AP2092A

HOTSPUR I, II

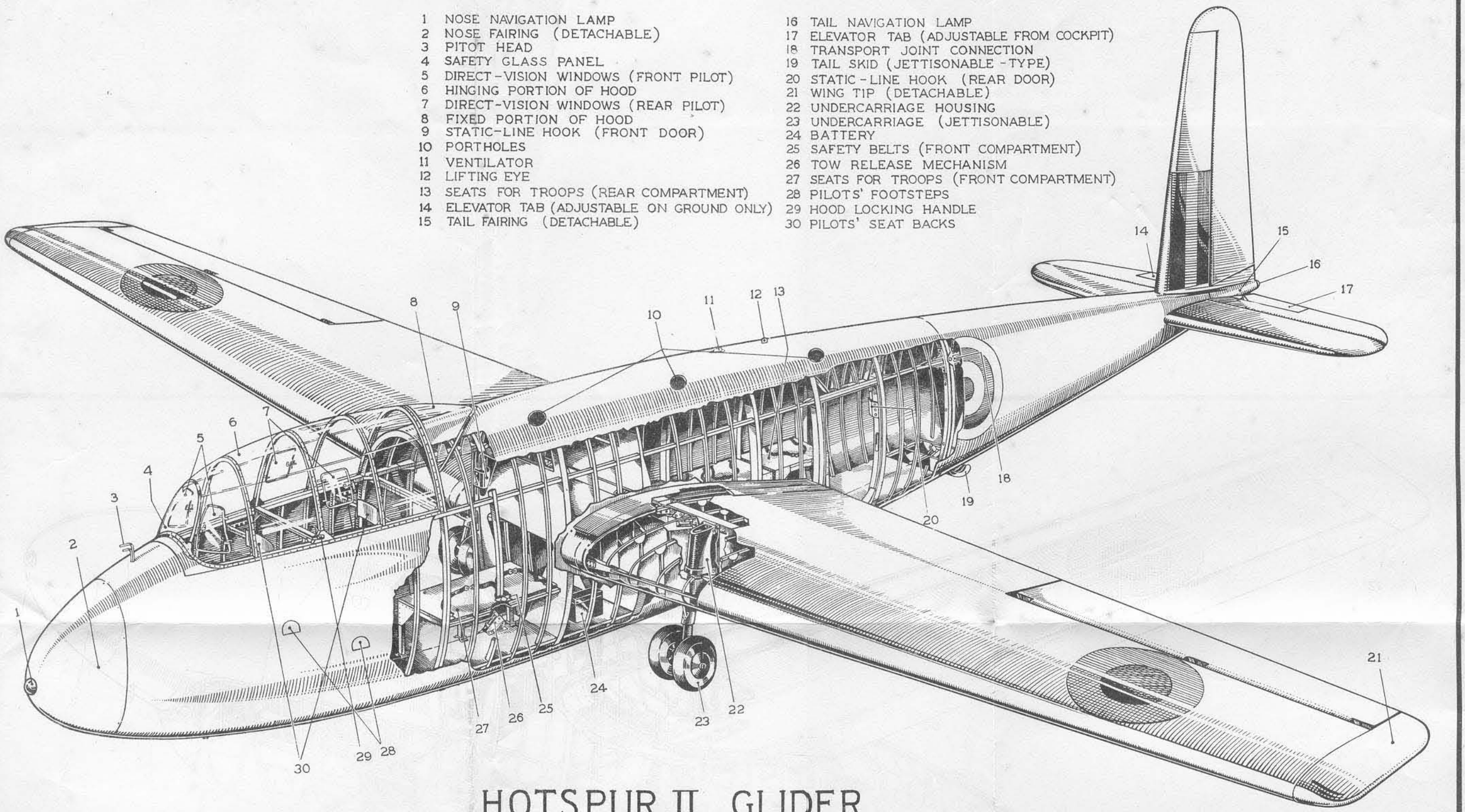
NOTES TO OFFICIAL USERS

Air Ministry Orders and Vol. II leaflets as issued from time to time may affect the subject matter of this publication. It should be understood that amendment lists are not always issued to bring the publication into line with the orders or leaflets and it is for holders of this book to arrange the necessary link-up.

Where an order or leaflet contradicts any portion of this publication, an amendment list will generally be issued, but when this is not done, the order or leaflet must be taken as the over-riding authority.

Where amendment action has taken place, the number of the amendment list concerned will be found at the top of each page affected, and amendments of technical importance will be indicated by a vertical line on the left-hand side of the text against the matter amended or added. Vertical lines relating to previous amendments to a page are not repeated. If complete revision of any division of the book (e.g. a Chapter) is made this will be indicated in the title page for that division and the vertical lines will not be employed.

1 NOSE NAVIGATION LAMP
2 NOSE FAIRING (DETACHABLE)
3 PITOT HEAD
4 SAFETY GLASS PANEL
5 DIRECT-VISION WINDOWS (FRONT PILOT)
6 HINGING PORTION OF HOOD
7 DIRECT-VISION WINDOWS (REAR PILOT)
8 FIXED PORTION OF HOOD
9 STATIC-LINE HOOK (FRONT DOOR)
10 PORTHOLES
11 VENTILATOR
12 LIFTING EYE
13 SEATS FOR TROOPS (REAR COMPARTMENT)
14 ELEVATOR TAB (ADJUSTABLE ON GROUND ONLY)
15 TAIL FAIRING (DETACHABLE)
16 TAIL NAVIGATION LAMP
17 ELEVATOR TAB (ADJUSTABLE FROM COCKPIT)
18 TRANSPORT JOINT CONNECTION
19 TAIL SKID (JETTISONABLE - TYPE)
20 STATIC - LINE HOOK (REAR DOOR)
21 WING TIP (DETACHABLE)
22 UNDERCARRIAGE HOUSING
23 UNDERCARRIAGE (JETTISONABLE)
24 BATTERY
25 SAFETY BELTS (FRONT COMPARTMENT)
26 TOW RELEASE MECHANISM
27 SEATS FOR TROOPS (FRONT COMPARTMENT)
28 PILOTS' FOOTSTEPS
29 HOOD LOCKING HANDLE
30 PILOTS' SEAT BACKS



HOTSPUR II GLIDER

F.R.F.

LIST OF SECTIONS

(A detailed Contents List appears at the beginning of each Section or Chapter)

ø Not applicable

R.T.P./1000 300 9/41.

LEADING PARTICULARS

Name and duty	Hotspur I troop-carrying trainer Hotspur II parachute-troop carrier and trainer
Type	8 seater, mid-wing, monoplane glider

MAIN DIMENSIONS

General

(Datum Line horizontal except where otherwise stated)

Length	39 ft. 3½ in.
Span - normal	45 ft. 11 in.
- with long-span wing	61 ft. 10⅝ in.
Ground angle, tail down	2°
Height - overall	10 ft. 10 in.
- fuselage	5 ft. 6 in.
Length - overall	39 ft. 3½ in.
- with nose and tail fairings removed	35 ft. 11¼ in.
Width - fuselage	3 ft. 6 in.

Outer planes

Aerofoil section	R.A.F. 34, modified
Chord - at root	7 ft. 4½ in.
- at tip projected -	
Short-span wing	4 ft. 0⅝ in.
Long-span wing	2 ft. 9 in.
Incidence (aerofoil to fuselage datum line).	5½°
Dihedral (top surface of spar centre line)..	2° 17'
Sweepback on 0.25 chord line	0° 56'
Sweepback on leading edge	3¼°

Centre section

Span (lower joint pin centres)	5 ft. 0⅝ in.
Chord	7 ft. 4½ in.
Incidence (aerofoil to fuselage datum line).	5½°
Dihedral	Nil
Sweepback	Nil

Amended by A.L.No.4

Tail plane

Span	13 ft. 0 in.
Chord (maximum), including elevator	4 ft. 1 in.
Incidence (aerofoil to fuselage datum line)	-1°
Dihedral	Nil
Sweepback	Nil

AREAS

Main plane, with ailerons and flaps -	
Short-span wing	274 sq.ft.
Long-span wing	323 sq.ft.
Ailerons, total -	
Short-span wing	22.5 sq.ft.
Long-span wing	31.2 sq.ft.
Flaps, total -	
Short-span wing (10% chord)	13.22 sq.ft.
Short-span wing (15% chord)	19.84 sq.ft.
Long-span wing	17.78 sq.ft.
Tail plane, with elevator and trimming tabs	41.3 sq.ft.
Elevator and trimming tabs	16.3 sq.ft.
Trimming tabs (two), each	1.25 sq.ft.
Fin, with rudder	21.75 sq.ft.
Rudder	10.95 sq.ft.

