Restricted

3rd Edition

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PILOT'S NOTES

CHIPMUNK T Mk. 10

Restricted

3rd Edition
June, 1966

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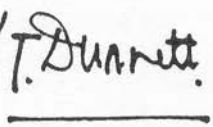
PILOT'S NOTES

CHIPMUNK T. Mk. 10

BY COMMAND OF THE DEFENCE COUNCIL



Prepared by the Procurement Executive,
Ministry of Defence

NOTES TO USERS

1. These Notes are complementary to AP.3456 Flying.

2. The limitations quoted in Part 2 are mandatory and are not to be exceeded except in an emergency. The contents of other parts of the book are mainly advisory but instructions containing the word "must" are also mandatory.

3. The Notes are divided by marker cards into six Parts. A Folio Sheet reference number is at the top left-hand corner of each sheet, each Part starting at FS1. The following conventions also apply:

(a) Words in large capitals in the text indicate the actual markings on the controls concerned.

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

4. The Flight Reference Cards (AP.101B-5510-14), for use in the air, are issued separately from these Notes and are subject to separate amendment procedure.

5. This Publication is now UNCLASSIFIED. New or revised sheets will not carry a security marking and AL5 calls for security markings to be deleted from the cover and pages already issued. Holders should take this action as soon as is reasonably possible and, in any event, before the Publication, or any part of it, is disposed of as waste.

6. Each amendment list instruction sheet includes a list of Special Flying Instructions and modifications covered by the amendment list.

7. Modification numbers are only referred to in these Notes when it is necessary to differentiate between pre and post mod. states. For ease of reference, a list of modification numbers mentioned in the text is included before the Introduction.

IMPORTANT

Comments and suggestions regarding Pilot's Notes and Flight Reference Cards should be forwarded to the Officer Commanding, Royal Air Force Handling Squadron, Boscombe Down, Wilts.

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MODIFICATION NUMBERS MENTIONED IN THE TEXT

Mod. No.	*Effect of Modification*	*Where mentioned* Pt.	Para.
M121, H167, H197	Introduces glider towing ...	I	32
H246	Slow-running cut-out ...	I	8
H263	Introduces UHF in lieu of VHF	I	27
H265	Introduces fatigue meter ...	I	19
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INTRODUCTION

1. The Chipmunk is designed as a basic trainer aircraft. It has a fixed undercarriage, fully castoring tailwheel, brakes and full dual control. The tandem cockpits are enclosed by a single hood. The fuselage, tail fin, tailplane and leading edges of the wings are metal covered; the rest of the wings and the control surfaces are fabric covered.

2. The aircraft is powered by a Gipsy Major Mk. 8 engine, driving a two-bladed, fixed-pitch, metal propeller. The engine has a self-indexing cartridge starter.

3. The principal dimensions are as follows:—

Span	34ft. 4ins.
Length	25ft. 5ins.
Height	7ft. 0ins.

PART I

DESCRIPTION AND MANAGEMENT OF SYSTEMS

Part I — DESCRIPTION AND MANAGEMENT OF SYSTEMS

Contents

PART I—DESCRIPTION AND MANAGEMENT OF SYSTEMS

Fuel system

1 Fuel tanks and venting

(*a*) *Tanks and fuel feed*

Fuel is carried in two flexible 9-gallon tanks, one in each wing. From the tanks the fuel flows by gravity, via non-return valves, to the single fuel cock and thence to the two engine-driven fuel pumps.

(*b*) *Venting*

The two tanks have a common vent on the underside of the fuselage. The vent fairing on the upper surface of each wing has a small hole on its starboard side, to prevent siphoning.

2 Controls and indicators

(*a*) *Fuel cock*

The fuel cock is operated by either of two mechanically inter-connected ON/OFF levers, one in each cockpit, to the left of the control column. When Mod. FTC/Chipmunk/6 is embodied, a gate is provided in the front cockpit, to retain the lever in the ON (forward) position; the cock cannot then be closed from the rear cockpit.

(*b*) *Fuel gauges*

A float-operated, direct-reading fuel gauge is on the upper surface of each wing, next to the filler cap. When the aircraft is in a tail-down attitude, i.e. on the ground, the contents are given by the red figures; in level flight, the white figures give the contents. In flight, the gauges can only be read accurately from the front cockpit.

3 Management of the fuel system

(*a*) The fuel cock should be set fully on (forward) before starting and must remain in this position at all times when the engine is running.

(*b*) The position of the fuel vent on the underside of the fuselage should result in both tanks emptying evenly. If, for any reason, uneven emptying occurs and one tank is allowed to empty completely, the other tank may fail to supply fuel to the engine.

(*c*) If the anti-siphoning hole in the vent fairing becomes blocked in any way, siphoning may occur during aerobatics and may then continue for the remainder of the flight. For this reason, aerobatics should not be attempted after flying in icing conditions.

Engine

4 Gipsy Major Mk. 8, general

The aircraft is powered by a four-cylinder, air-cooled Gipsy Major Mk. 8 engine, driving a two-bladed, fixed pitch propeller. The engine develops 145 BHP at sea level in ISA conditions. Two engine-driven fuel pumps are provided and the engine also drives a generator and a vacuum pump.

5 Priming

(*a*) A hand-priming lever, accessible through an opening in the engine port side cowling, is operated to ensure that the pumps, the pipe line to the carburettor and the carburettor float chamber are all filled with fuel.

(*b*) A carburettor flooder control, operated by a pull-wire through another opening in the port side cowling, enables the carburettor to be flooded, to provide the necessary rich mixture for starting.

(*c*) When priming the engine, the fuel cock should be ON and the flooder control pulled out while the hand-priming lever is operated.

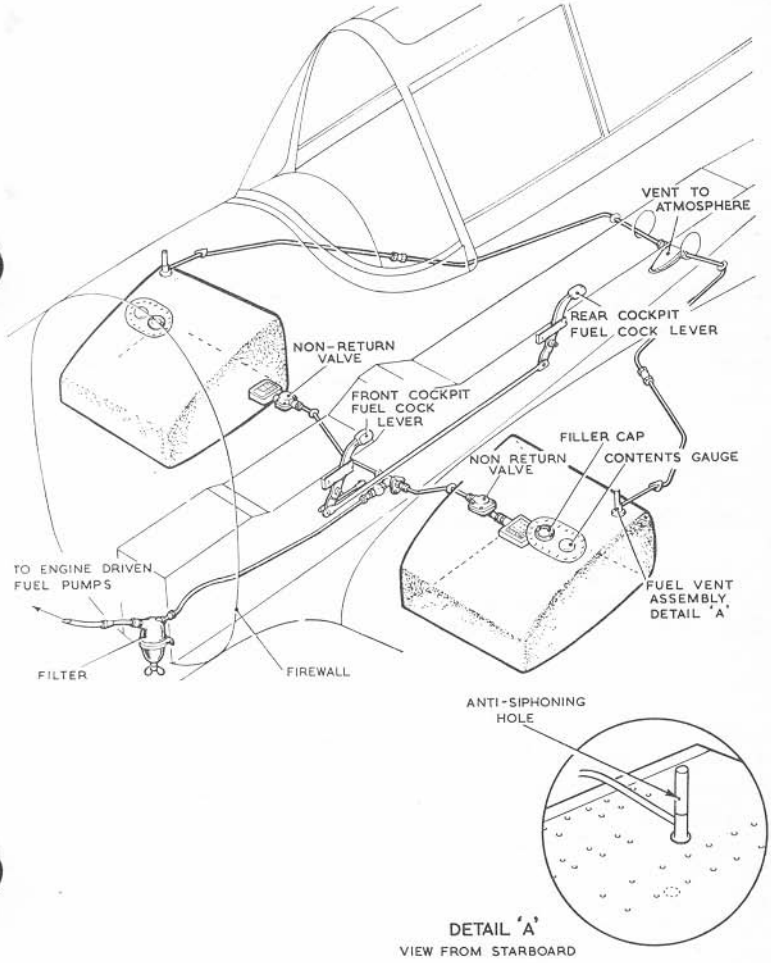

Fig. 1. Fuel system

6 Throttle and mixture controls

(*a*) *Throttles*

Interconnected throttle levers are provided, one in each cockpit. The lever moves in a quadrant divided into two sections, marked ECON CRUISING and POWER JET IN.

(*b*) *Mixture control*

A mixture control lever is in each throttle quadrant and is moved forward to weaken the mixture. A catch on the throttle lever in the rear cockpit is arranged to bring the mixture lever back to the fully rich position whenever the throttle is closed.

(*c*) *Friction control*

A friction nut is provided on each quadrant for both the throttle and the mixture control levers.

7 Carburettor air-intake control

The carburettor air intake is controlled by inter-connected CARB AIR, HOT/COLD levers, one on the starboard side of each cockpit. When the lever is in the COLD (forward) position, air is fed to the carburettor through a scoop in the starboard engine cowling. The lever is moved aft and down to select HOT and is retained in this position by a gate in the front cockpit bracket. With HOT selected, the carburettor is supplied with warm air from inside the engine cowling. On some aircraft this control may be wired to HOT if the air temperature is below 30°C; if COLD air is used below this temperature, carburettor icing may occur, indicated by rough running and loss of power.

8 Starting and stopping controls

(*a*) *Ignition switches*

A pair of ignition switches is provided on the port wall of each cockpit; both pairs must be on while the engine is running and the engine may be shut down from either cockpit. An impulse starter coupling is on the starboard magneto (switch No. 2); when starting by hand-swinging, this switch only should be set on before swinging, the No. 1 switch being put on as soon as the engine fires. ◀Post Command Mod. 023, the rear cockpit ignition switches are guarded. ▶

(*b*) *Cartridge starting*

(i) A self-indexing percussion firing cartridge starter, containing six cartridges, is controlled by a trigger ring in the front cockpit on the starboard side of the instrument panel. The control is protected by a hinged, spring-loaded flap, to prevent inadvertent operation; this flap should be left in the safe position until ready for starting and returned to this position after starting.

(ii) When the trigger ring is pulled to its full extent (approx. 9 ins.) a cartridge is both indexed and fired by the one operation.

(iii) Mod. FTC/Chipmunk/11 provides a stowage in the engine bay for the starter breech.

(*c*) *Slow-running cut-out*

Mod. H246 introduces a slow-running cut-out controlled by a ring and cable below the right-hand side of the instrument panel in the front cockpit. A label on the panel says PULL CUT-OUT TO STOP ENGINE and a further label, on the bulkhead below the panel, says SLOW-RUNNING CUT-OUT PULL. To stop the engine, close the throttle and pull the cut-out; switch off the ignition when the engine stops.

9 Oil system

A 2½-gallon oil tank (which includes a ½-gallon air space) is forward of the engine bulkhead. A dipstick is embodied in the filler cap, which is under the starboard cowling. A scoop in the port cowling passes air through a cooler in the tank.

10 Engine instruments

An RPM indicator is provided on the left-hand side of the instrument panel in each cockpit. An electrically-operated oil temperature gauge and a capillary-type oil pressure gauge are on the right-hand side of each instrument panel.

11 Electrical system

(*a*) *Generator*

A 500-watt, engine-driven generator charges the batteries and supplies DC for the following services: — Lighting, radio, pressure-head heater, oil temperature gauges.

(*b*) *Batteries*

(i) Two 12-volt, 15 AH batteries, connected in series, are housed in the rear fuselage and supply the aircraft services (except the pressure-head heater) when the generator is not charging.

(ii) A 2·4-volt, 1·2 AH alkaline battery, on the port wall of the front cockpit, supplies the emergency lighting.

(iii) A socket on the port side of the fuselage allows an external battery to be plugged in for ground-test purposes.

(*c*) *Controls and indicators*

(i) *Ground/Flight switch*

A GROUND/FLIGHT battery isolating switch is on the port side of the front cockpit, below the instrument panel. When set to GROUND, this switch isolates the batteries from the electrical system. When set to FLIGHT, it allows the generator to charge the battery and, when the generator is not charging, the battery to supply the aircraft services.

