p.m.

(ii) *Free-wheel unit*: allows rotors to free-wheel if engine r.p.m. drop.

(iii) *Torque limiting clutch*: minimises the effect of a snatch engagement of the rotor.

(iv) *Main rotor gearbox*: reduces engine to main rotor speed in ratio 11.15 to 1. The gearbox has an oil capacity of 11½ pints; the oil filler and level plug are on the starboard side and the filter and drain plug on the port side. An oil temperature gauge (30) is on the instrument panel.

(b) The transmission sequence from gearbox to tail rotor is:—

(i) *Tail rotor drive*: from gearbox, on which the rotor brake is applied.

(ii) *Torque limiting clutch*:

(iii) *Tail rotor drive shafts*:

(iv) *Tail rotor gearbox*: The gearbox has a capacity of ¾ pint. A temperature gauge (1) for the tail rotor gearbox oil is on the instrument panel.

MAIN SERVICES

15. Electrical system (24 volt)

(a) *Battery*. A 24-volt, 25 ampere-hour battery is stowed behind the observer's seat beneath the cockpit floor. The BATTERY ISOLATION switch (58) is the furthest left of three guarded switches at the centre of the control panel. An emergency battery is stowed just aft of the main battery; it supplies power to two emergency lamps on the instrument panel and one on the compass.

(b) *Generator*. A 29-volt 1,500-watt generator on the engine gearbox provides current for the electrical services and charges the main battery. The generator field circuit-breaker marked GEN-FIELD is in the circuit-breaker row (47), and the generator ON-OFF switch (2) is on the left-hand side of the instrument panel. A generator failure warning light (3) is immediately above the switch.

(c) *External supply*. An external D.C. supply can be plugged in at the socket on the right-hand side of the fuselage. There is no ground/flight switch; when the plug is inserted the internal supply is automatically isolated.

16. Vacuum system

Suction for the artificial horizon and the directional gyro is provided by a vacuum unit driven by the same shaft as the generator. A suction gauge (15) at the top of the instrument panel gives the suction in inches of mercury; at normal cruising r.p.m. this should be 3.5 to 4.5 inches.

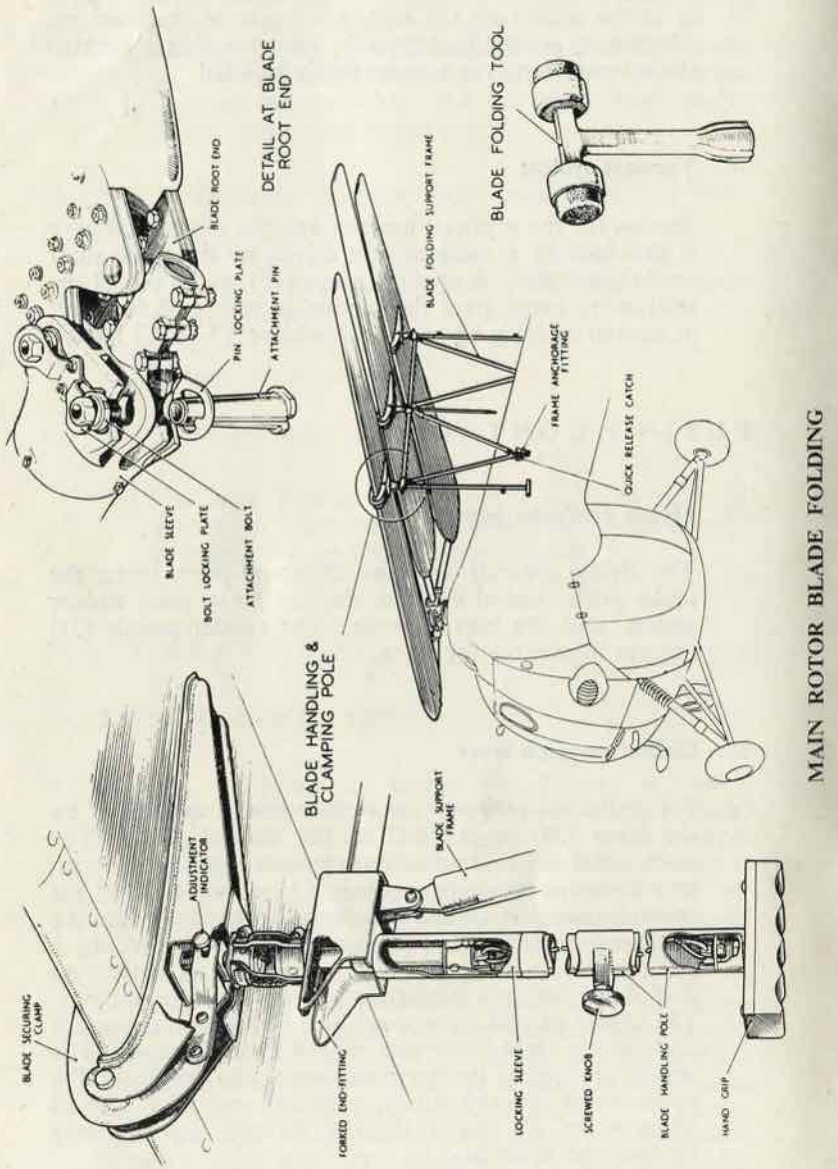
FLYING CONTROLS

17. Flying controls: general

The flying controls are: the collective-pitch lever, the cyclic-pitch control column, the tail rotor pitch rudder pedals, and the bias controls. The rudder pedals (31) are not adjustable for reach.

18. Collective-pitch lever

(a) The collective-pitch of the main rotor is controlled by the lever (38) to the left of the control panel. The mechanism is irreversible, but to control the load necessary to move the lever, a knob (63), at the back of the control panel, is turned clockwise. The lever can be secured in the minimum pitch position (fully down) by a catch half-way down the lever; this catch is twisted so that it fits under a projection on the bias control box. The degree of collective- pitch can be read on the gauge (52) at the right-hand side of the control panel. The action of raising the lever automatically increases the boost to keep the r.p.m. sensibly constant. Small adjustments of the twist-grip throttle control may however be necessary.



MAIN ROTOR BLADE FOLDING

(b) *Rotor brake*

At the lower end of its travel the collective-pitch lever comes up against a stop. This stop can be released by pressing the knob (61) on the top of the bias control box; the pitch lever can then be pressed further down. This action applies a brake on the tail rotor drive, thus stopping both the main and tail rotors. The pitch lever can be returned easily to the minimum pitch position regardless of the position of the stop release. The brake can be kept on by tightening the collective-pitch friction control knob. The brake is ineffective and should not normally be applied above 50 rotor r.p.m. On later aircraft with Mod. 690 (hydraulic rotor brake) embodied, the rotor brake can be applied by the hydraulic rotor brake lever on the control panel. This lever is retained by a spring clip when not in use. It is pushed forward to apply the brake and may be retained in the on position by means of a spring-loaded catch incorporated in the lever which engages in a slot on the control panel.

19. **Cyclic-pitch control**

The cyclic-pitch control column is directly in front of the pilot's seat, and may be duplicated for dual flying. There are three switches on the 1st pilot's cyclic-pitch control; a hoist selector switch (21), a press-to-transmit button (23), and a trigger switch (not used). A cyclic-pitch indicator (43) is at the front left-hand side of the control panel.

20. **Cyclic-pitch bias controls**

Two cyclic-pitch bias control handwheels (34) and (62) are at the rear of the control panel for trimming out control forces. They operate in the natural sense, and trim position indicators (35) and (60) are provided on the control panel.

21. **Main rotor blade folding**

As shown in the accompanying illustration the main rotor blades may be folded to lie back along the fuselage, where they are supported by a blade folding support frame.

The rotor is rotated until one blade is lying aft along the fuselage, and an attachment pin is removed (by means of a blade folding tool) from each of the other two blades. Blade handling poles are attached at indicated points on the blades, which are then folded back about the root ends until they lie parallel with the third blade. The handling poles are finally attached to the support frame which is anchored to a fitting on the tail cone.

The support frame is collapsible, and is normally stowed in the intermediate fuselage with the blade handling poles.

22. **Wheel brakes**

The wheel brakes are hydraulically-operated, and controlled by a lever (55) at the right-hand side of the control panel. A spring-loaded ratchet release button is in the top of the lever. A small reservoir underneath the cockpit floor supplies the fluid for the system.