CONTROL SURFACES - SETTINGS AND RANGE OF MOVEMENT

Tail plane and fin	Fixed
Aileron droop	Nil
Aileron movement	25° up, 12° down
Elevator	15° up, 25° down
Trimming tab, port	15° up or down
Trimming tab, starboard (fixed)	16° up
Rudder	25° each way
Flaps -	
First position	60° down
Second position	90° down

UNDERCARRIAGE

Main undercarriage -	
Type	Two separate cantilever shock-absorber struts, each with twin wheels, jettisonable after take-off

Track, mean	8 ft. 7½ in.
Shock-absorber struts -	
Type	G.A.L., rubber
Wheels -	
Type	Dunlop A.H.2288/1
Tyres	Dunlop 4 in. for 8 in. wheels
Air pressure	30 lb./sq.in.
Tail unit -	
Type	Castoring metal skid, jettisonable after take-off (or fixed, non-jettisonable skid on certain Mk.I gliders).
Shock-absorber	Rubber cord

HOTSPUR

SECTION 1

CONTROLS AND EQUIPMENT FOR PILOTS

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ALTERATIONS AND ADDENDA

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INTRODUCTION

1. The Hotspur I or II is an 8-seater mid-wing cantilever monoplane glider with jettisonable undercarriage, a fixed or jettisonable tail skid, and an enclosed cabin. It was originally designed for troop-carrying but has been adapted as a trainer both for glider pilots and parachute troops. The length is 39 ft. 3½ in. and the span is 45 ft. 11 in. except in those Mk.I gliders with long-span wings of 61 ft. 10¾ in.

2. The Hotspur I troop carrier trainer accommodates two pilots in tandem in the nose, and six men, facing forward, on bench-type seats aft of the cockpit. The top of the cabin consists of a detachable hood, in four sections, which provides means of entry and exit for pilots and troops, that part of the hood over the cockpit being transparent.

3. The Hotspur II is designed as a parachute troop-carrier and trainer and also carries two pilots and six men; two are seated side by side, (facing to starboard) forward of the spar bulkhead and four side-by-side (facing to port) in the aft part of the cabin. The troops in the front part of the cabin enter and leave through a removable door on the starboard side just in front of the wing and those in the aft part through a similar door behind the wing on the port side; the pilots are seated as in the Mk.I. The top of the cabin is integral with the fuselage but a hinged transparent hood is fitted over the pilots' cockpit; the hood is jettisonable to provide an emergency exit and on later Mk.II gliders is large enough to enable the undercarriage units to be seen without recourse to the small transparent panels which are fitted for this purpose to Mk.I and earlier Mk.II gliders. Other differences are of a minor nature and are dealt with in the subsequent Sections of this Publication.

4. Flying controls are duplicated for the two pilots. Control of ailerons and elevator is conventional and in some gliders the rudder control is by slide units, adjustable for leg reach, and by an alternative bar installation in the remainder. The quick release unit for releasing the glider from the "tug" aeroplane is under the control of the front pilot and if more than one glider is towed by the same aeroplane each has its own cable; the "tug" aeroplane has its own tow release unit. The front cockpit only is fitted with instruments, but they can be seen by the rear pilot.

5. The plywood-covered fuselage is of wooden construction throughout, in one unit with detachable nose and tail fairings, that of the Mk. II being divided additionally into two portions for transport purposes by a joint aft of the cabin. The centre keel member, of box-spar construction, follows the contour of the lower surface of the fuselage and two upper and two lower longerons also support the cabin floor. Two main frames coincide with the leading edge of the main plane and the centre-section spar, respectively, and light frames fore and aft of these main frames,

in combination with intercostal longitudinal stiffeners, stabilize and maintain the contour of the plywood covering. Monocoque construction is used for the Mk.II fuselage, except where the pilots' hood occurs, but in the Mk.I the auxiliary frames are discontinued at the two upper longerons to accommodate the detachable hood over the cabin.

6. The main plane is of wooden construction and consists of three units, port and starboard detachable outer planes and centre section, the last named integral with the fuselage. The outer planes are plywood covered and some versions have detachable compressed paper tips; the remainder have integral wooden tips. Those gliders with short span wings have one-piece ailerons and those with long span wings have two-piece ailerons; in both cases the ailerons are of wooden construction with plywood covering and are mass-balanced. Split flaps, of similar construction to the ailerons and extending from their inner ends to the wing root, may be used either to increase lift or drag. In the case of long span wings the flaps are in two portions.

7. The tail unit is of wooden construction and comprises a detachable non-adjustable tail plane, and a fin integral with the fuselage. The elevators carry two trimming tabs, of which that on the port side is adjustable from the cockpit while that on the starboard side is adjustable on the ground only. The rudder is mass-balanced and all the tail surfaces are plywood covered.

8. The undercarriage, which consists of two separate cantilever units each carrying twin wheels, is jettisonable from the cockpit after take-off. The fully-castoring tail skid is jettisonable except on some Mk.I gliders, which have a non-castoring, fixed skid. A central wooden landing skid, extending from the front of the fuselage to a point approximately half-way along the undersurface, preserves the structure from damage during practice landings.

9. The equipment includes torches, vacuum flasks, map case and sanitary bottles. A storage battery provides power for the navigation and signalling lamps.

CONTROLS AND EQUIPMENT FOR PILOTS

Note.- This section deals with the location of controls and equipment with which the pilots are concerned, and, where necessary, describes their function and method of operation. The layout of the various items is referenced in figs. 1 to 3, each referenced item having an individual number; these numbers appear in brackets in the text after the appropriate item.

INTRODUCTION

1. General information.- The HOTSPUR I & II gliders are 8-seater mid-wing cantilever monoplanes carrying two pilots and six troops. Originally designed for troop carrying, they have now been adapted as trainers for both glider pilots and parachute troops. The flying controls are duplicated for the two pilots. The wheeled undercarriage units are jettisonable after take-off and the fully-castoring tail skids may also be jettisoned except on some gliders which have a non-castoring fixed skid. A central wooden landing skid is provided to prevent damage to the structure on landing.

FLYING CONTROLS

2. Primary controls.- Dual primary controls are provided for the two pilots, who are seated in tandem. These comprise a control column (20) and rudder control by non-adjustable bar or separate slide units (16). On some gliders the slides are adjustable for leg reach on the ground only, to any one of three positions.

3. Primary controls locking gear.- This consists of a hinged clip which is attached to the front control column and from which two diagonal struts lock the column to the sides of the fuselage, while another strut is connected to the rudder slides, or bar. When not in use, the gear is stowed in clips behind the spar bulkhead on the right side.

Revised by A.L.No.5

4. Elevator tab control.- The lever (18), on the port side of the front cockpit, controls the port elevator tab, and is moved forward to correct tail heaviness; a ratchet holds the lever in any required position.

5. Undercarriage jettison control.- The undercarriage units and tail skid are jettisoned by pulling the lever (15), located on the starboard side of the front cockpit in later type gliders and on the right edge of the front seat in those earlier gliders in which a chest-type harness is used. On some Mk.I gliders the tail skid cannot be jettisoned.