(ii) *Generator warning light*

A generator warning light, at the top left-hand corner of the front cockpit instrument panel, comes on when the generator is not charging, provided that the Ground/Flight switch is at FLIGHT.

(iii) *Generator test facilities*

On some aircraft, voltmeter and ammeter sockets are provided on the port wall of the front cockpit, adjacent to the Ground/Flight switch; a NORMAL/GEN. TEST switch is then provided on the combined switch/fuse box to the rear of the front cockpit port wall.

12 Management of the electrical system

(*a*) The Ground/Flight switch should be at GROUND whenever the aircraft is parked and when an external battery is plugged in. It should be set to FLIGHT before starting the engine and left in this position throughout the flight; if this is not done, the aircraft services will fade whenever the engine is throttled back.

(*b*) If the generator fails, the batteries will supply the aircraft services. Transmissions should be kept to a minimum and, at night, the emergency lighting should be used instead of the normal cockpit lighting.

13 Vacuum system

An engine-driven vacuum pump provides suction for the gyro-driven instruments, i.e., the artificial horizons, the directional gyros and the turn and slip indicators.

Aircraft controls and flight instruments

14 Flying controls

(*a*) The control column can be removed from the rear cockpit by removing two safety pins and then withdrawing the two retaining pins at the base of the column.
(*b*) The rudder pedals can only be adjusted for leg reach on the ground. They may be moved to any one of three positions by raising the spring clip and pin and moving the rudder bar forward or aft as required.

15 Flying controls locking gear

The flying controls locking gear consists of two rods which are fitted over the controls in the front cockpit. The larger end of the hooked rod is fixed to the port rudder bar, with the smaller hook over the red bobbin on the port side of the control column box. The second, T-shaped rod, is clipped onto the control column, with the transverse tube forward of the column, and secured with a wing nut; the ends of the transverse tube then engage spring clips on the fuselage walls.

16 Trimming

(*a*) Trim tabs are incorporated in the rudder, the starboard aileron and the starboard elevator. The rudder and aileron tabs are only adjustable on the ground; the elevator tab can be controlled in flight.

(*b*) The elevator trim tab is controlled by a handwheel on the port side of each cockpit. The wheel is labelled UP/NOSE-DOWN and is so marked that all nose-up trim positions are black and all nose-down trim positions are white, the setting being read against the top of the wheel casing.

17 Flaps control

(*a*) Flap operation is controlled by a 3-position lever on the starboard side of each cockpit. UP (fully forward), 15° (mid position) or 30° (fully aft) may be selected. To move the lever forward a guarded, spring-loaded trigger at the top of the lever must first be operated, to release a pawl in the front cockpit quadrant; the use of the trigger is not necessary when moving the lever aft.

(*b*) No flaps position indicator is provided, as the flaps are easily seen from both cockpits.

(*c*) The flaps must not be raised on the ground if a tail wind component exists, due to the risk of the control cables leaving the pulleys.

18 Wheel brakes

(*a*) The wheels are fitted with hydraulic brake units; a master cylinder for each wheel is supplied with fluid from a reservoir on the forward face of the firewall.

(*b*) The brakes are controlled by a lever on the port side of each cockpit. The lever is spring-loaded and may be set to any position by pressing down the collar on the lever to engage a pawl on the quadrant; slight backward movement of either lever releases the pawl so that the lever can be moved forwards to the OFF position.

(*c*) With the lever on, equal braking is applied to both wheels when the rudder is central; differential braking is obtained by setting the lever to an intermediate position and operating the rudder pedals.

19 Flight instruments

(*a*) *Pitot-static system and associated instruments*

(i) A combined pitot-static pressure-head under the port wing supplies pressure for the ASI, RCDI and altimeter in each cockpit. The pressure-head is electrically heated; supplies to the heater are controlled by the rearmost switch on the switch/fuse box in the front cockpit. The heater will only operate when the generator is charging. Post-Mod. 011/FTC, the switch is guarded.

(ii) Mod. H.265 introduces a fatigue meter and associated airspeed switch. The fatigue meter is forward of the compass in the front cockpit and the airspeed switch, set to 52 ± 3 knots, is between the cockpits.

(*b*) *Gyro-operated instruments*

The gyros for the artificial horizon, the directional gyro and the turn and slip indicator in each cockpit are operated by suction from the vacuum system at $4\frac{1}{2}$ ins. Hg.

(*c*) *Compass*

A P.11 compass is provided in each cockpit, on the floor forward of the control column.

(*d*) Command Mod. 022 introduces a cover for the artificial horizon in the rear cockpit; the cover hooks over the top of the instrument panel and clips into place with a press stud. When not in use, the cover is stowed in the zipped stowage on the starboard side of the cockpit.

General equipment

20 Hood

(*a*) A single, sliding hood covers both cockpits. There are two external handles, one for each cockpit, on the top port side of the hood; these are connected to corresponding levers inside. Twisting any of the handles allows the hood to be pulled rearwards to either of two intermediate positions (in which it is locked when the lever is released) or to the fully open position. Handgrips are provided internally to facilitate moving the hood. The hood must always be moved by the handles and not by pushing on the hood structure.

(*b*) The hood is not jettisonable. A small spring-loaded panel in the top of the hood can be opened by either of two yellow/black knobs, one in each cockpit, on the starboard side of the hood; opening this panel overcomes the suction of the hood and enables the hood to be opened fully at higher speeds. At speeds below 100 knots, the hood should open normally.

(*c*) To provide an emergency exit, two jettisonable panels are provided in the hood, one for each cockpit, on the port side. Internal and external yellow/black handles are provided for each panel; the external handles are marked EMERGENCY, LIFT TURN AND PULL FOR EMERGENCY RESCUE and the internal handles are marked TURN AND PUSH OUT FOR CRASH LANDING EXIT.

21 Seats and harness

(*a*) The seats, designed for use with seat-type parachutes, are not adjustable.

(*b*) Z-type harness is provided for each seat. The harness straps must not be allowed to hang outside the cockpit when not in use, as they can damage the aircraft skin.

◀(*c*) Mod. 292 introduces a revised safety harness, embodying a negative-G restraint strap and an inertia-proof quick-release box (QRB). The strapping-in procedure is now as follows:

(i) Twist the operating knob on the QRB as far as it will go. *Do not depress the thumb catch on the operating knob*. With the knob held in this position, insert first the lap straps and then the shoulder straps (the negative-G strap is attached to the QRB).
(ii) Tension both shoulder straps until the negative-G strap is tight.
(iii) Tension both lap straps as required.

(*d*) To release the harness, depress the thumb catch on the top of the operating knob and turn it as far as it will go in either direction. ▶

22 Internal lighting

(*a*) *Front cockpit*
The instrument panel is illuminated by two lamps, controlled by a dimmer switch on the switch/fuse box; an override switch in the rear cockpit, on the port wall, enables the instructor to switch off these lamps. The compass lamp and its associated switch are on the compass mounting.

(*b*) *Rear cockpit*
The instrument panel lamps are controlled by a dimmer switch on the cockpit port wall. The compass lamp and switch are on the compass mounting.
(*c*) *Emergency lighting*
Two emergency lamps, one over each instrument panel, are individually controlled, in the front cockpit by a switch on the switch/fuse box, in the rear cockpit by a switch on the port wall, above the override switch. The lamps are supplied from an alkaline battery (see para. 11 (*b*)). The switches are identifiable in the dark by a luminous spot.

23 External lighting

(*a*) *Navigation lights*
The navigation lights are controlled by a NAV. LTS., ON switch on the switch/fuse box.
(*b*) *Downward identification light*
An identification light, on the underside of the starboard wing, is controlled by either a DOWN IDENT, ON switch or a morsing pushbutton on the switch/fuse box.
(*c*) *Taxying lamp*
The taxying lamp on the port undercarriage leg is controlled by a TAXYING LAMP, ON switch on the switch/fuse box.

24 Stowages

(*a*) A double stowage for maps and Pilot's Notes is in front of the seat in each cockpit.
(*b*) A luggage locker is provided aft of the seat in the rear cockpit. The maximum permissible load is 40 lb. When required, the control locking bars are also stowed in this locker; these weigh 1½ lb., thus reducing the luggage load to 38·5 lb. When flying solo, the full load may be placed in the locker but when the rear cockpit is occupied the maximum load must not exceed 18 lb.

25 Cockpit ventilation

A duct, forward of the windscreen, provides ventilating air for both cockpits. A shutter in the duct is controlled by a push-pull control, marked AIR VENT, PUSH, at the top right-hand side of the front cockpit instrument panel.

26 VHF (pre-mod. H.263)

(*a*) The VHF set may be either a 4-channel or a 10-channel fit. The transmitter/receiver is forward of and below the front instrument panel and the aerial is under the starboard wing.

(*b*) Two controllers are provided; that in the front cockpit is on the starboard side of the instrument panel, just below the cartridge starter control, while that in the rear cockpit is on the starboard wall. The rear cockpit control is the master and has, in addition to the channel selector, a FRONT/REAR changeover switch which, when selected to FRONT, transfers channel selection to the front cockpit controller.

(*c*) A press-to-transmit button is provided on the top of each control column. A guarded mute switch is provided on the controller in the rear cockpit; this switch is not spring-loaded to off, so it must be checked off before solo flight.

27 UHF (post-mod. H.263)

(*a*) Mod. H.263 introduces a lightweight, 12-channel UHF set (PTR170), in lieu of VHF. The transmitter/receiver is forward of and below the front instrument panel; the upper aerial is on top of the rear fuselage, to port of the centre-line and the lower aerial is under the rear fuselage, to starboard of the centre-line.

(*b*) The master controller is on the starboard wall of the rear cockpit and a similar controller is in the front cockpit, above the coaming. Each controller carries the following controls:

A CHANNEL switch, giving a selection of 12 channels.

A VOLUME control

An OFF/TR/ADF/TONE function switch. Of these switch positions, the OFF position controls the DC supply, TR selects the transmission and reception, ADF (inoperative) is for a homing facility and TONE transmits a continuous tone signal for D/F.

(*c*) To starboard of the front controller is a panel carrying the following switches: —

AERIAL C/O, UPPER/LOWER changeover switch

A spring-loaded TONE switch, for use when D/F homing is required with normal transmission/reception.

A similar panel on the port wall of the rear cockpit carries the following: —

REAR/FRONT cockpit changeover switch

Spring-loaded TONE switch

AERIAL C/O, UPPER/LOWER changeover switch.

(*d*) A frequency card holder is on the port side of the coaming in each cockpit. When not in use, the holders are held flush with the coaming by spring pressure; when raised, they are held upright by an over-centre spring device.

(*e*) A power supply panel on the port side of the front cockpit carries a fuse block and a dimmer switch.

(*f*) Transmission is by the press-to-transmit buttons described in para.26(*c*). A MUTE, ON/OFF switch is on the starboard wall of the rear cockpit.

(*g*) The integral lighting of both controllers is operated by a dimmer switch on the port wall of the front cockpit.

(*h*) From CG considerations, the maximum weight in the luggage locker is reduced.

28 Intercomm.

Intercomm. is through the amplification stage of whichever R/T set is installed.

Emergency equipment

29 Fire extinguisher

A BCF hand fire extinguisher is on the floor on the starboard side of the front cockpit. The extinguishant is

non-toxic. The bottle is trigger-operated and can be stopped and re-started; the total discharge time is 38.2 seconds. No engine fire extinguisher is provided.

30 First-aid kit

The first-aid kit is in a stowage in the port mainplane, near the root end. It is retained in position by a rip panel, which has a tag for quick opening. A perspex window may be fitted in the rip panel to enable the kit to be inspected.

31 Emergency exits

(*a*) To abandon the aircraft in flight, the hood should be opened fully, if necessary using the assister device described in para.20(*b*).