23. **C.G. compensating system**

(a) The C.G. compensating system allows fluid to be transferred between a forward and a rear tank to alter the C.G. position according to the load carried. The operation can be performed either on the ground or in the air. The forward tank (5.5 gall.) is under the cockpit floor, and the rear tank (5.75 gall.) is in the aft tail boom.

(b) The fluid is transferred by two electrically-driven pumps operating in parallel; the circuit-breakers for these pumps are in the circuit-breaker row at the forward end of the control panel. Movement of the fluid is selected by a spring-loaded lever (59) at the right-hand side of the control panel. Selection is in the natural sense; the lever is moved forward to transfer fluid to the forward tank, and rearwards to the rear tank. Selection of the lever automatically switches on the pumps; two clear warning lights (27) on the instrument panel come on when the pumps are working. Failure of either pump will not

affect the operation of the system, other than slowing down the transfer of fluid. A gauge (29) just above the warning lights shows the contents of the front tank; it is calibrated in pounds.

(c) The fluid used is Glycerol DTD.406A.

COCKPIT EQUIPMENT

24. **Access to cockpit**

The cockpit is entered through doors on each side of the cockpit; the handle at the rear end of each door is pushed up to open. When fully open the doors are held by catches; these are released with a light pull force on the doors. Each door is jettisonable from either inside or outside by a small handle (20) at the forward end; this handle is pushed forward to release the hinge. The door must be opened at the rear end before it can be jettisoned.

25. **Cockpit seating**

(a) *Pilot's seat.* The pilot's seat can be adjusted fore-and-aft by raising a spring-loaded catch on the starboard side at the rear, and sliding the seat along its runners.

(b) *Observer's seat.* The observer's seat has no fore-and-aft adjustment. It can be swivelled through 180° when a spring-loaded catch on the starboard side is released. This seat must not be faced aft when the port cyclic-pitch control is fitted, or fouling will occur.

(c) *Passengers' seats* Three folding deck-chair type seats may be fitted at the back of the cockpit.

(d) *Stretchers.* Two stretchers, one above the other, can be fitted when the passengers' seats are folded against the rear bulkhead or removed, and the hinged opening blisters are fitted.

26. Cockpit lighting (Pre-Mod. 792)

Light	*Position of light*	*Position of switch*
Compass lamp	By compass in cockpit roof.	(6) Extreme left of row of dimmer switches above instrument panel.
Instrument flying panel red lamps (two).	Above instrument flying panel.	Second switch (7) from left above coaming.
Coaming lamps (six).	On coaming (for instrument panel).	Second switch (12) from right above coaming.
Control panel lamps (two).	One at front end of panel and one at bias control box.	Extreme right switch (13) above coaming.
Cockpit lamps (two).	In cockpit roof.	Switch at extreme left of rear switch row (54).
Fuselage lamp.	Intermediate fuselage	Switch near light.
Patients' lamps and Aldis lamp.	Rear of cockpit.	Switch for cockpit lamps.
Emergency lamps.	Two coaming and one compass.	Switch (26) on instrument panel. Power is supplied by a 2.4 volt, 3 amp. hr. battery.

27. Cockpit lighting (Post Mod. 792)

Light	*Position of light*	*Position of switch*
1st Pilot's flying instruments.	3 under coaming 2 on panel.	Extreme right switch (13) above coaming.
Secondary instruments and control panels	2 under coaming 2 on control panel.	Second switch (12) from right above coaming.
Compass.	By the compass.	2nd switch (7) from left above coaming.
2nd Pilot's or observer's panel.	1 under coaming.	Extreme left switch (6) above coaming.
Cockpit lamps (two).	In cockpit roof.	Switch at extreme left of switch row (54).
Fuselage lamp.	Intermediate fuselage.	Switch near light.
Patients' lamps and Aldis lamp.	Rear of cockpit.	Switch for cockpit lamps.
Emergency lamps.	Two coaming and one compass.	Switch (26) on instrument panel. Power is supplied by a 2.4 volt, 3 amp. hr. battery.

28. Cockpit heating

The cockpit is heated by hot air obtained from a heat exchanger in the exhaust manifold. Air enters through an intake on the port side of the fuselage, passes through the heat exchanger, and enters the cockpit through a

grille at the front end of the control panel. The supply of air is cut off by pulling up the control (33) at the rear end of the control panel.

29. **Windscreen wiper**

A windscreen wiper is fitted and is operated by the control (8) above the instrument panel forward of the dimmer switches.

FLIGHT AND NAVIGATION EQUIPMENT

30. **Flight instruments**

(a) A standard instrument flying panel is fitted, with the exception of a turn-and-slip indicator; the latter may be fitted in later aircraft. A spirit level (17) is fitted at the top of the panel. The pressure head heater switch is in the front switch row on the control panel, at the extreme left.

(b) *Compass*

An E.2A compass (10) is mounted in the cockpit roof.

31. **External lighting**

Light	Position of switch in aft switch row (54).
Navigation lights.	2nd from left.
Identification light.	3rd from left, marked STEADY—OFF—SIGNAL.
Landing lamp.	(a) Master switch: 4th from left, marked ON—OFF—SECOND FILAMENT. (b) Control switch: 5th from left, marked UP—OFF—DOWN.

SIGNALS EQUIPMENT

32. **Intercommunication**

Intercom. is provided through the amplification stage of the V.H.F. set. The V.H.F. set must be switched on and both the BEACON-V.H.F./I.C. change-over switches (44) and (50) must be at V.H.F./I.C. before intercom. between pilot and observer can be obtained. When the observer is listening out on BEACON, he is cut off from the intercom., but may be recalled by closing the switch (53) marked I/C OVERRIDE at the right-hand side of the control panel.

33. **V.H.F.**

A T.R.1934 set is fitted, and is controlled by the channel selector box (41) at the front left-hand side of the control panel. A press-to-transmit switch (23) for the pilot is fitted on each cyclic-pitch control, and one (42) on the left-hand side of the control panel is for the use of the observer when the port cyclic-pitch control is removed. Intercomm. sockets are provided on each side of the control panel, and at the winch operator's station.

34. **Search and rescue beacon**

An ULTRA beacon receiver is fitted, and is controlled by an ON-OFF switch on the panel at the rear of the cockpit. The appropriate BEACON-V.H.F./I.C. change-over switch must be at BEACON before signals can be received by the pilot or observer.

RESCUE AND EMERGENCY EQUIPMENT

35. **Rescue hoist**

(a) *General.* The hoist, mounted on the starboard side of the fuselage, is electrically-controlled and hydraulically-operated. It is designed to lift a maximum live load of 400 lb. and a maximum dead load of 300 lb. It is controlled by three switches in the cockpit. A cable and an inter-

com. lead are lowered by a winch driven by a hydraulic motor. Hydraulic fluid is supplied from a reservoir through a pump driven off the main rotor gearbox. At the end of the cable is a hook to which may be attached a lifting sling and the winch operator's rescue seat and harness. The hook is normally stowed in a pocket on the forward boom of the winch.

(b) *Reservoir.* The reservoir at the rear end of the hoist supplies fluid to the hydraulic motor. A float in the reservoir operates a micro-switch if the fluid falls below a certain level; this stops the motor and illuminates a warning light (46) on the control panel to show that the hoist is inoperative. An automatic cut-out permits the circulation of fluid at zero pressure between the pump and reservoir.

(c) *Controls*

(i) *Pilot's switch.* A hoist selector switch (21), spring-loaded to the central off position, is fitted to the rear of the hand-grip on the cyclic-pitch control.

(ii) *Winch operator's switch.* The winch operator's DOWN—OFF—UP switch is on a wander lead stowed at the aft right-hand side of the cockpit.

(iii) *Master switch.* The HOIST-ON master switch is in the switch row (48) on the control panel.

Selection of either DOWN or UP on the operating switches causes hydraulic fluid to be directed to one side or other of the winch motor, thus operating the winch in the desired direction. Two micro-switches are fitted to the hoist to break the electrical circuit when the cable has travelled to its fullest extent from the up or down positions. When the motor is off an anti-slip unit locks the winch stationary. If both operating switches are selected in the opposite direction simultaneously, the winch will remain stationary.

(d) *Cable and cable-cutter.* The hoist cable is 75 ft. long. In an emergency it may be cut by releasing a spring-loader cutter which cuts the cable against an anvil. The spring is released by either the strap (11) above the starboard windscreen, or the one fitted across the starboard side of the canopy at the winch operator's station. Locking wire, with a red perspex disc attached, is fitted through the strap attachment brackets at the pilot's and winch operator's stations. The cutter is reloaded by removing the anvil retaining screw and screwing in a loading tool until the cutter is forced into its loaded position. The loading tool has a red pennant attached to it and is stowed normally on the aft bulkhead of the cockpit.