6. Undercarriage jettison visual observation.- The undercarriage jettisoning operation can be viewed by the front pilot through small transparent panels in Mk.I and certain Mk.II gliders, and through the hood in later Mk.II gliders.

7. Flaps control.- The flaps are operated by the "V" lever (19) on the port side of the front cockpit which moves over a notched quadrant. Both handle grips have spring-loaded release triggers. The flaps are lowered to the maximum lift position by pulling up the upper handle, after which it will be found more convenient to use the lower handle to increase the degree of drag exerted by the flaps. The setting of the flaps is shown by the position of the lower handle (marked FLAP INDICATOR) against a position indicator stencilled on the cockpit wall.

8. Tow release control.- The lever (12), mounted on the starboard side of the front cockpit on Mk.I and early Mk.II gliders, is pulled backwards to release the glider from the tow rope. In later Mk.II gliders the release control consists of a pull knob on the port side of the instrument panel, connected by bowden cable to the tow release lever. A second knob control is mounted on the port top longeron for operation by the second pilot.

9. Flying instruments.- On early Mk.I gliders an A.S.I., altimeter and compass are mounted separately; on Mk.II and later Mk.I gliders an A.S.I. (1), rate-of-climb indicator (2), turn indicator (4) and altimeter (8) are fitted to the instrument panel, with the compass (11) and compass card holder (10) mounted on the starboard decking.

LIGHTING EQUIPMENT

10. Battery switch.- The battery switch (3) is located on the port side of the instrument panel in those gliders which have electrical equipment.

11. Navigation lamps.- A switch (6), on the starboard side of the instrument panel, is moved up to light the combined navigation and identification lamps fitted to Mk.II and later Mk.I gliders; for signalling purposes this switch is set down and the pushbutton (7) operated.

EMERGENCY EQUIPMENT AND CONTROLS

12. Emergency Exit.- In Mk.I gliders the hood is in four sections. The forward transparent section over the pilots is hinged on the starboard side, the hinges having withdrawable pins attached to wires for emergency withdrawal. On the port side overcentre catches (21) are fitted, these being pulled down to secure, and lifted to release the hood. The remaining sections of the Mk.I hood are secured on both sides by withdrawable locking pins at top longeron level. In Mk.II gliders there is a one piece removable hood over the pilots only. It is hinged on the starboard side, the hinge pins being attached to lanyards (13) for emergency quick withdrawal. The port side is secured by two spring loaded bolts engaging with sockets fixed to the top longeron. These bolts are released simultaneously by means of a lever fitted between them and operable from both inside and outside the glider. For normal opening the bolts are withdrawn and the hood is swung open on its hinges. In an emergency the bolts are withdrawn and the hinge pin lanyards pulled, when the hood can be pushed clear.

COCKPIT ACCOMMODATION AND EQUIPMENT

13. Seats.- In those gliders in which the rudder controls are non-adjustable for leg reach, the pilot's seat backs (25) can be adjusted on the ground.

14. Entry.- The pilots enter gliders over the port side of the fuselage, on the Mk.I the front hood section is then pulled closed and secured by pulling down the catches (21) on the port side. On Mk.II gliders the cockpit hood hinges along its starboard side, and is secured by catches on the opposite side.

15. Direct-vision windows.- All gliders have direct-vision panels (9) for the front pilot, hinging inwards, on each side of the hood. Later gliders have these direct-vision panels duplicated for the second pilot.

16. Thermos flasks.- Two flasks (24) are mounted in clips, one on the starboard decking beside the front pilot and one to port of the rear pilot's seat.

17. Sanitary equipment.- A double-type sanitary container for the use of the pilots is stowed in clips on the port decking of the rear cockpit.

18. Torch.- A torch (26) is fitted on the starboard decking of the front cockpit.

19. Map case.- A fibre map case (14) is mounted on the starboard side of the cockpit adjacent to the front pilot.

Note on some gliders fitted with a rudder bar instead of slides the map case will be found in a similar position on the port side.

20. Weatherproof cover.- A cover which fits over the hood is provided and secured in position by three pairs of tapes tied beneath the fuselage.

ALTERATIONS & ADDENDA

to

HOTSPUR I & II gliders when modified to conform to the HOTSPUR III specification.

21. Explanatory.- Hotspur gliders are gradually being modified to conform to the full specification decided upon for training service use, and when all such modifications have been incorporated the gliders become HOTSPUR IIIs. The following paragraphs describe the more important alterations and additions to the pilot's controls and equipment introduced by these modifications but pending full modification individual gliders may be found to have some only of these incorporated.

CONTROLS AND INSTRUMENTS

22. Flaps controls.- A duplicate flap operating lever is added for the rear pilot; it is on the port side in a corresponding position to the front one, with which it is interconnected.

23. Instruments.- An instrument panel for the rear pilot is added; this carries an A.S.I. and Altimeter.

24. Tail skid.- The jettisonable tail skid is replaced by a fixed non-castoring tail skid forming an extension of the main skid.

25. Undercarriage jettison control.- No additional control is fitted for the rear pilot and if required, the undercarriage must be jettisoned by the front pilot as on early Mk.I and II gliders. The jettison control is fitted on a bracket on the right of the front pilot's seat on all gliders excepting Mk.I's.

26. Tow release control.- On gliders fitted with dual-pull-knob releases, these are connected to the tow release mechanism. No operating lever is fitted on the starboard side.

27. Navigation lamps.- On later gliders the switch (6) is on the port-centre of the instrument panel, the battery switch (3) must be "ON" before the switch (6) is operative.

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28. Intercommunication.- Some early gliders have T.R.9 but line intercom is now being fitted. The equipment consists of an amplifier with integral switch installed under the first passenger's seat on the port side; this switch must always be on when on tow.

Key to fig.1.

1. A.S.I.
2. Rate-of-climb indicator
3. Battery switch
4. Turn indicator
5. Time-of-flight clock
6. Navigation and identification lamps switch
7. Identification lamps signalling pushbutton
8. Altimeter
9. Direct-vision panel
10. Compass card holder
11. Compass
12. Tow release control lever (early gliders)
13. Hood jettison lanyard
14. Map case
15. Undercarriage jettison control lever (early gliders)
16. Rudder control slide units
17. Front pilot's seat
18. Elevator tab control lever
19. Flaps control levers
20. Control column
21. Hood catch.

Key to fig. 1

1. A.S.I.
2. Rate-of-climb indicator
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17. Front pilot's seat
18. Elevator tab control lever
19. Flaps control levers
20. Control column
21. Hood catch