(*b*) In a crash landing, if the hood is jammed, the break-out panels described in para.20(*c*) should be used.

Glider towing

32 Glider towing, general

When Mods. M.121, H.167 and H.197 are embodied, the aircraft is allowed to tow gliders, subject to the following restrictions:—

(*a*) The front seat only may be occupied (weight *and* CG considerations)

(*b*) The maximum all-up weight of the glider must not exceed 1,050lb.

(*c*) The glider must have either a CA or an ARB clearance for aero-towing.

33 Towing mechanism

The towing hook is in the fuselage, just aft of the tailwheel and the pilot's release knob is on the left of the

instrument panel, just below the ignition switches. A ◀$\frac{3}{4}$ inch, 9 to 10 cwt. nylon rope, up to 210 feet long,▶ should be used for towing.

34 Rear view mirror

Command Mod. 010/FTC introduces a rear-view mirror for glider-towing aircraft. The mirror is fitted externally to the top of the windscreen arch.

PART II

LIMITATIONS

Part II — LIMITATIONS

Contents

1 General

The Chipmunk T. Mk. 10 is cleared for use as a training aircraft, subject to the limitations given in the following paragraphs.

Airframe limitations

2 Speed limitations

(a) Maximum permissible speed ... 173 knots
Maximum speed for flap operation:
between up and half (15°) ... 93 knots
between half and full (30°) ... 71 knots

Speeds for flap operation also apply to flight with the flaps lowered.

WARNING: Care must be taken in manoeuvres at speeds above 100 knots, as it is possible to exceed the limitation of +5G.

(*b*) In the glider towing role, the normal minimum speed with a glider on tow is 50 knots and the maximum speed is governed by the maximum towing speed of the glider.

3 Spinning and aerobatics

(*a*) *Spinning*

Practice spins of up to eight turns are permitted.

(*b*) *Aerobatics*

Aerobatics are permitted but inverted flying is prohibited.

4 Weight and CG limitations

(*a*) *Weight*

Maximum AUW for all permitted forms of flying (except glider towing) ... ... 2,100 lb.
Maximum AUW for glider towing ... ... 1,900 lb.
Maximum load in luggage locker ... ... 40 lb.
◀ (reduced to 18 lb. when rear seat is occupied). ▶

(*b*) *CG*

The CG datum is on the port side of the fuselage and the limits are as follows: —

Forward ... ... 6·48ins. forward of datum
Aft ... ... 0·257ins. aft of datum

The CG moves aft as fuel is consumed.

5 Aircraft approach limitations (AAL)

The aircraft approach limitations are as follows: —

Precision radar ... ... Obstacle clearance height
Surveillance radar ... 300 feet above runway

6 Miscellaneous

(*a*) When the aircraft is flown solo, the pilot must occupy the front seat.

(*b*) The hood may be opened in flight at any speed within the limitations.

(*c*) When towing a glider, the aircraft must be flown solo and turns should not exceed Rate 2. The AUW of the glider should not exceed 1,050 lb.

(*d*) Unless aircraft have had the fatigue repair scheme embodied, flying is restricted as follows: —

(i) If fatigue life exceeds 12,000 hours the aircraft may not be flown, except for a single delivery flight for repair, when the aircraft must be flown with the minimum G loading.

(ii) If fatigue life is less than 12,000 hours but more than 10,000 hours, aerobatics, steep turns and pull-outs are prohibited.

(iii) If fatigue life is less than 10,000 hours, flying is unrestricted.

Engine limitations

7 Principal engine limitations, Gipsy Major Mk. 8 (fixed pitch propeller)

Condition	*Time limit*	*Max.* RPM	*Max. oil temp.* °C
Max.take-off	5 mins.	2,550*	100
Max. rich	Unrestricted	2,400	85
Max. weak	Unrestricted	2,300	85
Max. diving ($\frac{1}{3}$ throttle)	20 secs.	2,675	—

*Cannot be obtained on take-off or on climb at recommended speeds.

8 Oil limitations

(*a*) *Pressures*

Normal ... ... 40-45 PSI
Flight emergency minimum ... ... 30 PSI

(*b*) Minimum temperature for opening up 15°C.

PART III

HANDLING

Part III — HANDLING

Contents

PART III—HANDLING

Starting, taxying and take-off

1 Initial checks

On approaching the aircraft check:

General position	Clear of other aircraft Tail not towards open hangar door No fuel or oil leaks, or spillage under aircraft
Ground fire extinguisher available	
Chocks	In position
Starter breech	In engine bay stowage (or cockpit seat if no stowage provided)
Safety harness	Straps inside cockpit

Before starting the external checks, carry out the following preliminary checks:

(*a*) *Hood*

Condition and operation ...	Satisfactory
Runners	Clear
Optical panels	Clean
Spring-loaded panel ...	Secure
External jettison handles ...	Wire-locked in correct position

(*b*) *Front cockpit*

Ignition switches	Off
Brakes	Off
Ground/flight switch ...	GROUND
Starter safety cover ...	Toggle covered
Flaps	Up
Flying controls	Locks removed and stowed
Rudder pedals	Check adjustment
Loose articles	Clear

(*c*) *Rear cockpit*

Ignition switches	Off
UHF	Front cockpit selected

Cockpit lights switches ...	Off
Front cockpit lights override switch	Guarded down
Throttle friction nut ...	Loosened
DI	Caged
Mute switch	Unmuted
VHF	Front cockpit selected. Unmuted
Baggage locker	Contents secure. Closed
Safety harness	Secure if solo
Rudder pedals	Adjusted if dual
Loose articles	Clear

2 External checks

Carry out a systematic check of the aircraft exterior for obvious signs of damage, leaks, loose panels or fairings. At the same time, make the following specific checks:

(*a*) *Port mainplane*

First aid	Pack in position (if window fitted)
Flap	Position
Aileron	Condition of hinges and linkages. Full and free movement
Pressure-head	Cover removed. Condition
Fuel tank cap	Secure
Fuel gauge	Contents
Fuel vent	Hole clear

(*b*) *Port undercarriage*

Undercarriage leg	Extension approx. seven inches
Tyre	No cuts or creep. Inflation normal. Valve free
Chock	In position

(*c*) *Engine*

Intakes and ducts	Unobstructed
Spinner	Secure

Exhaust	Secure
Oil filler cap	Secure
Starter exhaust	In line with cowling vent

(*d*) *Starboard undercarriage*

As for port undercarriage

(*e*) *Starboard mainplane*

Fuel tank cap	Secure
Fuel gauge	Contents
Fuel vent	Hole clear
VHF aerial	Secure
Aileron	Condition of hinges and linkages. Full and free movement
Flap	Position

(*f*) *Starboard fuselage*

Internal jettison levers ...	Correct position, tell tale threads unbroken
Lower UHF aerial	Security

(*g*) *Tail unit*

Elevators	Full and free movement. Condition of hinges, linkages and tab cables
Rudder	Full and free movement, clear of tail fairing. Condition of hinges and linkages
Tail wheel	Strut extension correct. Tyre for cuts, creep, inflation and valve free

(*h*) *Port fuselage*

Upper UHF aerial	Secure

If the aircraft is to be flown solo, switch on the rear ignition switches, and set the hood half closed.

3 Cockpit checks

Enter the cockpit and strap in. Check the flying controls

for full, free and correct movement. Set the brake lever fully on and the ground/flight switch to FLIGHT. Check from left to right around the cockpit:

Pressure-head heater ...	ON
Generator test switch ...	NORMAL
Emergency lamp switch ...	OFF
Taxying lamp switch ...	OFF
Navigation lights switch ...	As required
Cockpit lamps switch ...	As required
Identification light switch	As required
UHF lamp dimmer	As required
Elevator trimming control	Full and correct movement. Set 2 divisions nose-down
Throttle and mixture controls	Open throttle, mixture control fully forward, close throttle, check mixture control moves back with throttle. Adjust friction nut
Glider release knob ...	Check operation if towing
UHF	Off. Channel and aerial selected
Generator warning light ...	On
Flight instruments ...	Condition. Altimeter at zero, DI caged
Engine instruments ...	Condition
VHF	Off. Light as required
Carb. air intake	As required
Flap lever	Operation. Check against flap position. Leave UP
Fire extinguisher	Security
Fuel cock	On (post-Mod. FTC/6 gated)
Magnetic compass ...	Serviceability Lamp switch as required

4 Starting the engine

(*a*) Indicate readiness and initiate the starting drill by calling:

Fuel on
Brakes on
Throttle closed

Switches off (give a clear "thumb down" signal).

(*b*) The ground crewman repeats the above.

(*c*) The ground crewman primes and waits until fuel draining ceases. If, due to the position of the operating cam on the pump, there is insufficient leverage on the hand priming lever, the cam position should be altered by rotating the propeller through 180°.

(*d*) If the engine is cold, the propeller should be turned through about six revolutions by hand in order to prime the cylinders. A hot engine should not require priming.

(*e*) *Starting the engine with the cartridge starter*

(i) The ground crewman inserts the starter breech, secures the starboard engine cowling, stands clear and calls "Breech inserted, cowling secure, clear to start".

(ii) Set the throttle lever about half an inch forward from the fully closed position and call "Contact", giving "thumb up" signal.

(iii) When the ground crewman acknowledges "Contact", switch on both ignition switches and operate the cartridge starter by lowering the safety flap over the cartridge starter control and pulling the control to the full extent of its travel (about nine inches). This indexes and fires a cartridge. The control ring may be released immediately and the safety flap should be returned to the safe position.

5 Failure to start

(*a*) If the starter has been indexed, the cartridge fired but the engine fails to start on the first attempt, check

all controls are set correctly. A fresh cartridge must not be indexed and fired for at least 30 seconds, during which time all personnel must keep clear of the propeller and engine.

(*b*) If the cartridge has been indexed but fails to fire, wait 3 minutes before operating the starter mechanism a second time. If a second cartridge fails to fire, wait a further 3 minutes, have the breech removed and all the cartridges changed before attempting a further start.

(*c*) The most likely cause of failure to start is over-richness. In this event, turn off the ignition switches, allow 3 minutes to elapse, then have the breech unloaded. Open the throttle fully and have the propeller turned backwards several revolutions by hand. Repeat the starting procedure without further priming on the first attempt. If the engine still fails to start after two or three successive attempts, have the cause investigated further.

⋈

6 Starting the engine by hand-swinging the propeller

(*a*) The ground crewman grasps the propeller and calls "Contact", giving the "thumb up" signal.

(*b*) Set the throttle lever about half an inch forward from the fully closed position, switch ON the impulse magneto (No. 2), reply "Contact" and give the "thumb up" signal.

(*c*) The ground crewman swings the propeller cleanly through the compression stroke to start the engine. When the engine starts, switch ON No. 1 magneto.

(*d*) If the engine fails to start, switch the ignition OFF, calling "Switches off" and giving a "thumb down" signal. The propeller is then positioned by the ground crewman for a further starting swing.

(*e*) The drill should then be recommenced as in sub-paras. (*a*) to (*c*). Overpriming should be dealt with as in para. 5 (*c*).

7 Checks during starting

If oil pressure is not indicated almost immediately, shut down the engine and have the cause investigated. In

cold conditions the indicated oil pressure tends to rise rather slowly. Provided that oil pressure is indicated, it is permissible to warm up at 1,100 RPM but a minimum of 30 PSI is necessary before opening the engine further. Check that the generator light is out.

8 Checks after starting

Radio	On
Intercomm.	Test
Ignition switches	Dead cut check
Artificial horizon	Erecting
Pressure-head heater ...	Ground crewman checks, then OFF
DI	Synchronise. Uncage
Radio	Test
Altimeter	Set

9 Testing the engine

(*a*) Ensure that the oil temperature has reached 15°C (min.) and that the oil pressure is 30 PSI (min.).