(e) *Intercom.* An intercom. cable, with socket, is lowered with the winch cable, but is only 30 ft. long. When more than 30 ft. of the winch cable are paid out, the intercom. breaks at the connecting socket. Six feet of intercom. cable at the centre of the winch drum are painted red to give warning to the pilot of an impending break.

36. **Rope ladder**

Attachment points for a rope ladder or hand ropes are provided on the starboard side of the fuselage. The rope ladder is stowed in the luggage compartment aft of the engine.

37. **Electric blanket**

A socket for plugging in an electric blanket is provided on the circuit-breaker panel on the aft bulkhead of the cockpit. It is controlled by an on-off switch on the panel.

38. **Fire-extinguishers**

(a) *Engine fire-extinguisher.* Flame switches in the engine bay illuminate a red light-cum-pushbutton (16) on the instrument panel when dangerously high temperatures

occur. The extinguisher is operated by depressing the pushbutton; the light can be tester by pulling out the inner section of the pushbutton. In a crash, inertia switches simultaneously operate the engine fire-extinguisher and isolate the battery. The flame switches are of the non-resetting type, i.e., the light will remain on after a fire is extinguished.

(b) *Hand fire-extinguisher.* A water-glycol hand fire-extinguisher (28) is clipped in a bracket on the forward face of the control panel. This extinguisher must not be used on burning liquid or electrical fires.

(c) *Fire access door.* A circular push-in panel, marked FIRE ACCESS DOOR, in the bottom port centre fuselage skin, provides access to the engine bay.

39. **Jettisonable panels**

(a) *Entrance doors.* The entrance doors are jettisonable by either an internal or external lever (20) at the forward end of each door. The lever is turned forward to jettison. The doors must be opened at the aft ends before they will jettison.

(b) *Emergency exits.* Additional exits are provided by the apertures aft of the entrance doors. When these are covered by rigid panels, exit can be effected by pulling the rings in the seating of the panel windows and knocking the windows out. Rings are provided both internally and externally.

40. **First-aid packs**

First-aid packs are located on the aft wall of the cockpit and in the luggage bay.

41. **Signal pistol**

A signal pistol and six cartridges are mounted on the starboard entrance door. The firing aperture (22) is forward of the starboard door post.

PART II
LIMITATIONS

42. **Engine limitations—Leonides Mk.173**

The principal engine limitations are as follows:—

Condition	R.P.M.		Max. boost (in. Hg.)	Max. temp. (°C)	
	Engine	Rotor		Oil	Cyl. head
Take-off (5 min.) ...	3,200	287	44	85	230
or	3,000*	270	46	85	230
Intermediate (1 hour)	3,000	270	39	85	230
Max. continuous ...	2,800	251	34	85	210

*If 44 in. boost is exceeded, r.p.m. must be restricted to 3,000.

Oil pressure

Minimum ... ... 60 lb./sq. in.

Normal ... ... 70-80 lb./sq. in. (2,800 r.p.m.)

Maximum ... ... 85 lb./sq. in.

Fuel pressure

Normal ... ... 23-27 lb./sq. in.

Oil temperature

Minimum for take-off ... 20°C.

Cylinder head temperature

Minimum for take-off	100°C.
Maximum for stopping engine	160°C.

Rotor R.P.M. in flight

(a) Power on—Max.	287
—Min.	245
(b) Power off—Max. (autorotation)	287
—Min.	210

Transmission oil temperature

Maximum (main and tail)...	95°C.
Normal: Main	80°C.
Tail	55-60°C.

43. **Flying limitations**

(a) *Maximum speeds*

Condition	Max. speed (knots) at sea-level		
	15°C	32°C	45°C
Power on or off with normal rotor speed range 250-280 r.p.m.	115	110	103
With ambulance blisters fitted.	112	107	100
Power on with extended rotor speed range 280-287 r.p.m. or 245-250 r.p.m.	70	64	59
Power off with extended rotor speed range 210-250 r.p.m.	70	64	59

The speeds are to be reduced by 3.5 knots for every 1,000 ft. of altitude.

NOTE.—Other speed restrictions apply for special operations such as winching and trailing of external stores, and instrument and night flying. (See (b) (c) and (d) below.)

(b) *Winching limitations*

NOTE.—All winching should be done into wind.

(i) *Lifts with live or dead loads whilst hovering*

The vertical and hovering performance varies considerably with individual aircraft, due mainly to the tolerance limits on engine power (500/520 BHP). If the worst case is considered, it is estimated that the windspeeds in the following table would be required for the conditions quoted to permit a vertical rate of climb of 180 ft./min. under sea-level conditions. The figures given in brackets are based on tests made with an aircraft with an engine rated near the upper tolerance limit.

Climate	Minimum windspeed in knots		
	5,400 lb. A.U.W.	5,200 lb. A.U.W.	5,000 lb. A.U.W.
ICAN (+15°C.)	4	—	—
Temperate Summer (+27°C.)	13(3)	8	—
Malayan (+32°C.)	18(8)	12 (Still air)	6
Tropical (Max.) (+45°C.)	27(17)	21(10)	15(5)

(ii) The maximum permissible indicated airspeeds at which a trailing load may be carried and/or winched in or out are as follows:—

Type of load	Condition	Weight of load	Limiting forward speed IAS
Live	Winching in or out or trailing.	Up to 400 lb.	30 knots.
Dead	Winching in or out or trailing.	Up to 300 lb.	40 knots.
Dead	Close hauled.	Up to 300 lb.	70 knots.

(iii) *Life of cable*

(1) The number of lifts at weights below 300 lb. is unlimited.

(2) Lifts between 300-400 lb. are restricted to a total of 100. Each lift within this range is to be recorded on F.700.

(c) *External load carrying*

External loads up to a maximum weight of 500 lb., slung under the fuselage, may be carried at speeds not exceeding 80 knots when Mods. 800 (introduction of external sling) and 806 (introduction of switch and wiring to permit jettisoning of load) are embodied. (Mod. 806 is essential, as otherwise the load can be carried but not released.)

(d) *Instrument and night flying*

When Mod. 838 (which introduces an electrically driven turn-and-slip indicator) is embodied:—

(i) Instrument and night flying may be carried out below 4,000 ft. in calm to moderate turbulence conditions, provided that adequate practice under simulated I.F. conditions has been gained.

(ii) Whilst instrument flying airspeeds should be maintained between 40 and 80 knots, and an angle of bank of 20° not exceeded. Should conditions of more than moderate turbulence be encountered the flight should be discontinued.

(iii) From a fatigue point of view, flying under I.F. conditions should be limited to 30 minutes.

(iv) Instrument flying in icing conditions is prohibited.

44. Weight and C.G. limitations

(a) The maximum permissible A.U.W. is 5,400 lb.

(b) In certain atmospheric conditions the maximum A.U.W. will need to be reduced to enable the aircraft to climb out of the ground cushion. (See graph in Part V—Operating Data.)

(c) The maximum dead load which may be hoisted on the winch is 300 lb., and the maximum live load 400 lb.

(d) The C.G. limits are: 2.1 in. to 7.3 in. behind the datum, which is on the vertical centre line of the rotor.

(e) The maximum load permitted in the luggage compartment is 200 lb.

PART III
HANDLING

45. Loading the aircraft

It is easy to exceed the C.G. limits when loading the aircraft. Reference must always be made to the chapter on loading in A.P.4361G—Volume 1.

46. Use of the C.G. compensator

NOTE.—Fluid should always be transferred from one tank to the other in the compensating system in accordance with a pre-flight plan. Indiscriminate use of the compensator in the air may lead to the C.G. moving outside its permitted range.

(a) *On the ground.* The compensator may be used to ballast the aircraft according to the load to be carried. The transfer of all the fluid from one tank to another takes $3\frac{1}{2}$ minutes and shifts the C.G. by 4.7 in.

(b) *In flight.* As fuel is used the C.G. moves forward; for every 5 gall. of fuel used, 3 lb. of C.G. compensator fluid should be moved aft, in order to keep the C.G. position constant. In hovering flight the compensator may be used to give the stick positions as required.