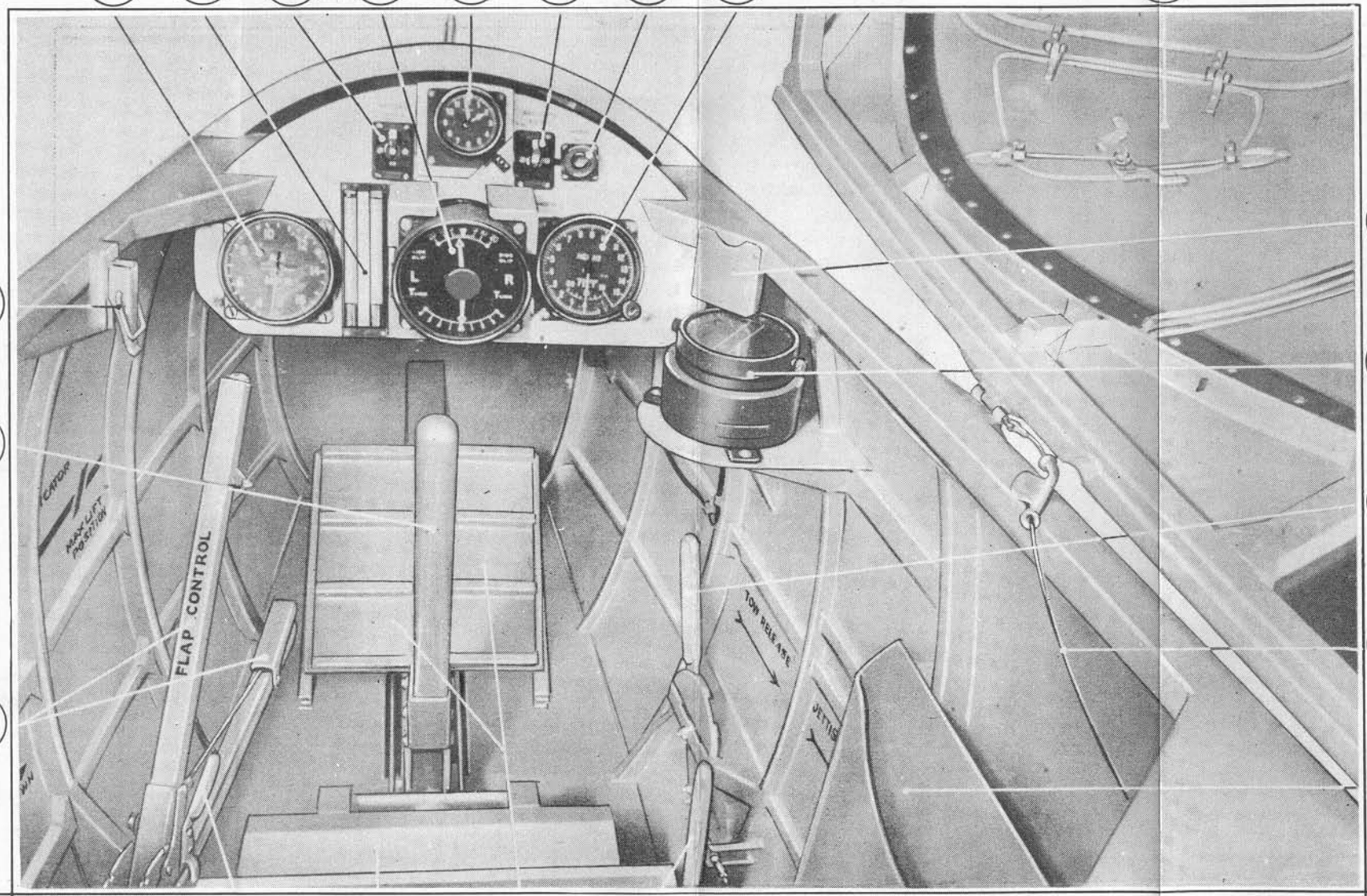

FIG. 1

FRONT COCKPIT – LOOKING FORWARD

FIG. 1

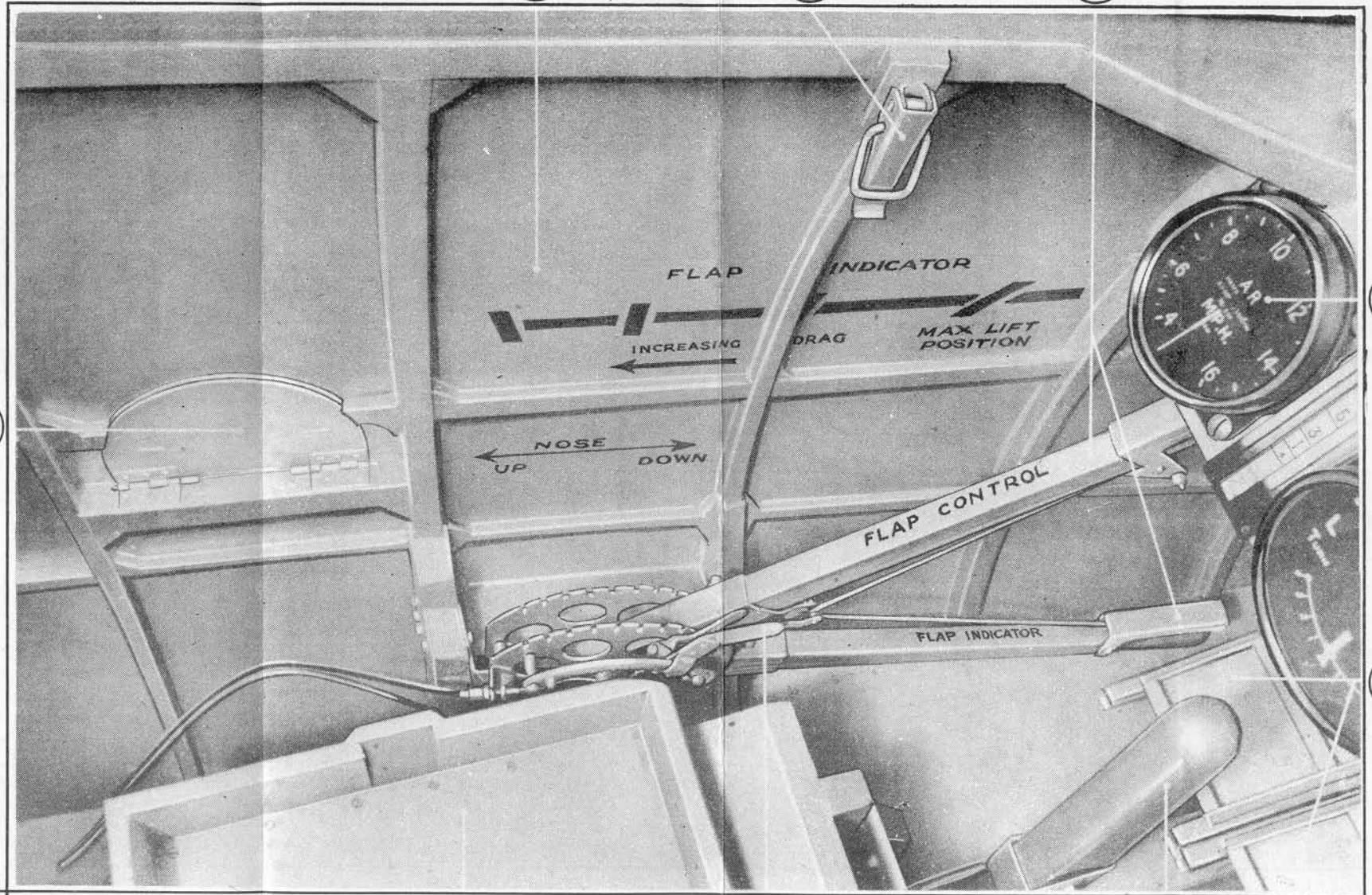

FIG. 2

FRONT COCKPIT - PORT SIDE

FIG. 2

Key to fig. 2

1. A.S.I.
16. Rudder control slide units
17. Front pilot's seat
18. Elevator tab control lever
19. Flaps control levers
20. Control column
21. Hood catch
22. Footstep flap
23. Flaps position indicator