(*b*) The aircraft should be headed into wind. If necessary, have a ground crewman in attendance to prevent the tail from rising; this precaution must be taken in gusty conditions.

(i) Centralise the rudder, set the brakes fully on and hold the control column fully back. Open the throttle steadily to 1,800 RPM.

(ii) Test each magneto in turn; the single ignition drop should not exceed 75 RPM. If it does, provided that there is no undue vibration, carry out the full power check of sub-para. (*c*) below. If, however, there is marked vibration, shut down the engine and have the cause investigated.

(*c*) The following full-power check should be made when the single ignition drop at 1,800 RPM exceeds 75, after repair, periodic inspections other than primary, or at the pilot's discretion. Except in these circumstances, no useful purpose is served by a full-power check.

(i) Carry out the preliminary checks in sub-paras. (*a*) and (*b*) above.

(ii) Open the throttle steadily to full power. Check that the RPM are approximately 2,000.

(iii) Test each magneto in turn. If the single ignition drop exceeds 120 RPM, or if there is excessive vibration, the aircraft should not be flown.

(iv) The time at full power should not exceed 30 seconds.

(*d*) After completing the checks either at 1,800 RPM or full power, close the throttle slowly and check the minimum idling RPM (approx. 650) then open up to 1,100 RPM.

NOTE: 1,100 RPM should always be set whenever the aircraft is stationary on the ground. If, for any reason, the engine has been run continuously below 1000 RPM for 5 minutes it must be opened up to at least 1600 RPM for 10 seconds to clear the plugs.

10 Use of brakes

(*a*) The following procedure should be used for setting the correct amount of brake:

Close the throttle and wave away the chocks.
When the chocks are clear, release the brakes.
Open the throttle, allow the aircraft to move forward; with the control column held fully back, close the throttle and apply the brakes.

(*b*) Release the brakes and apply full rudder in either direction, then move the brake lever backwards until pressure is felt on the rudder. This is minimum differential brake and is sufficient for light winds but in strong winds it may be necessary to use a little more brake.

(*c*) The number of notches required can be counted by applying finger pressure to the brake lever collar during the operations described. If differential brake is required for landing in strong cross-wind conditions, the correct amount of brake can then be set in the air.

11 Taxying

(*a*) If it is necessary to taxy in cold conditions, before engine run-up, avoid using more than 1,100 RPM until a satisfactory oil temperature and pressure have been achieved (see para. 7).

(*b*) While taxying, check the operation of the direction indicator, artificial horizon and turn-and-slip indicator.

12 Checks before take-off

Trim	Two divisions nose-down
Throttle friction nut ...	Adjust
Mixture	Fully rich. Carburettor air-intake as required
Fuel	Fully ON (gated post-Mod. FTC/€) Contents
Flaps	UP (half flap for shortest run)
Gyros	Artificial horizon erected, DI synchronised
Gauges	Oil temperature and pressure correct for take-off
Pressure-head heater ...	On
Harness	Secure and tight
Hood	Closed and locked

13 Take-off

(*a*) Align the aircraft with the take-off path, release the brakes and then open the throttle slowly to the fully forward position. Keep straight by use of the rudder. There is a tendency to swing to starboard if the throttle is opened too quickly. Raise the tailwheel and fly the aircraft off at approximately 45 knots.

(*b*) *Short take-off*

Select half flap. Head the aircraft into wind, hold the control column fully back and increase power to

the maximum that can be held against the brakes. Release the brakes, establish full power and check any swing. Raise the tail as soon as possible and fly the aircraft off at 35-40 knots. Climb at 65 knots until a safe height is reached, then raise the flaps. If necessary climb at 55 knots initially in order to clear any obstacles.

(*c*) *Crosswind take-off*

Set differential brake appropriate to the wind strength. Hold the control column into wind and open the throttle slowly to full power. Keep straight by use of rudder. Hold the aircraft on the ground until 50 knots is reached, then fly off with a positive movement of the controls. At a safe height set the brake lever off.

(*d*) *Checks after take-off*

Brakes	...	...	Off
Engine instruments		...	Checked
Flaps	...	...	Up

Handling in flight

14 Climbing

Climb at full throttle. The mixture control should normally be left in the fully rich position to assist engine cooling but see para. 15(*a*). The speed for maximum rate of climb is 65 knots, but 70 knots is recommended for easier handling and engine cooling considerations.

15 Engine handling

(*a*) *Mixture control*

Changes in height require corresponding adjustments of the mixture control. As height is increased, move the lever forward sufficiently to eliminate rough running caused by over-richness. Normally, the mixture should not be weakened to such an extent that the RPM are reduced (see para. 17(*b*)).

(*b*) *Carburettor icing*

As the engine is prone to carburettor icing, it is recommended that the air-intake heat control should be wired in the HOT position in temperatures below 30°C. If the control is used in the COLD position, icing may occur,

indicated by rough running or loss of power. If icing does not clear shortly after selecting HOT air, manipulation of the throttle may assist.

16 General handling

(*a*) *Flying controls*

The aircraft is pleasant to fly; the controls are well harmonised and they remain light and responsive throughout the speed range, although they tend to become heavier as the limiting speed is approached.

(*b*) *Changes of attitude*

Flaps down	Slightly nose-down.
Flaps up	Slightly nose-up.
Increase power	Nose-up, yaw to starboard.
Decrease power	Nose-down, yaw to port.

There is no change of trim when the hood is operated. A change of speed produces a slight change in directional trim.

(*c*) *Stability*

The aircraft is easy to trim under all conditions of flight and holds its trimmed speed well.

17 General flying

(*a*) *Cruising*

The normal cruising speed is 90 knots. The maximum continuous (weak) power setting is 2,300 RPM (independent of mixture control setting) but it is recommended that 2,100 RPM are not exceeded in cruising flight. At or below 2,100 RPM a weaker mixture is obtained and the possibility of rough running at the higher RPM is eliminated.

(*b*) *Flying for range*

The recommended range speed is 90 knots. To obtain the most economical mixture, ease the mixture control forward until the RPM are observed to drop or rough running begins. Then move the control back until the

original RPM and/or smooth running conditions are restored. The control is then in the correct position for all throttle settings at that altitude.

(*c*) *Flying for endurance*

The recommended speed for maximum endurance is 60 to 65 knots. In turbulent conditions increase speed to 70 knots.

(*d*) *Flying at reduced airspeed*

Select half flap and reduce airspeed to 65 knots. The stalling speed in these conditions is about 35 knots.

18 Gliding

The optimum glidepath is achieved at 70 knots clean and at 65 knots with half flap.

19 Pre-stalling, spinning and aerobatics checks

Height	Sufficient for recovery (see Command Air Staff Instructions).
Airframe	Flaps as required for stalling. UP for aerobatics and spinning. Brakes fully off. DI caged.
Security	Harness secure and tight. Hood closed and locked. No loose articles.
Engine	Mixture fully rich. Carburettor air as required. Oil temperature and pressure within limits. Fuel sufficient.
Location	Clear of controlled airspace and populated areas.
Look out	Clear of other aircraft and of cloud, vertically and horizontally.

20 Stalling

(*a*) The approximate stalling speeds, in knots, are: —

Power off, flaps up	45
Power off, flaps half or full	38
Power on, under typical approach conditions	35

(*b*) In all configurations, warning of the stall is indicated by slight elevator buffet some three knots before the stall occurs. With power off, at the stall, the nose drops gently and the buffet continues. There is a slight tendency for the nose to pitch. If the control column is held hard back, the elevator buffet increases and a wing may drop. An attempt to raise the wing with aileron at this stage aggravates the wing drop. With power on, pre-stall buffet is increased and any wing drop at the stall is more pronounced. Stalls with full flap selected are more marked and wing drop may occur.

(*c*) To recover with minimum loss of height, apply full power and, simultaneously, move the control column sufficiently far forward to unstall the aircraft. Use rudder to prevent any further yaw. When control is regained, level the wings with aileron and ease the aircraft out of the dive.

(*d*) The stall in a steep turn is indicated by buffet; normally, there is little tendency to flick.

(*e*) Stalling speeds are reduced by about two to three knots if the aircraft is being flown solo. With the hood open, stalling speeds and characteristics are unaffected.

21 Spinning

(*a*) *General*

The aircraft is cleared for practice spins of up to 8 turns. Before practice spinning, complete the checks at para. 19.

(*b*) *Entry into the spin*

(i) Close the throttle and, at 50 knots, apply *full* rudder in the intended direction of spin and move the control column *fully* back.

(ii) The aircraft may be reluctant to enter a spin, especially to the left and at forward CG. A spiral dive may develop instead, particularly if the control column is not kept fully back. The spiral can be recognised by an increase in the control column forces and a fairly rapid rise in airspeed during the first two turns.

(iii) If the control column is not moved fully back until after the spin has been entered, a manoeuvre similar to a spin may be encountered. The speed remains stable at around 70 knots and normal recovery action is immediately effective.

(iv) A more positive spin entry can usually be achieved by applying aileron opposite to the direction of the intended spin, in addition to the normal entry control movements.

(*c*) *Characteristics of the spin*

After a half roll in the direction of spin, the nose drops sharply as rotation continues. Slight pitching is apparent at this stage. The spin stabilises in two to five turns with the nose about 30° below the horizon. The rate of rotation is slightly lower than in the initial stage and the airspeed is low and steady.

(*d*) *Spin recovery action*

(i) Close the throttle, if not already closed.

(ii) Check ailerons neutral.

(iii) Check direction of yaw as indicated by the turn needle.

(iv) Apply and maintain *full* rudder to oppose the direction of yaw.

(v) After a brief pause move the control column firmly and progressively forward until the spin stops.

(vi) Centralise the rudder immediately, but not before, the spin stops.

(vii) Level the wings and ease out of the dive.

(*e*) *Spin recovery characteristics*

(i) A moderate push-force is required to move the control forward and care is necessary to ensure that the ailerons are maintained neutral throughout. If full recovery action is taken before the spin has become stable, recovery is achieved within one to two turns.

(ii) After prolonged spinning (six to eight turns), a heavier push-force may be necessary to effect recovery. In a stable spin, particularly when the rear seat is occupied, the aircraft may continue rotating for up to three turns after taking recovery action. During this period, the rate of rotation increases and the angle steepens before the spin stops.

(*f*) *Delayed recovery*

(i) If the aircraft is slow to recover from the spin, the application of aileron in the direction of the roll will assist normal recovery action.

(ii) If spin recovery action has not been effective by 3,000 feet AGL, abandon the aircraft.

22 Diving

(*a*) Set the mixture control to fully rich before starting the dive.

(*b*) As the speed increases, a progressively greater push-force is necessary to hold the aircraft in the dive. However, the limiting speed can be reached without re-trimming. Maintain directional trim by a progressive application of right rudder.

(*c*) In the dive, keep the throttle at least one-third open. Maximum permissible RPM are 2,675 for up to 20 seconds. At larger throttle settings, as the maximum speed is approached, it is necessary to throttle back to keep the RPM within the limitations.

23 Aerobatics

NOTE: Aerobatics should not be attempted after flying in icing conditions, as there is a risk of fuel siphoning.

(*a*) Complete the checks given in para. 19.

(*b*) Until experience is gained, the following speeds (in knots) are recommended:

Roll	120
Barrel roll	120
Stall turn	120
Loop	130
Half-roll off loop	140

(*c*) For manoeuvres in the looping plane, care should be taken not to exceed the RPM limitations at high speed.

(*d*) The aircraft is not cleared for inverted flight, as overfuelling of the engine may occur, leading to a rich cut and possible failure to restart in flight. During manoeuvres involving transient periods of negative G, such as slow rolls, the throttle should be closed before reaching the inverted attitude and the negative G phase confined to a period not exceeding 5 seconds. The engine should be cleared at normal power for several seconds after such a manoeuvre.

(*e*) Since structural damage is likely to occur during a tail-slide, vertical manoeuvres should be completed and recovery action taken before aerodynamic control is lost.