47. External checks

Before entering the cockpit, have a 24-volt external battery plugged in and switched on. While the internal supply can be used for starting, its use is not recommended for normal operation. Check that the aircraft is headed into wind, and that the main and tail rotors are free from obstructions. The engine must not be started over ground saturated with fuel. Put the wheel and rotor brakes on, and then carry out the following specific checks, in addition to the standard ones:—

Main rotor attachment pins	Secure (inspect from top of fuselage)
Main rotor blades	On rear drag hinge stops
Tyre pressures	Nosewheel normal Main wheels normal
Nosewheel leg extension	5 in. approximately
Main wheel legs extension	4 in. approximately
Luggage compartment	Luggage correct (not more than 200 lb.) and secure.

48. **Management of the fuel system**

(a) The fuel-and-oil cock should be on for starting and at all times when the engine is running.

(b) Fuel is normally fed to the engine from the main tank by means of the main tank normal booster-pump.

(c) For starting and in flight, the main tank normal booster-pump should be on and the fuel pressure warning magnetic indicator black. In the event of the fuel pressure falling below normal, indicated by the fuel pressure warning magnetic indicator (49) showing white, the main tank emergency booster-pump should be switched on.

(d) When the contents of the main tank have fallen to 35 gallons the contents of the auxiliary tank may be transferred by switching on the transfer booster-pump. On completion of transfer, or in the event of transfer booster-pump failure, the fuel transfer magnetic indicator (45) will show white.

(e) Should it be necessary to jettison fuel, operation of the fuel jettison control lever will jettison fuel from the main tank down to 25 gallons. If the transfer booster-pump is switched on when fuel jettisoning is taking place, any fuel in the auxiliary tank will be transferred to, and

jettisoned from the main tank via the main tank jettison pipe. If, however, the transfer booster-pump is not switched on, the contents of the auxiliary tank will not be affected.

49. **Checks before starting**

Doors	Closed and secure. Jettison handles pointing up.
Cable cutters	Locking wire intact.
Safety harness	Adjust. (If observer's seat vacant, check harness coupled and locked).
Seats	Adjust for length. (When the aircraft is fulfilling the ambulance role, the pilot's seat must not be set in the extreme aft position as it will foul the fitting on the forward, upper, starboard extremity of the loading frame during loading and unloading operations.) The observer's seat must not be facing aft if dual cyclic-pitch is fitted.
Flying controls	Full and correct movement
Bias controls (62) & (34)	Full and correct movement
Collective-pitch (38)	Minimum. Lever below catch
Oil cooler shutters (9)	SHUT (for cold start)
Rotor brake	As required
Wheel brakes (55)	As required

50. **Starting the engine**

(a) *Checks*

Fuel-and-oil cock (37)	ON
Main tank normal booster-pump (47)	Circuit-breaker in Magnetic indicator *black* If fuel pressure is less than 10 lb./sq. in., switch on the emergency booster-pump.
Slow running cut-out (36)	Down
Throttle (40)	As required
Battery isolating switch (58)	ON
Generator switch (2)	ON
Booster-coil isolation switch (48)	ON (cold engine) OFF (hot engine)
Ignition switches (51)	ON

(b) *Priming*

The high pressure priming system is for use in Arctic conditions, and will not normally be necessary. The COLD START priming system is also not necessary when the engine is hot.

(c) *Starting*

Press the engine STARTER and COLD START switches together. It may be necessary to keep the cold start switch depressed for a few seconds after the starter switch has been released. It is difficult to select sufficient throttle to start the engine without exceeding the engagement r.p.m., and to avoid a snatch engagement care must be taken to throttle back to idling r.p.m. when the engine has fired.

(d) *Over-priming*

If the engine is difficult to start, and over-priming is suspected, switch off the ignition, the booster-coil, and the booster-pump, pull up the slow-running cut-out, and open the throttle. *Do not turn the fuel cock off*, as this controls the oil as well. Press the engine starter switch to blow out the engine, then repeat the starting procedure with more sparing use of the cold start switch.

51. **Checks after starting**

Oil pressure (25)	If the oil pressure does not rise within 30 seconds of starting, the engine should be shut down.
Fuel pressure (14)	23-27 lb./sq. in.
Booster-coil isolation switch	OFF
External supply	Disconnected

52. **Rotor engagement and warming up**

NOTE.—A check should be made that all ground crew are clear of the rotor before engagement is made.

Check rotor brake off.

(a) Rotor engagement is automatic, the clutch commencing to engage at approx. 950-1,000 r.p.m. and becoming fully engaged at 1,200 r.p.m. While engaging the rotor, hold the control column in the fore-and-aft neutral position and inclined to port. This prevents excessive flapping of the rotor blades at low rotor speeds before centrifugal force has developed sufficiently to hold them at their coning angle. This is particularly important in high winds or gusty conditions. Rotor engagement should not be attempted in windspeeds above 40 knots.

(b) *Engagement*

Open the throttle continuously and smoothly to give 1,200-1,500 r.p.m. (i.e., at least 200 r.p.m. in excess of the engagement speed) and check for smooth operation of the clutch. Check that the needles on the combined r.p.m. indicator are superimposed.

(c) *Warm up*

Warm up at 150-200 rotor r.p.m. (Avoid running at 100-140 rotor r.p.m.) Keep the oil cooler shutters closed when warming up. Then make the following checks:—

Generator failure warning light (3)	Out
Rotor	Correct tilting in relation to cyclic-pitch control movement.
Suction gauge (15)	3.5 in. Hg. (after running at 200 rotor r.p.m. for 2 minutes).
Pressure head heater (at 48)	As required.
Instruments	Check and set
Cabin heating (33)	As required.

53. **Testing the engine**

After warming up to 20°C. oil and 100°C. cylinder head temperature:—

(a) Open the throttle to give 240 rotor r.p.m.

(b) Test each magneto; a drop of 5 rotor r.p.m. or more is excessive.

(c) Make the following checks:—

Free-wheel	Open the throttle to give not more than 287 r.p.m. Close the throttle quickly to check free-wheel with r.p.m. needles and synchroscope.
Oil pressure	70-90 lb./sq. in.
Oil temperature	20-85°C.
Fuel pressure	23-27 lb./sq. in.
Transmission oil temperature	Max. of 95°C. (both main and tail rotors)

54. **Taxying**

To taxy, release the brakes and open the throttle to give 250/270 rotor r.p.m. Ease the cyclic-pitch control forward, increasing the collective-pitch from minimum until forward motion is obtained. Regulate taxying speed with cyclic-pitch control and brake, and maintain directional control with the rudder.

NOTE.—(a) Never taxy at speeds greater than 25 knots over smooth ground and 15 knots over rough ground. At speeds greater than these, ground resonance may develop; if it does, the procedure given in para. 68 should be followed.

(b) Use the minimum pitch required for forward motion. If the blades bump on the droop stops, increase the pitch just sufficient to lift the blades above them.

(c) Considerable care must be taken in high or gusty winds. A short flight may often be better than taxying.

55. **Checks before take-off**

Bias (34) and (62)	Lateral Longitudinal	At positions marked with arrows
Throttle (39)	Friction adjusted	
Mixture (36)	Slow running cut-out down	
Pitch (38)	Catch off. Friction adjusted	
Fuel (37) (5) and (47)	Cock ON Check contents Booster-pump on	
Oil cooler shutters (9)	Open	
Brakes (55)	Off	

56. **Take-off**

Vertical take-off

(a) Head the aircraft into wind.

(b) Open the throttle smoothly to give 265 rotor r.p.m. and raise the collective-pitch lever to the power required for take-off. As the pitch lever is raised it may be necessary to close the throttle slightly to avoid exceeding maximum rotor r.p.m. An alternative method to this is to increase r.p.m. and collective-pitch together by suitable manipulation of the controls, but care should be taken to achieve 265 rotor r.p.m. before the aircraft leaves the ground. Right rudder is necessary in order to keep straight with a central C.G. The aircraft tends to roll to port and pitch forward as the collective-pitch lever is raised. Starboard and aft cyclic-pitch control is needed to counteract this, but the control should immediately be returned to neutral as the wheels leave the ground.

(c) Hover at 10-15 ft. and check control functioning. Avoid hovering with the wheels just touching the ground as ground resonance may result. (See para 68.)

(d) Transfer to forward flight when clear of obstacles. It will be necessary to close the throttle slightly as speed is gained.

57. **Climbing**

The speed for maximum rate of climb is 45 knots. Use 39 in. Hg. and 265 rotor r.p.m. This setting gives a better climb than 270 rotor r.p.m.

58. **General flying**

(a) *Controls*

All controls are sensitive, especially in the fore-and-aft plane; this is more noticeable in the ground cushion. The collective-pitch control has an irreversible mechanism, but any out-of-balance forces in the blades become apparent at the cyclic-pitch control.