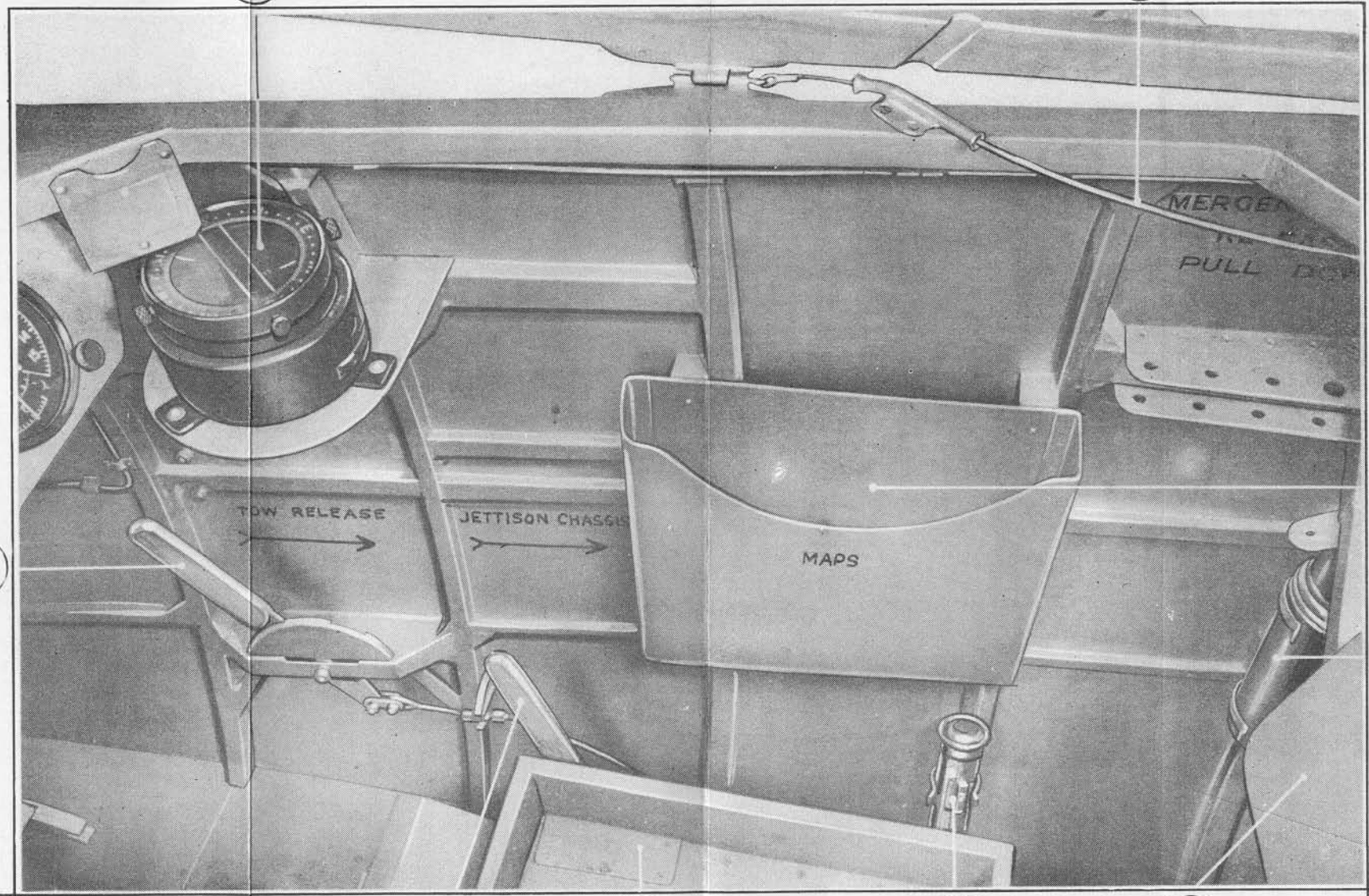

FIG. 3

FRONT COCKPIT – STARBOARD SIDE

FIG. 3

Key to fig. 3

11. Compass
12. Tow release control lever (early gliders)
13. Hood jettison lanyard
14. Map case
15. Undercarriage jettison control lever (early gliders)
17. Front pilot's seat
24. Thermos flask
25. Front pilot's seat back
26. Torch

SECTION 2

HANDLING AND FLYING NOTES FOR PILOT

1. INTRODUCTORY

These notes are for the guidance of pilots flying Hotspur glider combinations. Tug aircraft pilots should refer to the appropriate appendix hereto covering the tug aircraft used.

The method of signalling between the glider and tug pilots, both on the ground and in the air, should be in accordance with the code of signals as laid down by the Command concerned.

Note: It is of vital importance that glider and tug pilots shall agree and understand the code of signal to be used.

2. FLYING LIMITATIONS

Maximum permissible speeds in m.p.h. I.A.S.

Nose towing	135*
Belly towing	110
Diving	155*
Flaps to MAX LIFT position	90

" beyond "Note: Limitations and recommended handling speeds are subject to any temporary restrictions in force at the date of issue, or which may be imposed from time-to-time."

for lowering and when down. A.L. 7/A

g on aeroplanes A.T. 478 to A.T. 508 inclusive
ation No.85

3. POSITION ERROR CORRECTION

With flaps up the corrections in m.p.h. are:-

AT	70	80	90	100	110	120
+		4	8	11	14	15
−	3					

With flaps fully down:-

AT	51	60	65	70
+		1	4	6
−	3			

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4. FITNESS OF AIRCRAFT FOR FLIGHT

Ensure that the total weight and the disposition of the load are in accordance with the Loading and C.G. diagram. It is of the greatest importance that the disposition of the load is kept within the limits laid down, or the aircraft may become uncontrollable.

5. PRELIMINARIES

Before entering the cockpit

(i) See that all passengers are seated and strapped in and the load secured and stowed in accordance with the loading and C.G. data.

(ii) See that both doors are closed and the catches properly fastened.

(iii) See that the glider is directly behind the tug and on the same heading.

On entering the cockpit

(iv) Test quick release controls, attach cable and then see that the quick release lever, and knob controls where fitted, are in the CLOSED position.

(v) See that nothing is fouling the quick-release bowden cable at either end.

(vi) Check that the undercarriage jettison lever is fully forward and secure.

(vii) See that primary controls are unlocked and that the locking gear is properly stowed. Test all controls for free operation.

(viii) Set the altimeter to zero.

(ix) Close the hood and check that it is fastened forward and aft and "(x) Test inter-com (if fitted) with tug; leave switch on."

6. PREPARATIONS FOR [illegible] 13/6

(i) Set elevator trimming lever fully forward.

may still result. A fast landing should be made and the nose rubbed well in. (See sub.para. (viii)). If there is not room to pull up before reaching the boundary the aircraft may be swung.

(c) The glider can be sideslipped, but the rudder is not effective enough to hold much sideslip for long.

(vii) To land in a small space, the final approach should be made to one side of the field and not straight down the middle, put the glider on the ground immediately the leeward boundary is passed and rub the nose well in (see sub.para.(viii)). As the windward hedge is approached, swing the glider smartly to run parallel with it, finally swing downwind if necessary and if enough speed is left. A half-loaded glider can be landed and stopped in an area of 120 yards square under conditions of light wind.

(viii) It should be noted that rubbing the nose in, especially on rough ground, is liable to damage the nose skid and glider structure; consequently, do not rub the nose in harder than is necessary to stop within the space available.

17. DUTIES OF THE PILOT AFTER LANDING

When the glider has come to rest:-

(a) Move the flap lever to the "off" position.

(b) Move the trimming lever forward.

(c) Stay with the glider until the tractor has towed it back to the take-off point. During ground towing, sit in the front seat with the hood closed to prevent damage by wind and hold the control column back to prevent damage to the elevators by banging up and down.

18. EMERGENCY ACTION

(i) Abandoning in flight. If it is necessary to abandon the glider follow, as far as possible, the drill set out in Vol.I. Section 3 Para.4.

(ii) On the ground in the event of the exits jamming, it is possible to kick through the glider skin with the foot.

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APPENDIX I

Notes for MASTER II tug aircraft Pilots when towing HOTSPUR GLIDERS.

1. Flying limitations

The following speed limitations must be strictly observed.

	Readings in m.p.h.	
	On Tug A.S.I.	On Glider A.S.I.
Nose towing	... 155 (135)	... 135 (115)
Belly towing	... 125	... 110

NOTE: The speeds in brackets must not be exceeded with gliders B.T.500 and ~~modifi~~ "Limitations and handling speeds are subject to temporary restrictions - See Section 2, para.2." 12/6

2. Engine limitations

The normal limitations must be observed but the following cylinder head temperature concession has been approved for use when towing gliders only.

CRUISING CONTINUOUS (RICH & WEAK) - 210° C.