(*f*) If aerodynamic control is lost and an inadvertent tail-slide is about to develop, close the throttle and brace the control column and rudder pedals in a central position. Grip the control column with both hands and remain braced until the nose has dropped and any oscillations have ceased. As a precaution, return to base and place the aircraft unserviceable pending inspection for tail slide damage.

Approach and Landing

24 Approach procedure

(*a*) *Instrument approach settings*

	Configuration	RPM	*Rate of descent ft./min.*	*Airspeed (kts.)*
Initial descent (fast)	Flaps up	1,500	1,000	90
Slow rate descent	Flaps up	Adjust to give 500 ft./min.		90
Glide path	Half flap	Adjust to give 300 ft./min.		70

When in visual contact with the runway, lower full flap and reduce speed to threshold speed.
Fly the GCA pattern at 90 kts, flaps up.

(*b*) *Aircraft approach limitations*
The aircraft approach limitations are:

Precision radar ... ... Obstacle clearance height
Surveillance radar ... ... 300 feet above runway level

25 Checks before joining the circuit

Fuel	... ...	Content sufficient.
Instruments	... ...	Erect and synchronised.
Radio	... ...	Correct frequency Unmuted Call "Rejoining"
Altimeter	... ...	Set as required Check reading

26 Checks before landing

Mixture	... ...	Rich. Carburettor air as required.
Fuel	... ...	Contents sufficient.
Flaps	... ...	As required.
Harness	... ...	Secure and tight
Hood	... ...	Closed and locked.
Brakes	... ...	As required.

27 Approach

(*a*) Reduce speed to 70 knots on the base leg and select half flap. Maintain 70 knots during the final turn, aiming to line up with the intended landing path at about 400-500 feet. Lower full flap if required. On the final approach, reduce speed progressively to the correct threshold speed.

(*b*) The runway threshold speeds are as follows:

	Flaps down	*Flaps up*
Power assisted	55	60
Glide	60	65

28 Landing

As the landing area is approached, round out and close the throttle. Aim to touch down in the three-point attitude. When the tailwheel is firmly on the ground, hold the control column hard back and, if necessary, apply the brakes carefully.

29 Overshooting

Open the throttle fully. Climb at 60 knots with full flap lowered or 65 knots with half flap. At a safe height raise the flaps, in two stages if full flap has been selected. There is a slight sink but little trim change. Allow the speed to build up to 70 knots. Check brakes off.

30 Flapless landing

For a flapless landing a slightly extended downwind leg may be necessary. The approach is long and flat; little power is required.

31 Crosswind landing

(*a*) The maximum permissible crosswind component is 15 knots, subject to local orders.

(*b*) In strong crosswind conditions, set differential brake when downwind. In gusty conditions, not more than half flap should be used.

(*c*) Use the normal 'crab' technique. Immediately before touchdown align the aircraft with the landing path by a firm, smooth application of rudder.

(*d*) During the landing run, it may be necessary to hold the control column into wind.

32 Short landing

From a normal powered approach with full flap selected, gradually reduce speed to the threshold speed of 45 knots (50 knots until experience is gained).

33 Checks after landing

When clear of the runway, or after turning through 90° away from the landing path on a grass airfield, stop and check:

Brakes	...	Fully on
Pressure-head heater	...	Off
Throttle friction nut	...	Adjust
Flaps	...	Up

34 Shut-down procedure

(*a*) If the serviceability of the engine is in doubt, carry out such items as may be necessary of the run-up given in para. 9.

(*b*) In all cases run the engine at 1,100 RPM for one minute, then test the magnetos for a dead cut and, when a slow-running cut-out is embodied, for a live magneto. Note a positive drop in RPM without the engine stopping.

(*c*) Stop the engine by closing the throttle, switching off the ignition from either cockpit and finally opening the throttle fully when the RPM have dropped to 200-300.

(*d*) When the engine has stopped, close the throttle.

(*e*) *Slow-running cut-out*

When a slow-running cut-out is embodied, stop the engine by closing the throttle and pulling the cut-out. Switch off the ignition when the engine stops.

35 Checks after stopping the engine

Lighting	...	Off
Direction indicator	...	Caged
Radio	...	Off
Fuel cock	...	OFF
Ground/flight switch	...	GROUND

Give a clear "thumb down" signal and call "switches off". After the ground crew has removed the starter breech and placed the chocks in position, release the brakes. Vacate the aircraft, making sure that the harness straps are left inside the aircraft and ignition switches are off.

Glider towing

36 Glider towing

(*a*) *Take-off*

(i) Use half flap for take-off. Take up slack and, on

receiving the signal from the marshaller, open the throttle quickly to full power. Until experience is gained, it is recommended that the stick is held hard back until established on the take-off run. If the glider has a skid and no wheels, the aircraft accelerates quickly initially as the nylon rope stretches and then slows down again until the glider starts to move, after which the speed builds up fairly quickly. Considerable left rudder is required to maintain heading and slight use of brakes may be necessary.

(ii) The glider should not be allowed to rise more than 20 feet above the aircraft; if it is allowed to rise 30 feet during the take-off run, full aft stick is required to get the aircraft off the ground.

(iii) The recommended unstick speed is 45 knots, increasing to 50 knots for the climb-away.

(*b*) *Climb*

When climbing at 50 knots, approximately $\frac{1}{3}$ left rudder is required. At this speed, with the flaps up, the aircraft is in a marked nose-up attitude and the forward view is noticeably restricted. The use of half flap improves the forward view and gives greater stability in turbulent conditions.

(*c*) *Cruising*

(i) The minimum cruising speed is 50 knots; turns on tow should not exceed Rate 2, as the glider speed builds up rapidly at higher rates of turn.

(ii) The maximum cruising speed must be governed by the maximum towing speed of the glider, allowing for differences in pressure-error corrections.

(*d*) If, because of the limiting speed of the glider, the aircraft has to be flown below the recommended speed of 50 knots, this should be done only by an experienced tug pilot, subject to a minimum speed of 45 knots. Half-flap must be used. The nose-up attitude is marked and considerable rudder is needed to prevent yawing. Elevator control is normally adequate but is dependent on the glider pilot maintaining his correct station. Engine cooling is reduced and oil temperatures must be monitored. Pre-stall buffet may occur, particularly in turbulent conditions.

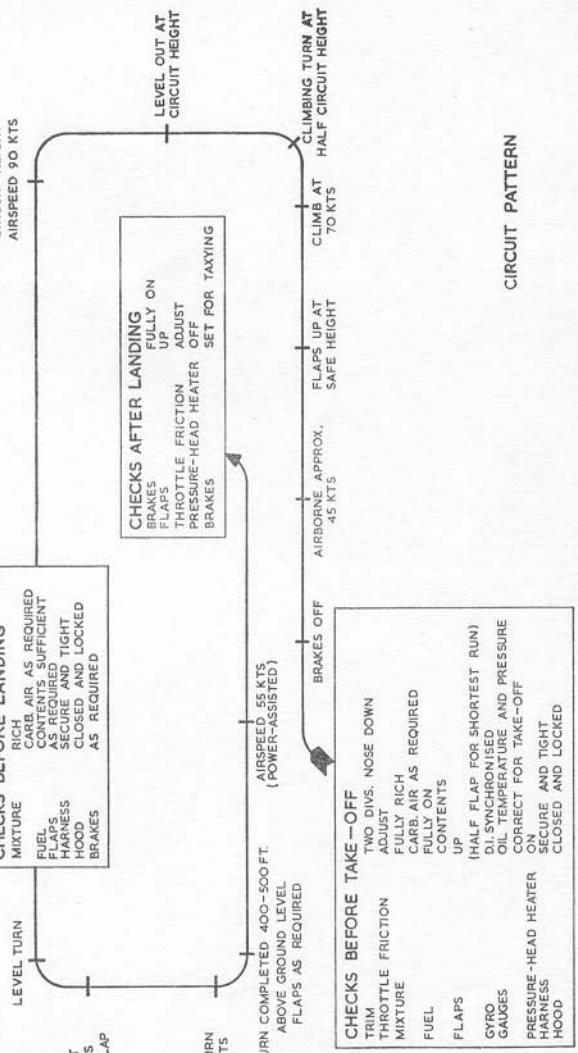

Fig. 1. Circuit procedure

PART IV

EMERGENCY HANDLING

Part IV — EMERGENCY HANDLING
(Completely Revised)

Contents

1 Engine fire on the ground

Actions
Warn crew
Throttle ... ... Closed
Fuel cock ... ... OFF
Ignition switches ... ... OFF
Parking brake ... ... Off, to allow aircraft to be moved from burning fuel or other aircraft
Ground/flight switch ... GROUND
Collect the hand fire extinguisher and vacate the aircraft quickly. Use the extinguisher if possible.

2 Engine fire in the air

NOTE: No engine fire-extinguisher is fitted.

(*a*) *Immediate actions*
Warn crew
Throttle ... ... Closed
Fuel cock ... ... OFF
Raise nose to reduce speed and RPM
Ignition switches ... ... OFF

(*b*) *Subsequent actions*
Make R/T distress call.
If the fire does not go out abandon the aircraft if sufficient height is available (1,500 feet).

If it is impossible to abandon the aircraft, make a forced landing.

If the fire goes out, do not restart the engine; make a forced landing.

3 Engine failure after take-off

(*a*) *Immediate actions*

Select gliding attitude.
Pick a landing area.
Lower flaps as necessary.

(*b*) *Subsequent actions*

Make R/T call.
Carry out crash actions.

NOTE: Circumstances and the time available will dictate the least hazardous course of action and which of the above drills can be completed.

4 Engine failure in flight

(*a*) *Immediate actions*

Close the throttle, gaining height if possible while reducing speed to 70 knots for the glide.
Warn crew.
Select a suitable landing area, noting wind direction and strength.
Check the altimeter setting.
Plan descent.

(*b*) *Subsequent actions*

Check for the cause of failure (mechanical, fuel state, fuel cock, ignition switches, mixture control, intake blockage or icing).

(i) *If mechanical*:

Fuel ... ... OFF
Ignition ... ... OFF
Make RT distress call.
Do not attempt to restart.
Carry out a forced landing (para. 5).

(ii) *If not mechanical*:

Make RT distress call.
Attempt to restart (para. 6), if sufficient height available.

(*c*) Make abandon decision before the committal height of 1,500 feet AGL.

5 Forced landing

NOTE: When simulating engine failure at height, the engine should be cleared every 1,000 feet during the descent.

(*a*) Check:

Fuel	...	...	OFF
Ignition	...	...	OFF
Hood	...	...	Closed and locked, side panels jettisoned
Harness	...	...	Secure and tight
Brakes	...	...	As required

(*b*) *Landing*

If the speed is high after round-out, land on the main-wheels, except on rough or soft ground, when a 3-point landing is essential.

6 Restarting the engine in flight

If no mechanical defect:

(*a*) *Engine stops firing, propeller windmilling*

(i) Check:

Ignition switches		...	ON
Fuel cock	...	...	ON
Carb. air	...	...	HOT

(ii) If the engine does not pick up, carry out a forced landing or abandon.

(*b*) *Engine stops firing, propeller stationary*

(i) Provided that the propeller is *stationary*, restart the engine with the cartridge starter as follows:

Ignition switches		...	ON
Fuel cock	...	...	ON
Throttle	...	...	Closed
Cartridge starter		...	Operate

(ii) If the starter fails to operate, it may be possible to restart the engine by diving, provided that, if the restart is unsuccessful, sufficient height will still be available to make a forced landing. Application of rudder or elevator, to induce an asymmetric load on the blades, may assist in moving the propeller.

7 Abandoning the aircraft

WARNING: The minimum height for abandoning the aircraft is 1,500 feet AGL except in a spin, when it is 3,000 feet AGL. See also Part III, para. 21 (*f*) (ii).