(b) *Trim changes*

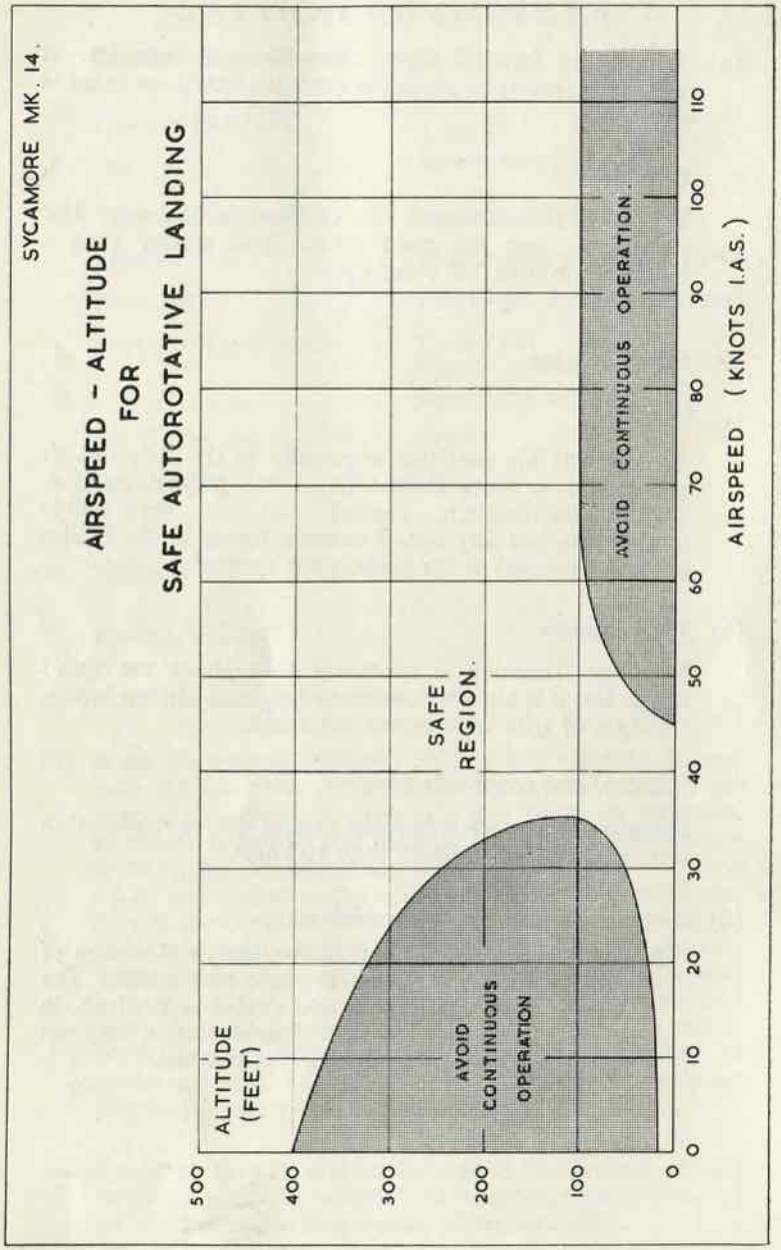
Frequent trimming is necessary throughout the speed range, but it is always possible to hold out-of-trim forces. Changes of trim with power are small.

(c) *Sideways and rearwards flight*

Sideways and rearwards flight should not be made at an estimated *airspeed* greater than 10 knots.

(d) *Altitude-airspeed recommendations*

(i) The accompanying chart shows the combination of altitudes-airspeeds which are safe and unsafe. The shaded areas indicate altitude-airspeeds at which, in the event of power failure, full autorotation may not be achieved before the ground is reached.



(ii) Hovering should be avoided in *still air* between altitudes of 20 and 400 ft. unless operationally essential. No attempt should be made to hover across or down wind in a wind strength greater than 10 knots, due to the risk of running out of control.

59. **Handling during winching**

NOTE.—The hoist cable should be dipped into the water or made to contact the ground to release static electricity before commencing rescue operations.

(a) All winching should be done into wind.

(b) The height at which to winch will depend on the wind strength, air temperature, and humidity. (See Table in para. 43(b)), but it should not be made below approx. 30 ft. as should the rescuee be in a dinghy down-wash will, wind and swell being equal, drive the dinghy forward and to starboard.

(c) The run up to the rescue point should be made as quickly as practicable, the aim being to avoid a very slow inching run up, as this involves use of high power over a relatively long period, is more tiring and causes the down-wash to arrive at the dinghy at the same time as the aircraft. In conditions of no wind it may be necessary for the rescuee, if uninjured, to abandon the dinghy.

(d) When commencing the lift it is important that the cable slack should be taken up gently and the hoist initiated vertically to avoid swinging. Normally a smoother lift and better control results by raising the aircraft initially rather than by reeling-in on the winch. Move slowly forward when the load is clear of obstructions. In the case of live loads a slow rate of descent should be commenced at the same time, whilst winching in, in order to keep the rescuee within 10 ft. of the water until he is inside the aircraft. This will minimise the danger to the rescuee in the event of the cable parting.

(e) If a swing develops it should be corrected immediately to avoid running out of control or the load fouling the step.

60. **Autorotation**

(a) To assume autorotative flight reduce the collective-pitch to minimum and maintain forward speed with the cyclic-pitch control.

(b) Use the collective-pitch lever to maintain 275 rotor r.p.m.

(c) The speed for minimum rate of descent is 45 knots.

(d) From slow or hovering flight a minimum height of 400 ft. is required to attain full autorotation. See graph in para. 58 (d) (i).

61. **Checks before landing**

Brakes (55)	Off
Fuel (37) (5) and (47)	Cock ON
	Contents
	Booster-pump on

62. **Approach and landing**

(a) *Normal (vertical) landing*

(i) Maintain 270-287 rotor r.p.m. and a speed of 25-45 knots during the approach, depending on the wind strength and gradient.

(ii) Hover at 10 ft., using 270 rotor r.p.m.

(iii) Lower the aircraft on to the ground.

(iv) As the wheels touch reduce collective-pitch and throttle. Allow the aircraft to roll forward to uncrease the tyres.

(b) *Running (autorotative) landing*

NOTE.—Power-off autorotative landings may be safely accomplished except from the airspeed and altitude conditions that are within the shaded areas of the chart in para. 58 (d) (i).

(i) Maintain 270-287 rotor r.p.m. and glide at 45 knots, into wind if possible.

(ii) Start to reduce speed slowly at 300 ft.

(iii) Level out by easing the cyclic-pitch control forward when airspeed and rate of descent have decreased.

(iv) Gradually increase collective-pitch to cushion the aircraft on to the ground.

(v) Run on at 15-30 knots, moving the cyclic-pitch control forward to neutral.

(vi) As the aircraft touches reduce collective-pitch and throttle simultaneously.

(vii) Apply brakes.

(c) *Crosswind landing*

Hold the cyclic-pitch control into wind a sufficient amount to avoid side drift. After touchdown continue to hold the control into wind until the r.p.m. are reduced.

63. **Running down and stopping the engine and rotor**

(a) If the serviceability of the engine is in doubt, such items of the run-up as may be considered necessary should be checked. Check magnetos for a dead cut, at idling r.p.m.

(b) Idle the engine at 2,000 r.p.m. for 2 minutes, or until the cylinder head temperature falls below 160°C., whichever is the shorter.

(c) Stop the engine by pulling up the slow-running cut-out control.

(d) Turn the ignition switches off and close the throttle.

(e) Stop the rotor by applying the rotor brake, not above 50 rotor r.p.m. Never apply collective-pitch as a means of braking the rotor; this would cause the blades to flap with the possibility of hitting the tail cone.

When Mod. 690 is embodied the hydraulic rotor brake may be applied when the motor r.p.m. have fallen below 150.

(f) Turn off the fuel and all switches.

(g) If parking outside, tighten the collective-pitch friction knob so that the rotor brake is held on.

PART IV
EMERGENCY HANDLING

64. **Engine failure**

(a) *Below 20 ft. hovering*

Increase pitch, aiming to have maximum collective-pitch just before the aircraft touches the ground. A heavy landing must be expected.