NOTE.- To ensure adequate cooling climb at a speed of not less than - ~~115~~ 105 m.p.h. I.A.S. AL 9/2

3. General

No special tugging technique is necessary but the tug should be flown as steadily as possible avoiding all sudden and unnecessary manoeuvres.

NOTE.- It is of vital importance that the tug and glider pilots shall agree and understand the c "When line intercom is used switch must be set to MIX or held to LINE while towing glider. After casting off set to I.C." 12/6

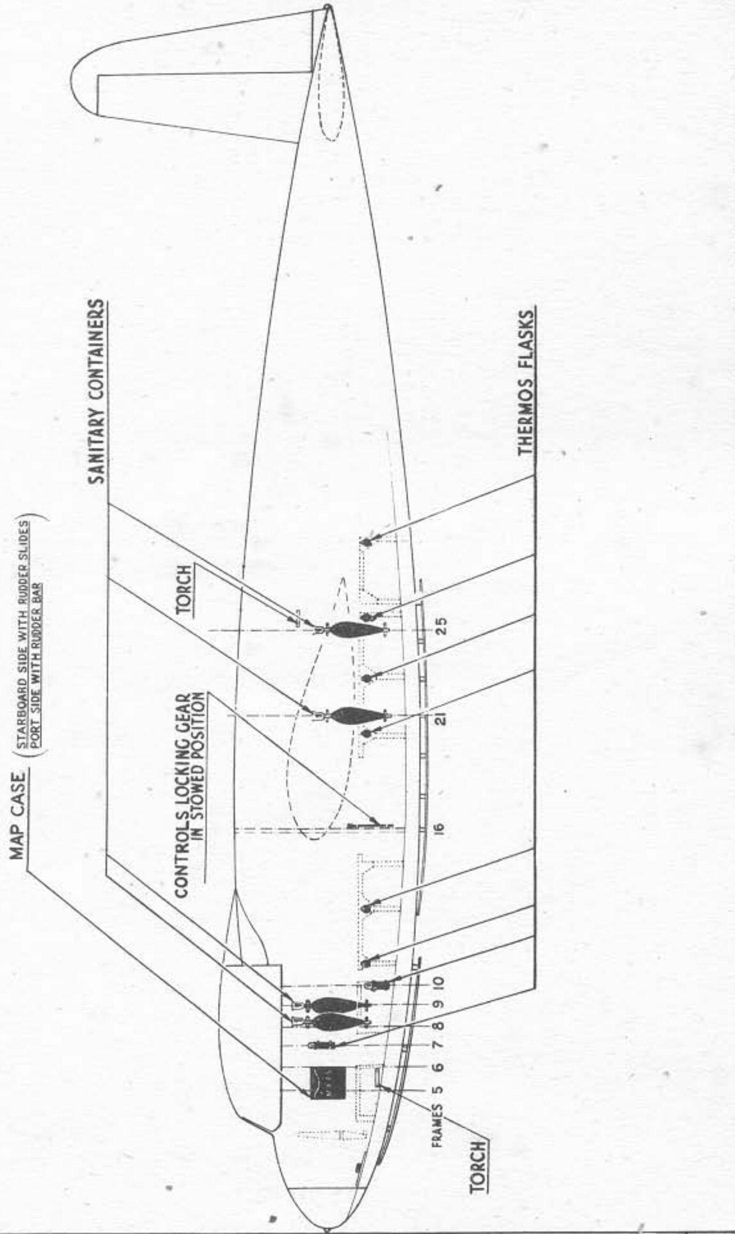

FIG. 1 — DISPOSITION OF EQUIPMENT — FIG. 1

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SECTION 3 - CONTROLS AND EQUIPMENT FOR TROOPS

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SECTION 3 - CONTROLS AND EQUIPMENT FOR TROOPS

Introduction

1. This section deals with controls and equipment of concern to the troops who occupy the glider. The text gives the location, and where necessary, a description of the function and operation, of troops' controls and equipment, the items being illustrated in figs. 1 and 2. Each item is given an individual number and these are included within brackets in the text immediately after reference to the appropriate item.

GENERAL CONTROLS AND EQUIPMENT

2. Seating.- In Mk.I gliders troops, numbering six, are accommodated in tandem on bench-type seats in the cabin portion of the fuselage, each man facing forward. In Mk.II gliders two men are seated side-by-side, facing to starboard ahead of the mainplane, the remaining four men being seated behind the mainplane, side-by-side and facing to port. The seats are numbered from nose to tail of the fuselage, the first seat behind the rear pilot being No.3.

3. Entrance and exit.- In Mk.I gliders entry is over the fuselage sides, after which the hood is dropped into position and secured by turning the fasteners so that the locking bolts are in a horizontal plane. The hood is released for exit by turning the fasteners so that the bolts are vertical. Mk.II gliders have a door, forward of the mainplane on the starboard side of the fuselage, giving access to, and exit from, the front compartment and a similar door behind the mainplane on the port side, serving the rear compartment. To release the doors from inside, the handle of the locking bolt should be rotated out of its locating clip and pushed forward; the door can then be drawn inwards at the rear edge and slid towards the rear of the fuselage to free the retaining spigots, using the handgrips. If necessary, both doors may be jettisoned but for training purposes the front door can be stowed across the rear end of the front compartment and the rear one can be placed along the rear compartment, aft of the exit. Exit by parachute should not be made unless the undercarriage has been jettisoned.

4. The following drill must be observed when making parachute exits; the numbers refer to the troops as they were seated at take-off:-

No.8 out
No.4 out and No.7 in the seat occupied by No.8
No.7 out and No.3 in the seat occupied by No.4
No.6 in seat occupied by No.8 and No.5 in seat occupied by No.7
No.6 out
No.3 out and No.5 in seat occupied by No.8
No.5 out

Note.- It is important that No.3 does not leave until No.8 has jumped (see Sect.4, Chap.1).

5. Safety harness.- Each man is provided with a simple two-piece safety harness (2), attached to the seat.

6. Static line hook.- Mk.II gliders have a hook (10) situated

about half-way up each rear door pillar, for attachment of the parachute static line ring prior to jumping.

7. Vacuum flasks.- A vacuum flask (9) is carried in clips beneath each seat.

8. Sanitary containers.- Three double-type containers (7) are accommodated in clip mountings on the fuselage walls, one on the starboard side of the rear cockpit within reach of the occupant of seat No.3, and two in the rear compartment on the port side.

9. Torch.- A torch (11) is clipped just forward of the rear door, for use in the rear compartment.

Key to fig. 1

1. Flap protecting tow-release mechanism
2. Safety harness
3. Seat backs
4. Sanitary bottle for use of pilots
5. Rear pilot's seat back
6. Door post handgrip
7. Position of sanitary bottle for use of occupants of seats No. 3 and 4.
8. Rear pilot's seat
9. Thermos flask