Actions

Warn crew.

Make distress call.

Operate spring-loaded hood panel.

Open hood.

Release safety harness.

Speed as low as possible.

Disconnect R/T lead.

Abandon the aircraft by diving head first towards the trailing edge of the mainplane.

If in a spin, leave the aircraft on the outside of the spin.

8 Ditching

(*a*) Because of the fixed undercarriage, it is expected that the ditching behaviour will not be good and it is recommended that the aircraft be abandoned rather than ditched.

(*b*) If ditching is inevitable carry out the following drill:

Crew	...	...	...	Warn
Radio	...	...	...	Transmit distress call
Flaps	...	...	...	As required
Hood	...	...	...	Jettison side panels. Open
Parachute harness	...		...	Release
Safety harness	...		...	Locked and tight

(*c*) Approach into wind at normal speed, using full flap. If power is available, hold the aircraft just clear of the water until ready to touch down at the lowest practicable speed. Close the throttle and stall in a three-point attitude, onto the crest of a wave if possible. If there is a heavy swell running, ditch along the swell. Be prepared for the aircraft to turn onto its back and float in a nose-down attitude. After touch-down, release the harness and leave the cockpit as rapidly as possible.

PART V

OPERATING DATA

Part V — OPERATING DATA

Contents

1 Pressure-error corrections

The pressure-error corrections are as follows:—

From to	50 60	60 66	66 78	78 93	93 120
Clean	+5	+4	+3	+2	+1
15° flap	+4	+3	+2	+1	

2 Take-off

(*a*) At the maximum weight of 2,100lb., using half flap, the approximate take-off distances (in yards) in ISA conditions, zero wind, are as follows:—

	Runway	*Grass*
Ground run	220	245
To 50 ft.	450	485

(*b*) According to airfield and AUW conditions, these distances will be affected as follows:—
Each 1,000 feet increase in altitude increases the distance by 7.5%.
Each 10°C rise in temperature above ISA increases the distance by 5%.

Each 100lb. decrease in AUW decreases the distance by 10%.
Each 10-knot increase in headwind decreases the distance by 22%.

3 Climb

(*a*) At a take-off weight of 2,100lb. and at a speed of 65 knots, the sea level rate of climb in ISA conditions is 840 ft./min., reducing by 45 ft./min. with each 1,000 feet of altitude.

(*b*) The rate of climb is reduced by 15 ft./min. for each 10°C increase in temperature above ISA and is increased by 40 ft./min. for each 100lb. reduction in AUW.

(*c*) The fuel used for take-off and climb to 10,000 feet is approximately five gallons.

4 Cruise

(*a*) *Range and endurance*

The recommended range speed is 90 knots at all heights. The optimum endurance speed is 60 to 65 knots.

(*b*) *Cruise charts*

Figures 1 and 2 show approximate speeds and fuel consumptions against RPM for heights of 2,000 and 5,000 feet using hot or cold carburettor air. These charts assume correct use of the mixture control.

5 Glider towing

(*a*) *Take-off*

Towing a glider of the maximum weight, the ground run (on grass) is approximately 300 yards and the take-off distance for the combination to reach 50 feet is approximately 660 yards in ISA conditions, with flaps up, using the recommended unstick speed of 45 knots and climb-away speed of 50 knots. The distances are reduced to approximately 290 and 600 yards, using half flap and unstick and climb-away speeds of 40 and 45 knots respectively.

(*b*) *Climb*

At the maximum glider weight, with full throttle, flaps up and a speed of 50 knots, the sea-level rate of climb is approximately 360 ft./min. and the service ceiling is approximately 7,700 feet. The use of half flap reduces the rate of climb slightly.

(*c*) *Cruise*

The comfortable continuous cruising speed is 50 knots. At this speed, towing a glider of the maximum weight, the still air range in ISA conditions is 150 nautical miles and the endurance is approximately $2\frac{1}{2}$ hours.

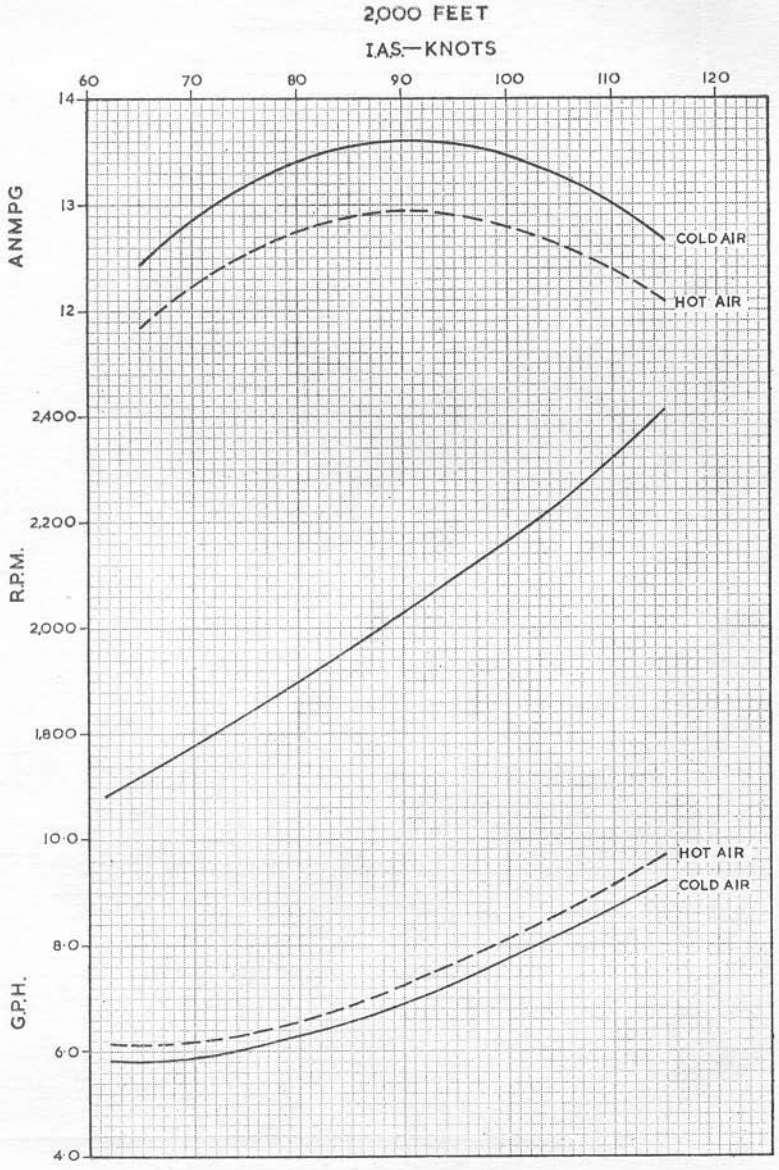

Fig. 1. Cruise data, 2,000 feet

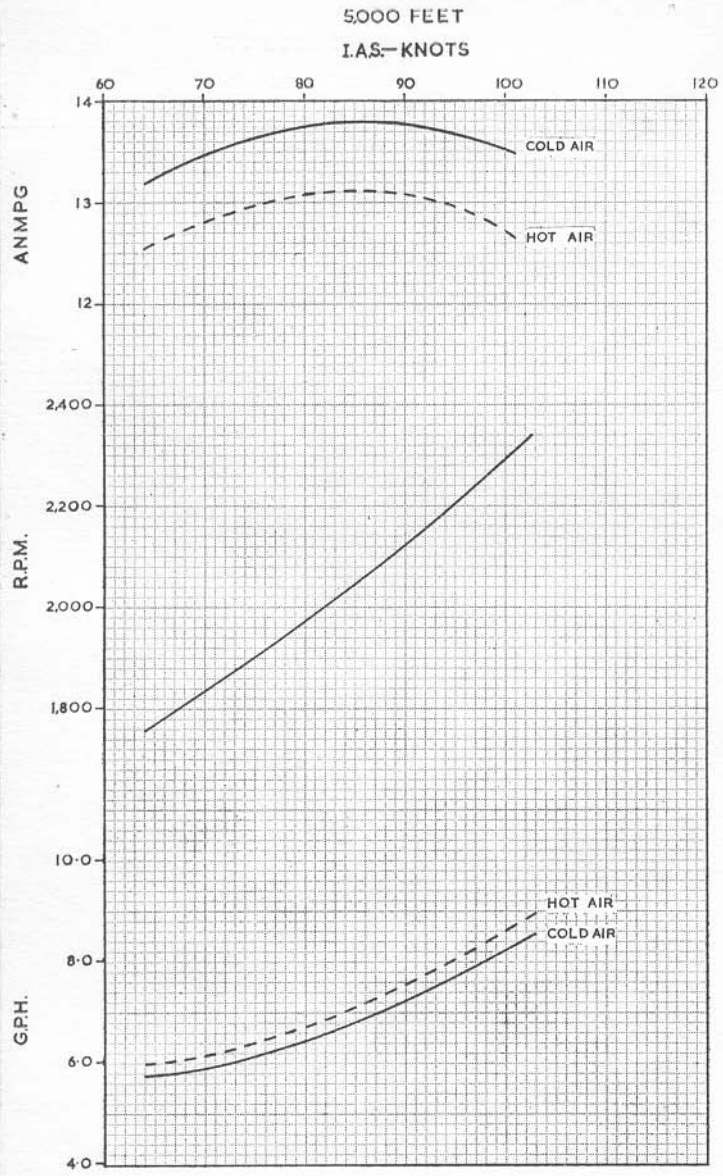

Fig. 2. Cruise data, 5,000 feet

PART VI

ILLUSTRATIONS

Part VI — ILLUSTRATIONS

Contents

Fig. A. Front cockpit, port side

1. Quick-release mic/tel socket
2. Fuse box, containing fuses for:
   Taxy lamp, pressure-head heater, cockpit lighting, oil temperature gauge, navigation lights, ident. light, radio
3. Pressure-head heater switch
4. Generator test switch
5. Emergency lamp switch
6. Taxying lamp switch
7. Navigation lights switch
8. Cockpit lighting dimmer switch
9. Downward ident. light switch
10. Ident. light morsing pushbutton
11. Throttle lever
12. Mixture control
13. Throttle and mixture levers friction nut
14. Ignition switches
15. Fuse box for UHF
16. Dimmer switch for UHF controller lighting
17. Elevator trim wheel