(b) *Above 20 ft.*

The ability to attain full autorotation depends on the combination of altitude and airspeed at the point where the engine fails. Above 400 ft. full autorotation can be obtained whatever the airspeed; below 400 ft. it may not always be possible. Refer to the chart in para. 58 (d) (i). In all cases decrease the collective-pitch to minimum and establish a glide at 45 knots. Use 270 rotor r.p.m. and make a power-off landing.

65. **Engine fire in flight**

(a) Assume autorotative flight immediately.

(b) Stop the engine as follows:—

1. Close throttle (40)
2. Slow-running cut-out up (36)
3. Booster-pump off (47)
4. Fuel-and-oil cock off (37)
5. Ignition switches off (51)
6. Battery isolating switch (58) and all other switches off etc.

(c) Press the fire-extinguisher button when the engine has stopped.

(d) Carry out a power-off landing. In order to prevent flames damaging the rotor blades speed should be maintained above 50 knots for as long as possible.

66. **Main gearbox failure**

(a) Assume autorotative flight immediately.

(b) Stop the engine as in para. 65 above.

(c) Carry out a power-off landing.

67. **Tail rotor failure**

(a) Tail rotor failure will be indicated by loss of directional control.

(b) Assume autorotative flight immediately.

(c) Stop the engine as in para. 65 above.

(d) Correct the torque effect of the main rotor by applying cyclic-pitch control slightly away from the direction in which the aircraft tends to turn.

(e) Make a normal autorotative landing into wind, on a straight flight path if possible. Forward speed at the time of ground contact is desirable, provided the landing surface is reasonably smooth. *Never apply power during the landing or a violent swing will develop.*

68. **Ground resonance**

(a) Ground resonance is a phenomenon which occurs when transverse oscillations of the helicopter body on the undercarriage are in sympathy with oscillations of the rotor blades in the drag plane. The result may be an uncontrolled lateral pitching which can end in the destruction of the aircraft.

(b) Hovering with the wheels just touching the ground should be avoided, as this state is conducive to the setting up of oscillations on the undercarriage. Should ground resonance occur the aircraft should be lifted clear of the ground immediately at the same time opening the throttle. If this is not possible then the collective-pitch should be reduced, the ignition switches put off and finally the rotor and wheel brakes applied.

69. **Cockpit door jettisoning**

Either door may be jettisoned from inside by pulling up the jettison handle and pushing the door outwards, after releasing the normal door handle. In autorotation the doors may strike the main rotor.

70. **Ditching**

NOTE.—All doors and exits should be jettisoned.

(a) *With power.* If engine power is available, hover just above sea and let the passengers clear the aircraft. Then remove to a safe spot and lower the aircraft into the water, rolling to starboard with cyclic-pitch as it touches. (If flying solo it may be preferable to roll to port.) This will make the rotor blades strike the water and will either stop them or break them off. Clear the aircraft as soon as the rotor blades stop rotating.

(b) *Without power.* Make a normal power-off landing at as low a forward speed as possible. As soon as the tail hits the water, bring the aircraft to a level attitude with forward cyclic-pitch control, and roll to starboard to stop the blades. (If flying solo it may be preferable to roll to port.) Clear the aircraft as soon as the blades stop rotating.

(c) *Wind and swell.* If the wind is strong, make the ditching into wind. If the wind is light and the swell heavy, ditch along the swell.

PART V

OPERATING DATA

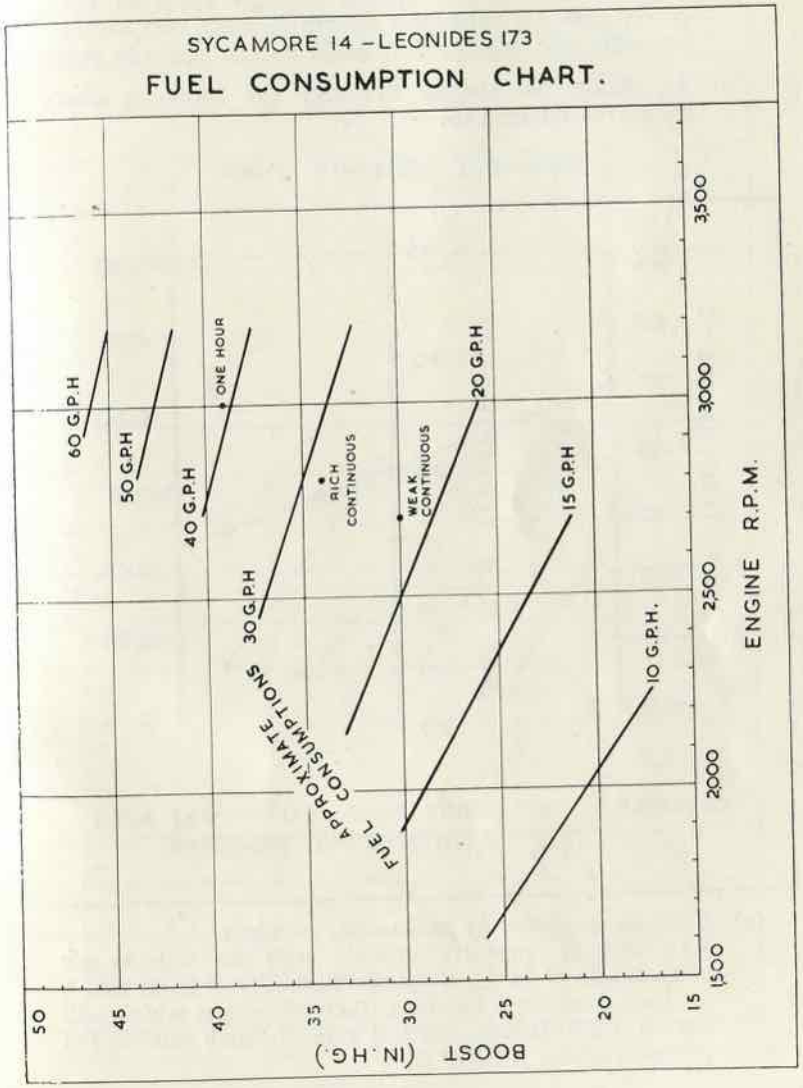
71. Pressure error corrections

The corrections, in knots to be applied to the A.S.I. reading to obtain R.A.S. are:—

I.A.S. (Kts.)		20	40	60	80	100
LEVEL FLIGHT	Add	3	2	1	0	0
CLIMBING	Add	2	6.5	6	3	—
AUTO-ROTATION	Subtract	—	2	5	7	—
	Add	10	—	—	—	—

72. Range flying

A chart of fuel consumption (in gallons per hour) against boost and r.p.m. is given below.

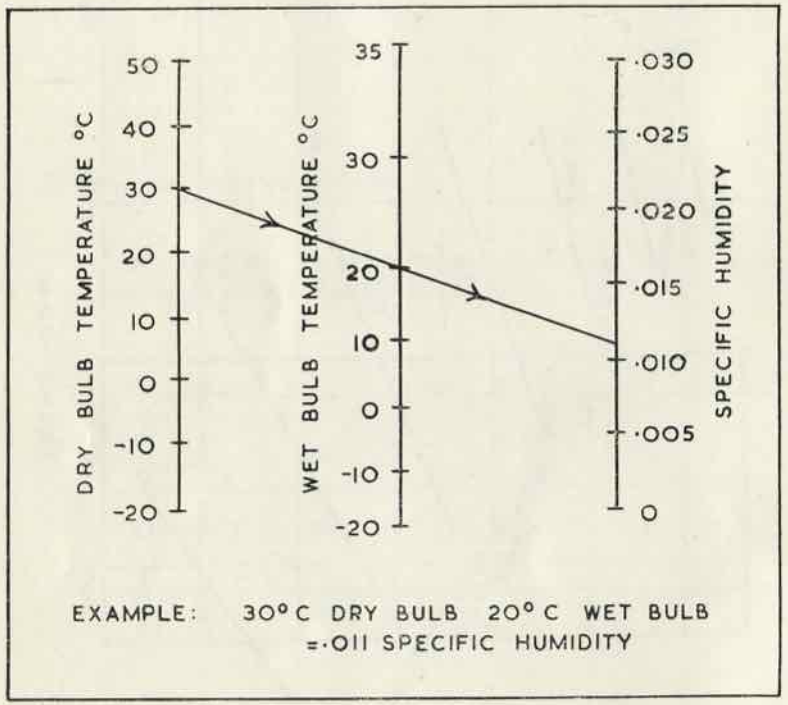


73. **Maximum take-off weight for 180 ft./min. vertical rate of climb without ground effect at max. power**