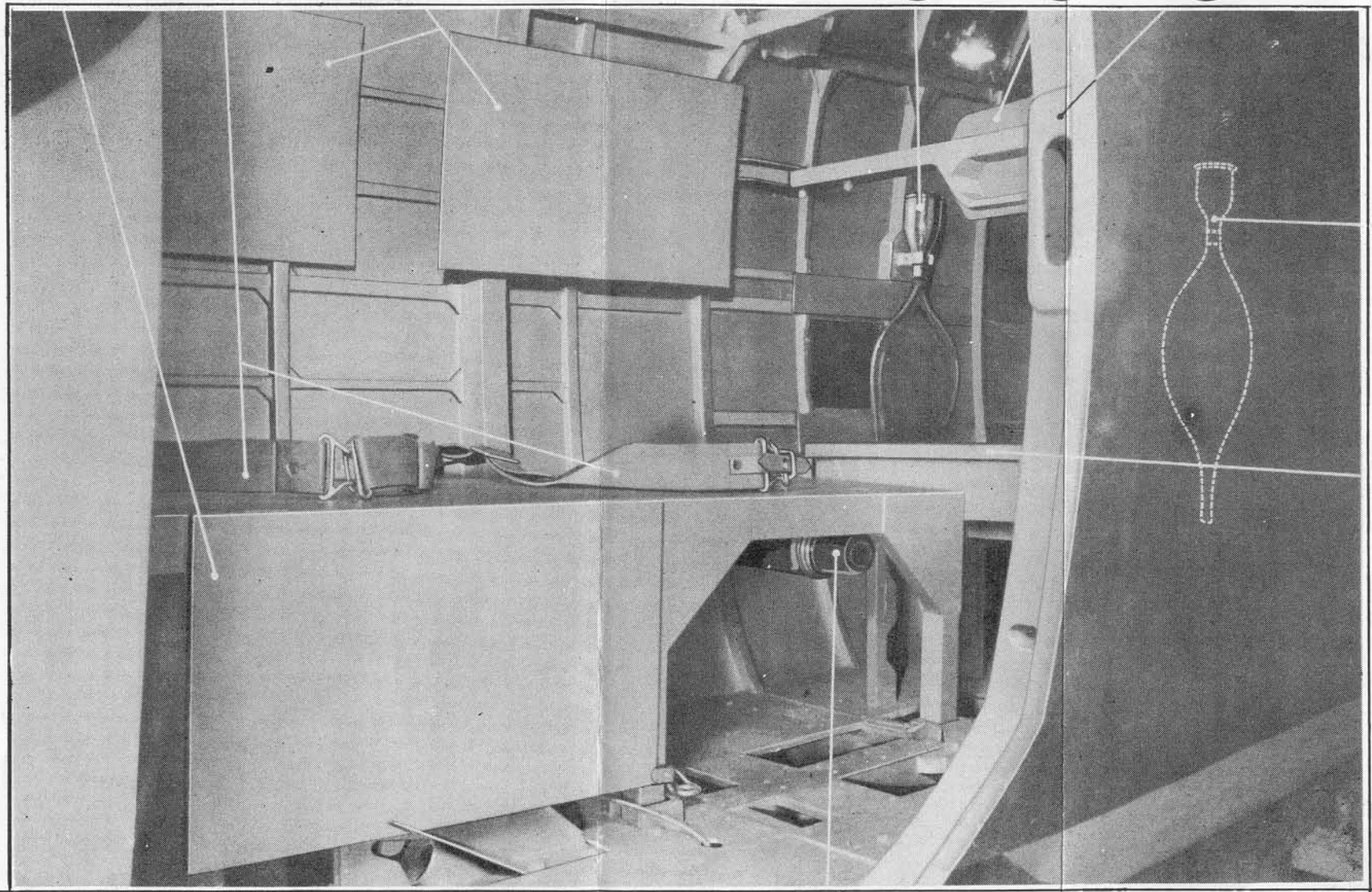

FIG. I

FRONT COMPARTMENT - LOOKING FORWARD

FIG. I

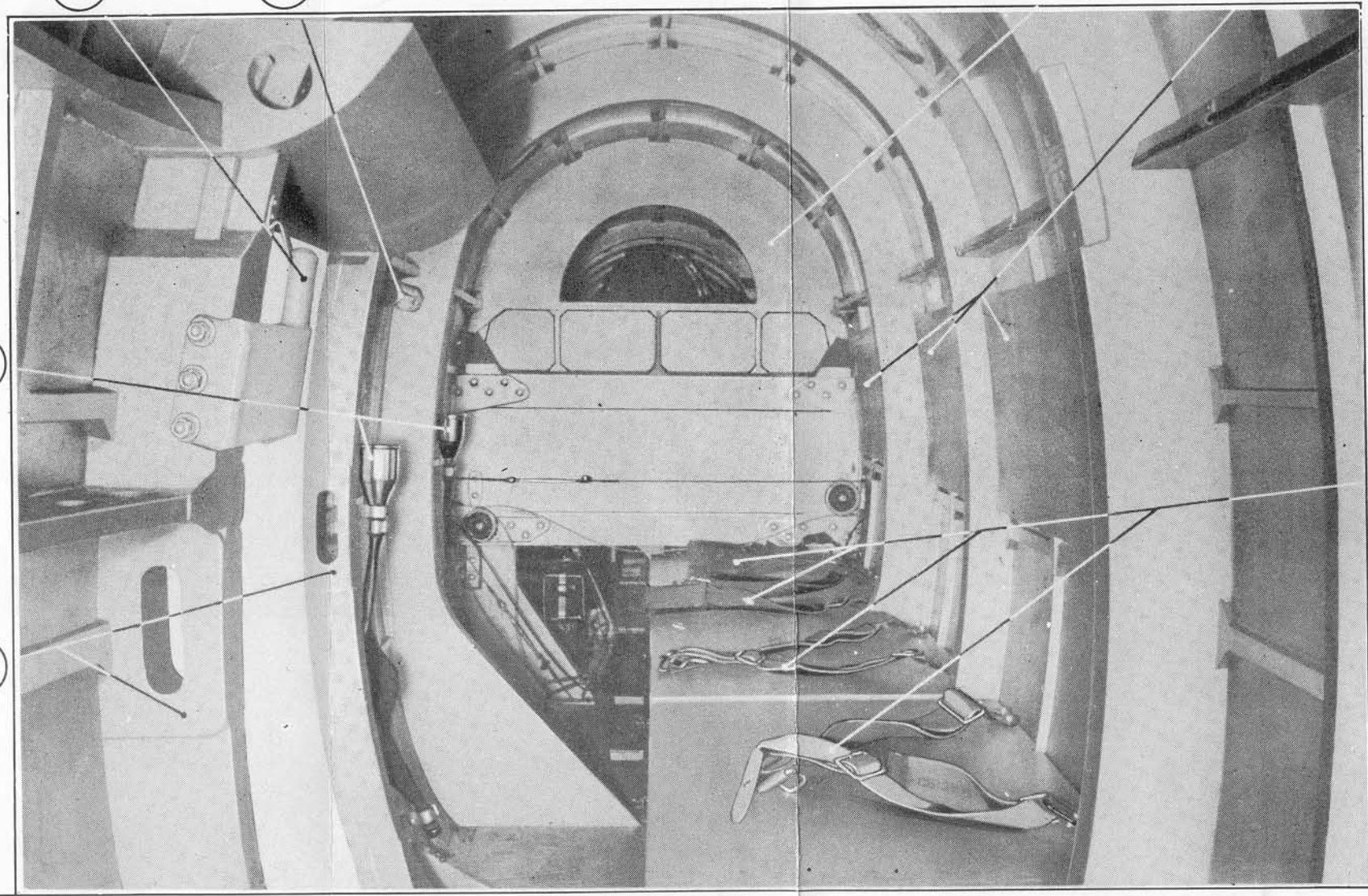

FIG. 2 REAR COMPARTMENT - LOOKING FORWARD. FIG. 2

Key to fig. 2

2. Safety harness
3. Seat backs
6. Door post handgrips
7. Sanitary bottles
10. Static line hook
11. Torch
12. Spar bulkhead

SECTION 4

INSTRUCTIONS FOR GROUND PERSONNEL

CHAPTER 1 - LOADING AND C.G. DATA

LIST OF CONTENTS

WARNING:—This chapter has not yet been amended to cover the Hotspur III glider. It applies only to Hotspur I and II gliders (*see* note on inside of front cover). (A.L. No. 8)

LIST OF ILLUSTRATIONS

CHAPTER 1 - LOADING AND C.G. DATA

Introduction

1. The purpose of the loading and C.G. data and the loading diagram (see fig.1) is to enable the position of the Centre of Gravity of the glider to be determined for any distribution of load, to enable its change of position due to the effects of troop movements, undercarriage jettisoning, etc. to be investigated, and to ensure that it is within the limits specified as showing the glider correctly loaded for flight.