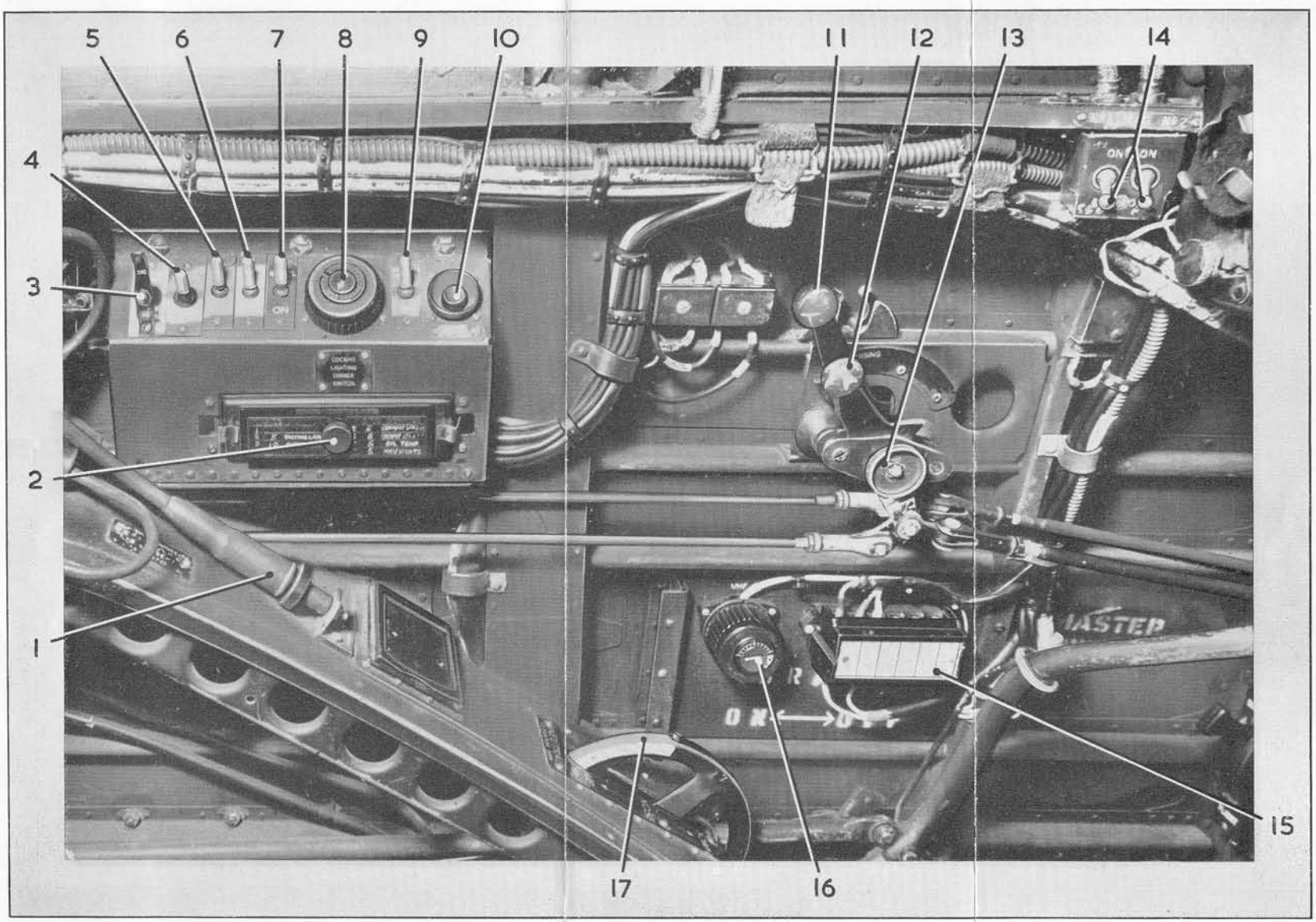

Fig. A. Front cockpit, port side

Fig. B. Front cockpit, forward view

1. Brakes control lever
2. Ground/flight switch
3. Altimeter
4. Mounting for stop watch
5. RPM indicator
6. Generator warning light
7. ASI
8. Frequency card holder (stowed position)
9. Artificial horizon
10. UHF controller
11. UHF aerial changeover switch
12. UHF tone switch
13. RCDI
14. Ventilation control
15. Oil temperature gauge
16. Oil pressure gauge
17. Press-to-transmit button
18. Flap control lever
19. Hand fire extinguisher
20. P.11 compass
21. Compass lamp switch
22. Fuel cock lever
23. Turn and slip indicator
24. Direction indicator and setting knob

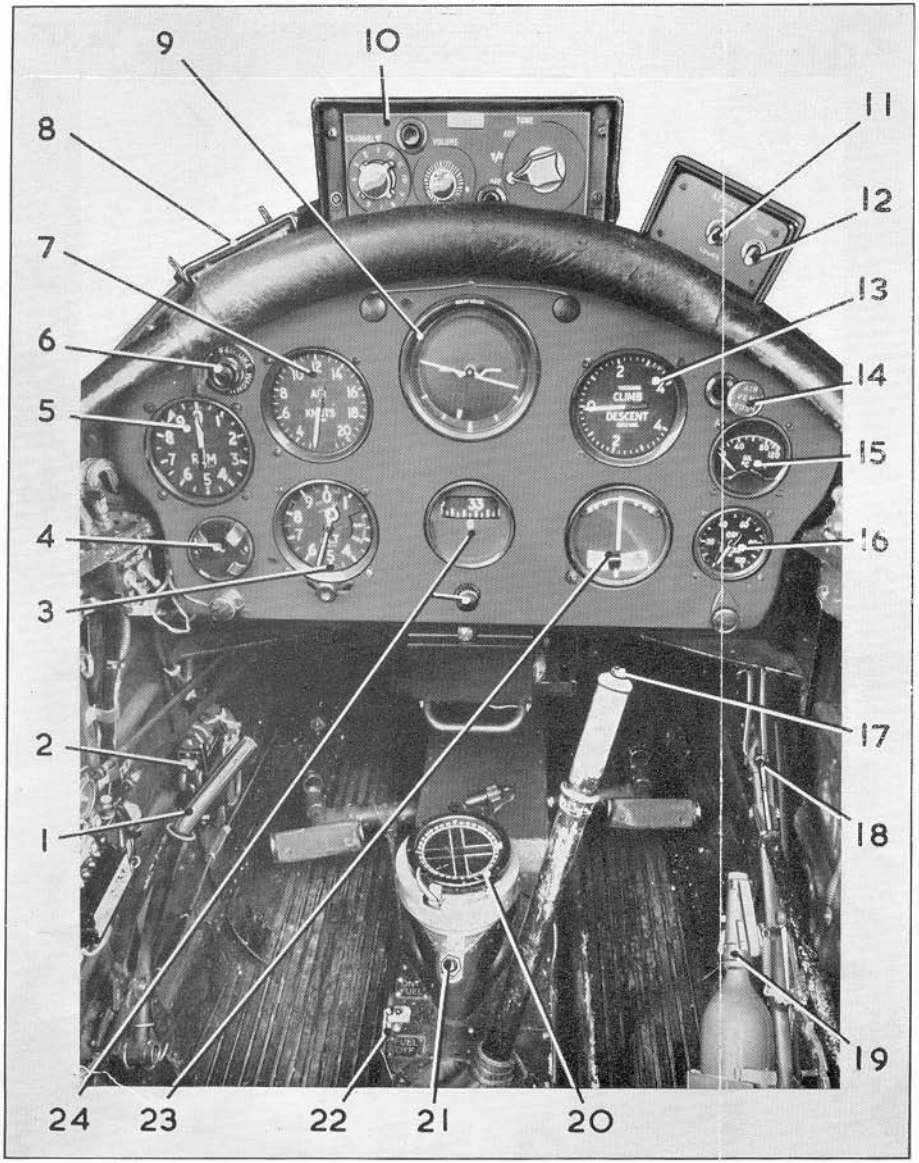

Fig. B. Front cockpit, forward view

Fig. C. Front cockpit, starboard side

1. Cover for cartridge starter control
2. Carburettor air control
3. Compass deviation card
4. Stowage bag

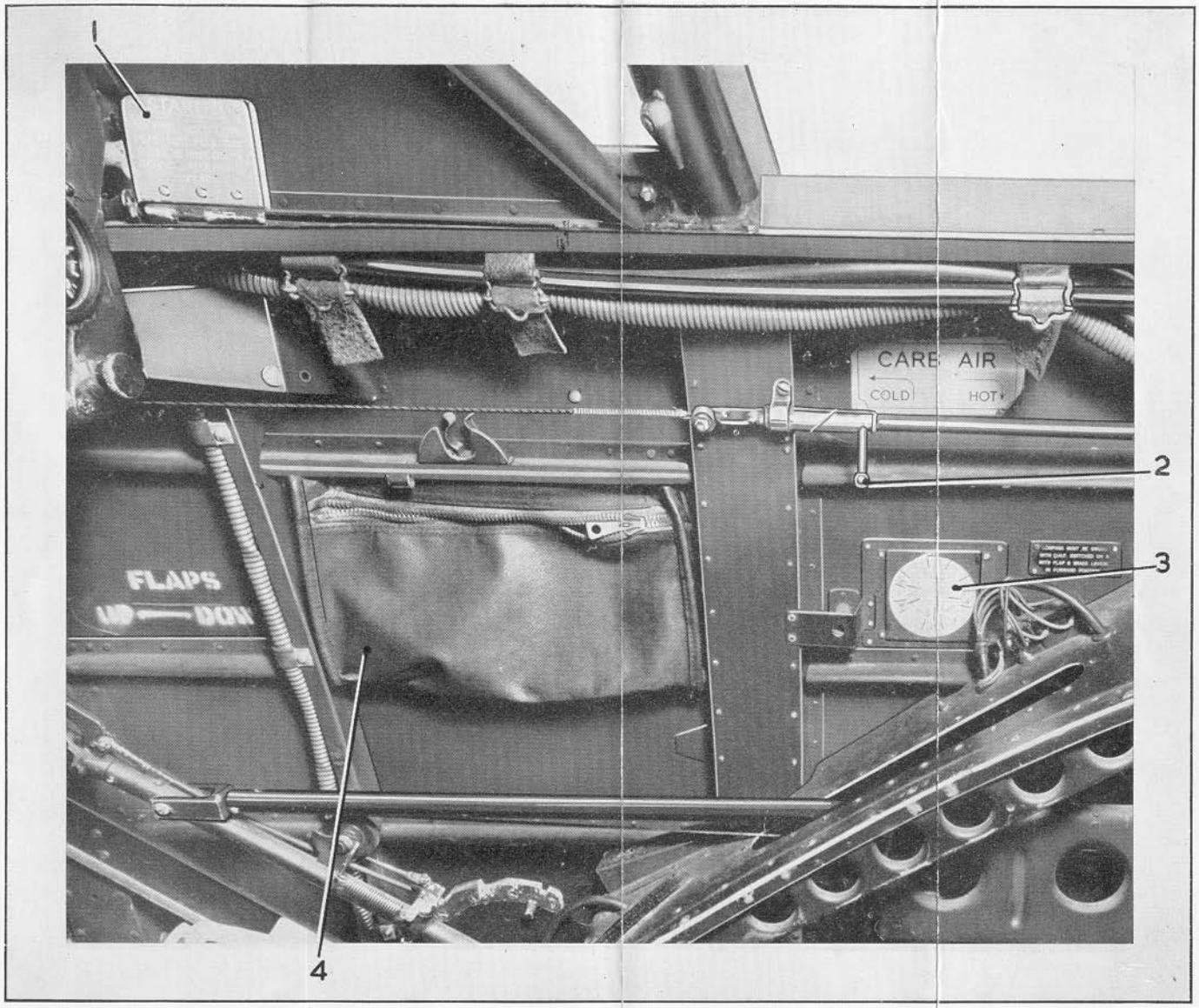

Fig. C. Front cockpit, starboard side

Fig. D. Rear cockpit, port side

1. Quick-release mic/tel socket
2. UHF control front/rear switch
3. UHF tone switch
4. UHF aerial changeover switch
5. Front cockpit lighting override switch
6. Emergency lamp switch
7. Ignition switches
8. Throttle lever
9. Mixture control
10. Throttle and mixture levers friction nut
11. Cockpit lighting dimmer switch
12. Elevator trim wheel