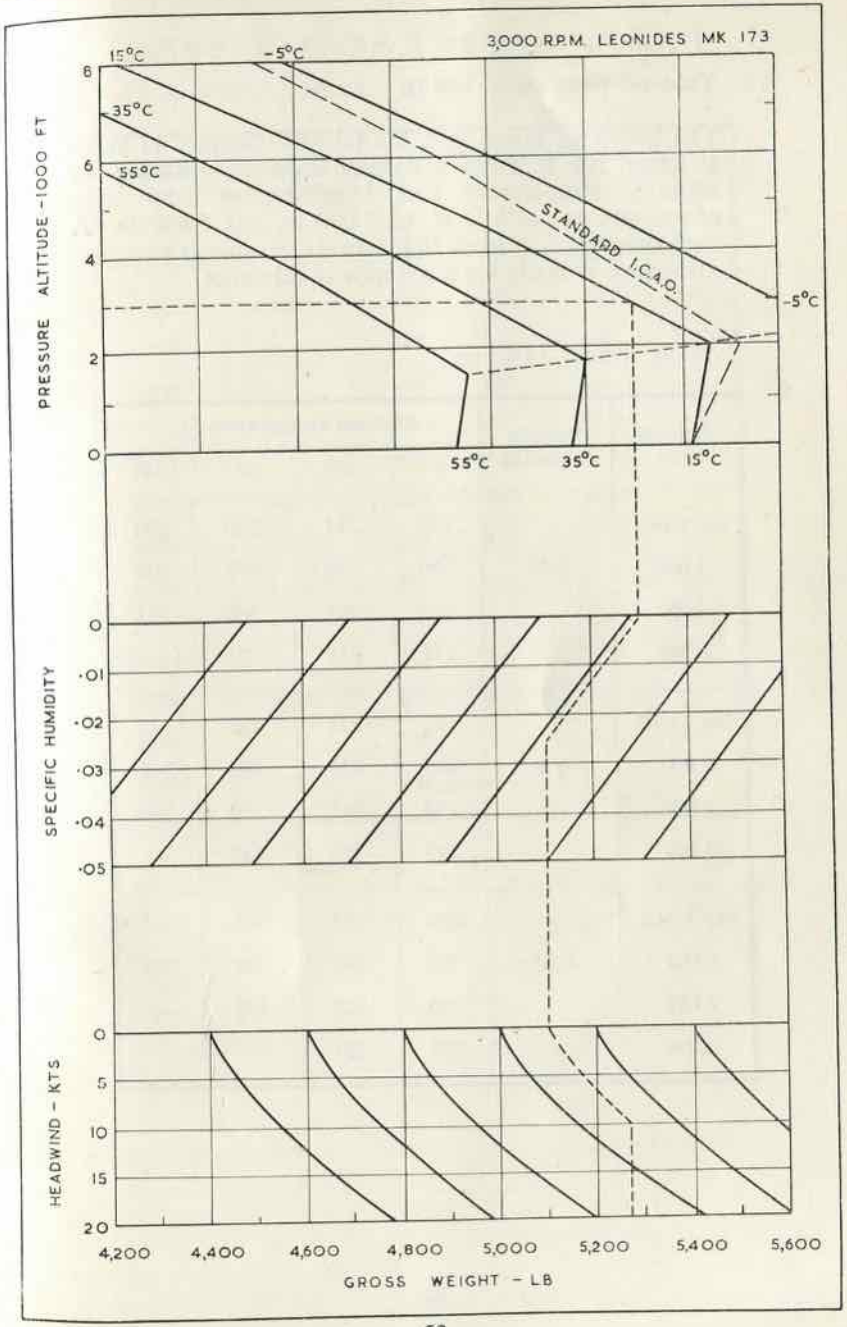
(a) A chart of maximum take-off weight for climbing vertically *outside the ground cushion effect* at max. power (less 4% tolerance) against altitude, temperature, humidity and headwind is given on the opposite page.

(b) To obtain the specific humidity the following chart should be referred to:—

SPECIFIC HUMIDITY CHART



(c) *Example as shown by broken line on chart*
At 3,000 ft. pressure altitude with an outside air temperature of 15°C., a specific humidity of 0.025 and a 10 knot headwind, the max. take-off weight which will permit a 180 ft./min. vertical rate of climb outside the ground cushion is 5,270 lb.



74. **Take-off distance to 100 ft.**

The following tables give the take-off distance in yards to clear 100 ft. from a cushion take-off, allowing for altitude, temperature and humidity, in zero wind conditions, at an A.U.W. of 5,000 lb. and 5,400 lb. A cushioned take-off from 10 ft. wheel clearance is assumed; allowance is made for a 4% power tolerance.

All-up weight 5,000 lb.

Altitude feet	Specific humidity	Ambient temperature °C.			
		5°	15°	25°	35°
Sea Level	0.01	170	215	250	290
2,000		190	230	270	310
4,000		210	255	300	345
6,000		255	315	375	—
Sea Level	0.02	185	235	285	325
2,000		205	255	305	345
4,000		230	285	330	390
6,000		295	350	410	—
Sea Level	0.03	200	255	315	365
2,000		220	280	340	385
4,000		245	320	375	—
6,000		335	395	—	—

All-up weight 5,400 lb.

Altitude feet	Specific humidity	Ambient temperature °C.			
		5°	15°	25°	35°
Sea Level	0.01	190	250	315	380
2,000		215	275	340	405
4,000		245	325	405	—
6,000		315	410	—	—
Sea Level	0.02	205	290	355	—
2,000		235	310	395	—
4,000		275	375	—	—
6,000		355	—	—	—
Sea Level	0.03	215	325	400	—
2,000		250	370	—	—
4,000		305	425	—	—
6,000		400	—	—	—

PART VI
ILLUSTRATIONS

FIGURE 1—COCKPIT FORWARD VIEW

1. Oil temperature gauge: tail rotor.
2. Generator switch.
3. Generator failure warning light.
4. Cylinder head temperature gauge.
5. Fuel contents gauge (main tank only).
6. Dimmer switch. Pre-Mod. 792. Compass lamp.
   Post Mod. 792. 2nd Pilot's panel lamps.
7. Dimmer switch. Pre-Mod. 792. Instrument panel lamps.
   Post Mod. 792. Compass Lamp.
8. Windscreen wiper control.
9. Oil cooler shutters control.
10. E.2A compass.
11. Hoist cable cutter control (pilot's).
12. Dimmer switch. Pre-Mod. 792. Coaming lamps.
    Post Mod. 792. Secondary instruments and centre panel lamps.
13. Dimmer switch. Pre-Mod. 792. Coaming lamps.
    Post Mod. 792. Ist Pilot's panel lamps.
14. Fuel pressure gauge.
15. Suction gauge.
16. Fire warning light and extinguisher pushbutton.
17. Spirit level.
18. Rotor and engine r.p.m. indicator.
19. Boost gauge.
20. Door jettison control.
21. Hoist selector switch.
22. Signal pistol aperture.
23. Press-to-transmit button.
24. Directional gyro.
25. Engine oil pressure and temperature gauge.
26. Cockpit emergency lamps switch.
27. C.G. compensating pumps indicator lights.
28. Hand fire-extinguisher bottle.
29. C.G. compensating front tank contents gauge.
30. Oil temperature gauge: main rotor.
31. Rudder pedals.
32. Cyclic-pitch control.

FIGURE 2—CONTROL PANEL

33. Heating control.
34. Lateral bias control.
35. Longitudinal bias indicator.
36. Slow-running cut-out.
37. Fuel-and-oil cock.
38. Collective-pitch lever.
39. Throttle friction knob.
40. Throttle twist-grip.
41. V.H.F. set channel selector box.
42. Observer's press-to-transmit switch.
43. Cyclic-pitch indicator.
44. Observer's BEACON—V.H.F./I.C. change-over switch.
45. Fuel transfer pressure magnetic indicator.
46. Hoist warning light.
47. Circuit-breakers—
    Reading left to right:
    - Transfer booster-pump.
    - Generator field.
    - C.G. compensator pump No. 2
    - C.G. compensator pump No. 1
    - Main tank emergency fuel booster-pump.
    - Main tank normal fuel booster-pump.
48. Front switch row—
    Reading left to right:
    - Pressure head heater.
    - Hoist master.
    - Oil dilution.
    - Booster-coil isolation.
    - Engine priming.
49. Fuel pressure warning magnetic indicator.
50. Pilot's BEACON—V.H.F./I.C. change-over switch.
51. Ignition switches.
52. Collective-pitch indicator.
53. Intercom. override switch.
54. Rear switch row—
    Reading left to right:
    - Cockpit lamps.
    - Navigation lights.
    - Identification light steady-off-signal.
    - Navigation light steady-off-signal.
    - Landing lamp on-off-2nd filament.
    - Landing lamp control up-off-down.
55. Wheel brakes lever.
56. Cold start switch.
57. Engine starting switch.
58. Battery isolation switch.
59. C.G. compensator flow selector lever.
60. Lateral bias indicator.
61. Collective-pitch lever bottom stop release.
62. Longitudinal bias control.
63. Collective-pitch lever friction control.