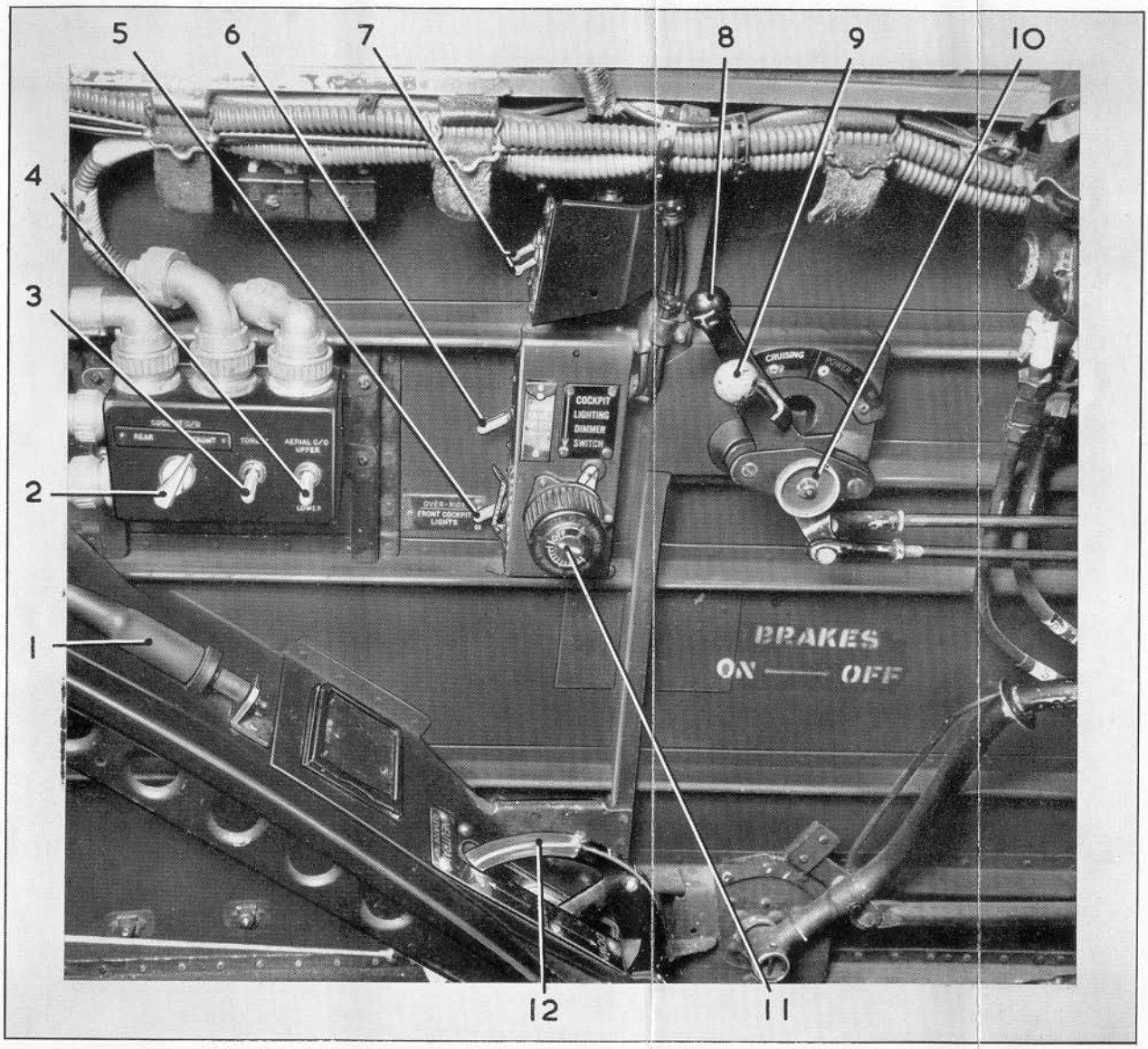

Fig. D. Rear cockpit, port side

Fig. E. Rear cockpit, forward view

1. Brakes control lever
2. Direction indicator and control
3. Altimeter
4. Mounting for stop watch
5. RPM indicator
6. ASI
7. Artificial horizon
8. RCDI
9. Oil temperature gauge
10. Oil pressure gauge
11. Turn and slip indicator
12. Press-to-transmit button
13. Flap control lever
14. P.11 compass
15. Compass lamp switch
16. Fuel cock lever

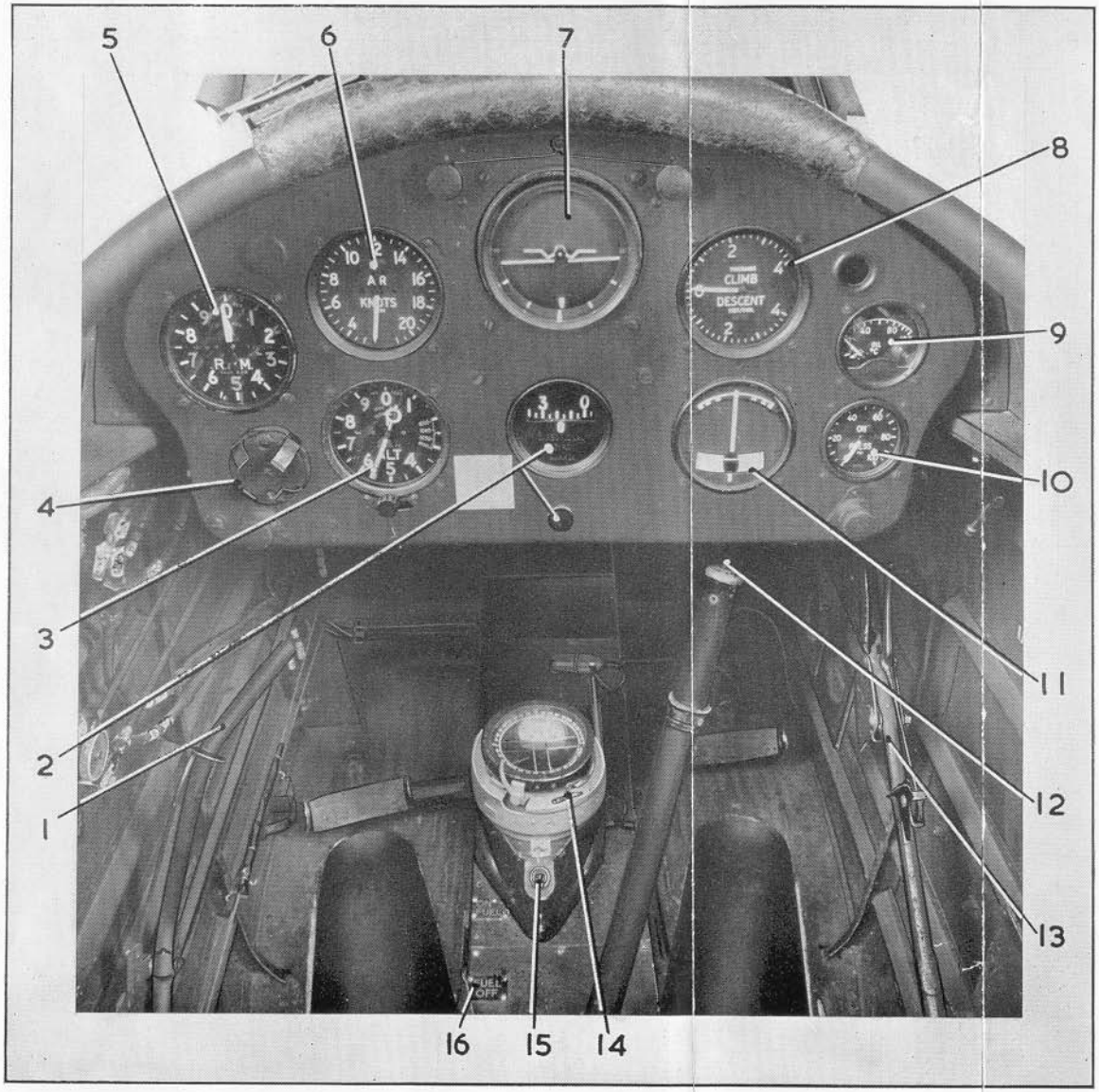

Fig. E. Rear cockpit, forward view

Fig. F. Rear cockpit, starboard side

1. Carburettor air control
2. Mute switch
3. UHF controller
4. Mic/tel socket
5. Compass deviation card

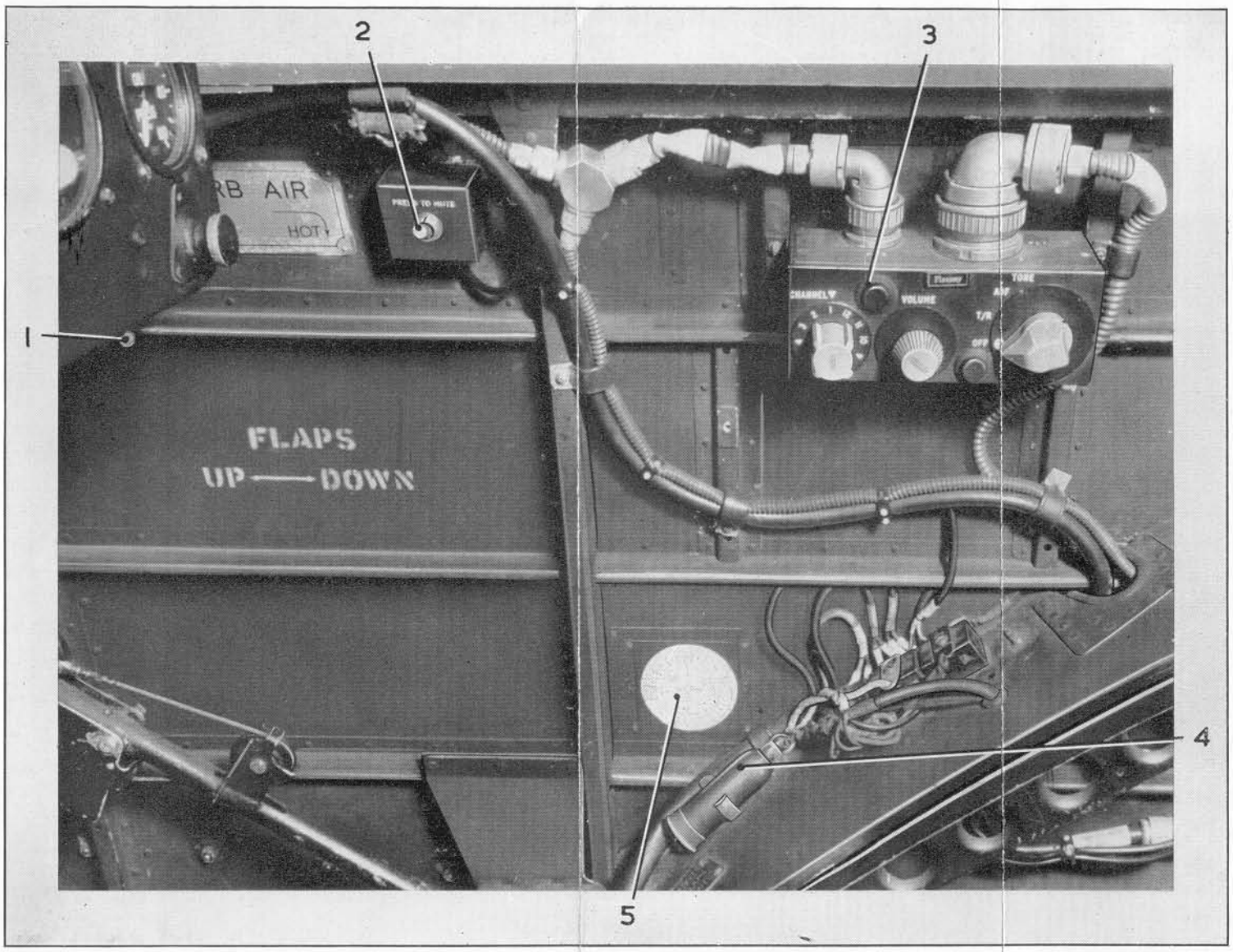

Fig. F. Rear cockpit, starboard side

RESTRICTED

AMENDMENTS

Amendment lists will be issued as necessary and should be inserted in the appropriate place in the Notes. New or amended paragraphs will be indicated by triangles positioned in the text thus: ◀.....▶ to show the extent of the amended text and thus: ▶◀ to show where text has been deleted. When a page is issued or re-issued by amendment the number of the amendment will appear at the bottom of the page. Incorporation of an amendment list must be certified by inserting the date of incorporation and signature below.

A.L. No.	Signature	Date	A.L. No.	Signature	Date
1		14/12/67	7		
2		8/10/68	8		
3		2.10.68	9		
4		13/1/72	10		
5		29/1/73	11		
6	M. Harris	13/3/73	12		