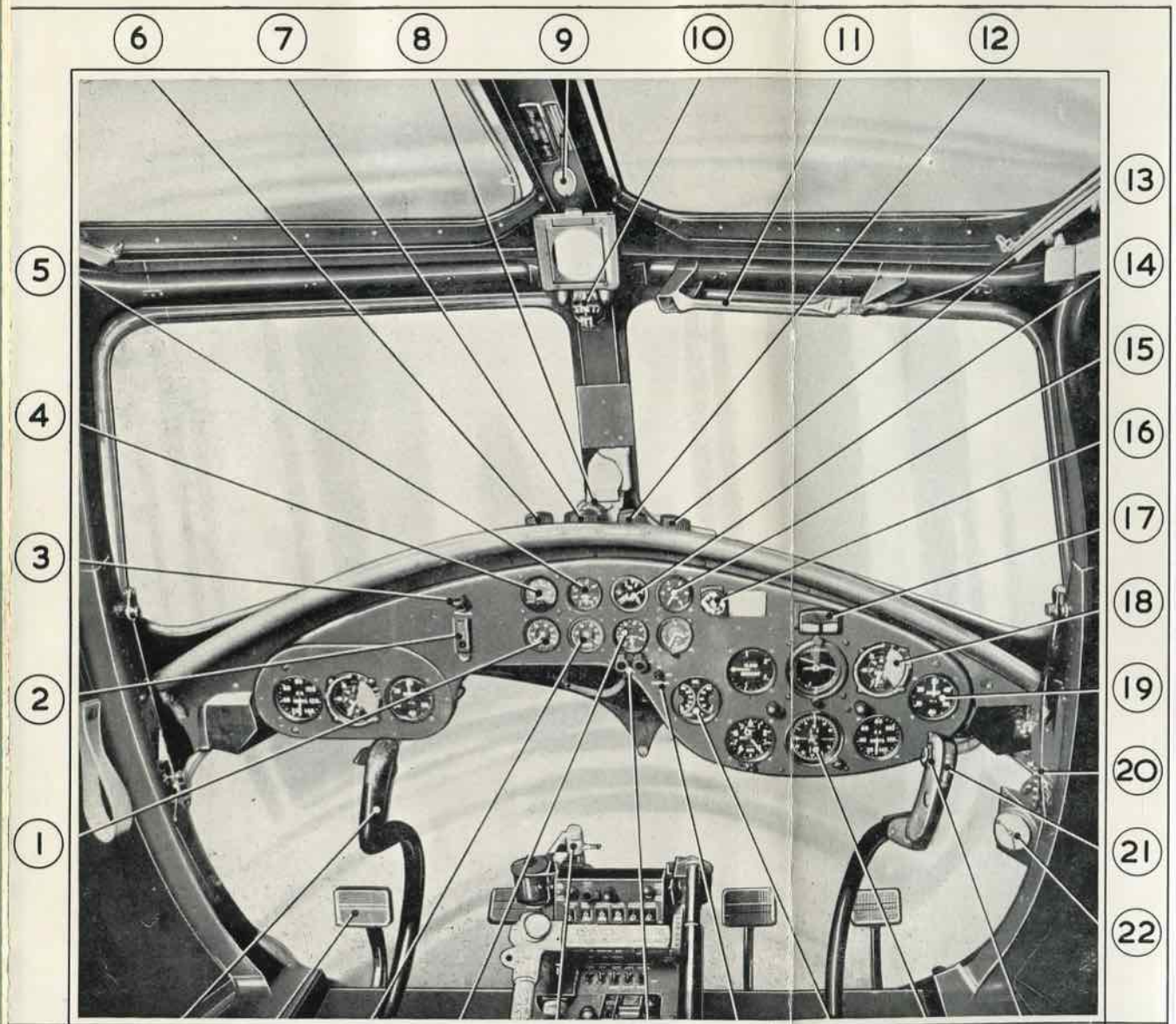


FIG 1

CABIN - FORWARD VIEW

FIG 1

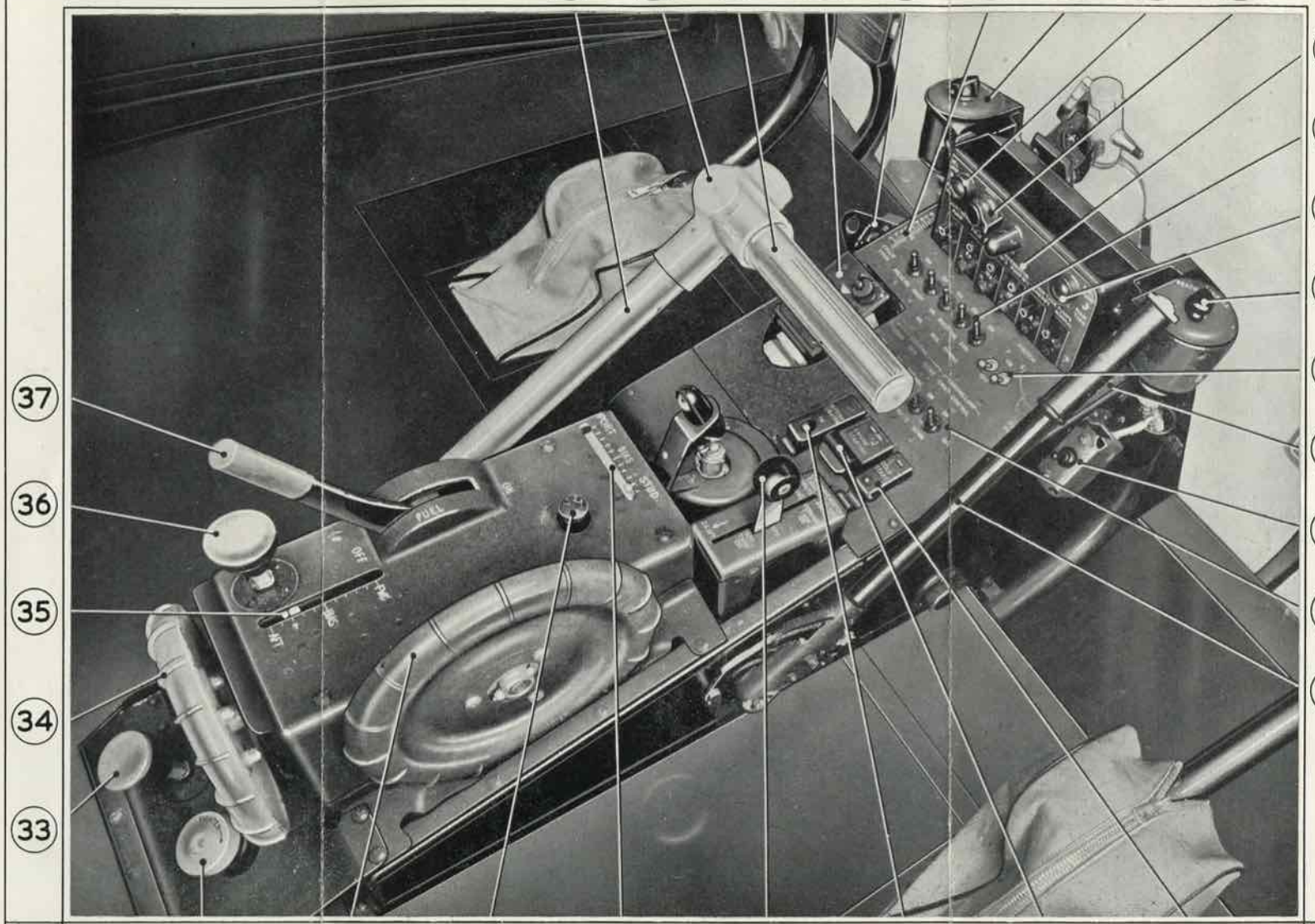


FIG 2

CONTROL PANEL

FIG 2