2. The calculations are based on the Hotspur II only and the tare weight is based on that of gliders incorporating the modifications given in para.11. If modifications differing from, or additional to, those in the list in para.11, have been incorporated, they must be allowed for when calculating the C.G. position.

Definition of Centre of Gravity position

3. The C.G. position in the glider is defined by its distance measured parallel to the horizontal fuselage datum line, from the C.G. datum point described in para.5. The moment arm (in inches) or distance of a load item from the C.G. datum point, multiplied by the weight (in lb.) of the load item concerned, gives the moment (in lb. in.) of that item. The moment and moment arm are positive when the load item concerned lies aft of a vertical line drawn through the C.G. datum point and negative when the load item is forward of the line.

4. The moment arm is given by the expression

$$\frac{\text{Tare moment (lb.in.)} + \text{Moments of load items (lb.in.)}}{\text{Tare weight (lb.)} + \text{Weight of load items (lb.)}} =$$

$$\frac{\text{Total moment (lb.in.)}}{\text{Total weight (lb.)}} = \text{moment arm in inches}$$

C.G. datum point

5. The C.G. datum point for the Hotspur II lies at the intersection of the vertical and horizontal datum lines. The vertical datum line is perpendicular to the horizontal datum line and tangential to the centre-section leading edge and is 31 in. in front of the centre-line of the main spar frame. The horizontal or fuselage datum line is parallel to, and 16 in. below, the top surface of the top longeron.

C.G. travel limits

6. The approved C.G. travel limits for the Hotspur II vary with alteration of the loaded weight of the glider and differ according to whether belly-towing or nose-towing is utilised. The glider must always be loaded so that the C.G. position lies within the limits shown in the graph given in fig.3; these limits may only be exceeded while troops are leaving the glider by parachute. The approved limits of travel at take-off weight (3,635 lb.) are 21·9 in. to 32·9 in. aft of the C.G. datum point.

Operational notes

7. The parachute drill described in Section 3 must be observed at all times when the troops leave the glider other than in an emergency, see also para.10.

Examples of the determination of C.G. position

8. Normal loading.-	Weight (lb.)	Moment (lb.in.)
(i) Glider with pilots and troops, undercarriage and tail skid jettisoned:-	3,465	106,570
C.G. position = $\frac{106,570}{3,465}$ = 30.76 in.		
(ii) Glider with pilots, less troops and unspecified military equipment:-	1,995	48,000
C.G. position = $\frac{48,000}{1,995}$ = 24.06 in.		

9. Incorrect loading.-	Weight (lb.)	Moment (lb.in.)
(i) Occupant of seat No.3 leaves before occupant of seat No.6:-		
Glider with pilots, less occupants of seats Nos. 3, 4, 5 and 6	2,465	92,240
C.G. position = $\frac{92,240}{2,465}$ = 37.35 in.	(4.45 in. behind rear limit)	
(ii) No troops aft of spar bulkhead:-		
Glider with pilots less occupants of seats Nos. 5, 6, 7 and 8	2,465	36,880
C.G. position = $\frac{36,880}{2,465}$ = 14.97 in.	(6.93 in. before front limit)	
(iii) No troops forward of spar bulkhead:-		
Glider with pilots, less occupants of seats Nos. 3 and 4	2,935	115,820
C.G. position = $\frac{115,820}{2,935}$ = 39.45 in.	(6.55 in. behind rear limit)	

Note.- In calculating the above incorrect loadings undercarriage and tail skid are considered jettisoned and the effect of the unspecified military equipment is disregarded.

Effect of parachute drill on C.G. position

10.

Troop movement (numbers correspond to seats normally occupied by troops)	C.G. position aft of C.G. datum
No.8 out	25.18 in.
No.4 out and No.7 in No.8 seat	30.43 in.
No.7 out and No.3 in No.4 seat	25.38 in.
No.6 in No.8 seat and No.5 in No.7 seat	32.79 in.
No.6 out	25.82 in.
No.3 out and No.5 in No.8 seat	32.77 in.
No.5 out	24.15 in.

Ballasting

11. Light-load.- Light-load ballasting (Mods.Nos.68 and 101) is necessary when flying with one pilot only, who must occupy the front pilot's seat. Lead disc weights, each weighing 17½ lb., are carried on each side of the fuselage, on a removable tubular ballast bar mounted on the main bulkhead, forward of the front pilot's seat (see fig.2). The number of ballast weights used is as follows:-

(i)	Belly-towing	8 weights (140 lb.)
(ii)	Belly-towing and full dual control	7 weights (122½ lb.)
(iii)	Nose-towing	4 weights (70 lb.)

The moment arm of light-load ballasting is -132.0 in.

12. Full-load.- Full-load ballasting (Mods.102 and 103) is used when it is required to fly at the full all-up weight or at any intermediate weight, without carrying troops in the glider; two pilots must always be carried with this form of ballasting. Two platforms fixed to the crew's seats, and a mounting alongside the battery (see fig.2), carry weights, each of which weighs approximately 51½ lb. The correct number and disposition of these weights to make up an all-up weight of 3,606.5 lb. is shown in fig.2; the weight of each pilot, with his parachute, must be brought up to 200 lb. by additional ballasting at his seat, if necessary. The moment arms of the six ballast stations are given in fig.2 and it is thus possible to calculate the correct location and number of 51½ lb. ballast weights required to load the glider to intermediate loadings while keeping the C.G. position within the limits given in the graph in fig.3. Two examples of such intermediate loading, to 2,674.5 lb. and 3,143 lb., respectively, are shown in fig.2.

Modifications included

13. The tare weight and loading shown in fig.1 include the following modifications:-

Nos.:- 1, 3, 4, 5, 6, 11, 15, 16, 17, 18, 19, 20, 21, 24, 26, 27, 29, 30, 31, 32, 33, 34, 36, 37, 39, 41, 42, 43, 46, 47, 49, 50, 57, 59, 61, 65, 70, 73, 74, 81, 84, 88, 92, 98, 110, 111, 113, 114, 117, 119, 123, 124, 128, 135, 138.

The tare weight given in fig.2 includes, in addition to the foregoing

modifications, Mod.No.102.

Change of weight and moment due to modifications

14. Modifications that are incorporated in the glider but are not listed in para.13 are additional to those included in figs.1 and 2 and must be allowed for when calculating the total weight and C.G. position. The following table gives changes of weight and moment due to such additional modifications; the weights in the table affect tare load, unless listed as removable items.

Mod. No.	Description	Weight (lb.)	Moment (lb.in.)
2	Incorporation of metal rudder slides for both pilots	+ 0.70	- 78.40
7	Larger flaps	+ 0.61	+ 41.48
9	Bearing in aileron circuit	+ 1.50	- 39.00
13	Release pin for pilot's hood	+ 2.34	- 179.01
23	Larger dome on Mk.II hood	+ 13.0	- 975.0
25	Pilot's seats altered	+ 0.48	- 28.8
35	Strengthened mounting for flap lever	+ 1.56	- 154.4
48	30% hinge position aileron installation	+ 5.0	+ 310.0
54	Cable guards on frame 19	+ 3.50	+ 119.0
56	Improvements to hood latch	+ 0.30	- 22.5
59	Entrance door altered	- 0.05	- 1.65
60	Strengthening flap lever	+ 0.20	- 22.0
62	Control column bearing	+ 0.28	- 25.2
63	Shrouding on fin and tail plane	+ 4.00	+ 1,200.0
64	Main wheel strut guide tube	+ 0.85	+ 18.7
66	Keel, strengthened attachment at frame 35	+ 0.12	+ 21.2

Mod. No.	Description	Weight (lb.)	Moment (lb.in.)
67	Main wheel units jettison lever	+ 0.06	- 5.4
68	Light-load ballast weights (fixed parts)	+ 2.94	- 388.0
69	Cranked control column introduced	+ 0.75	- 67.5
71	Rubbing plate for flap cable	+ 0.10	- 9.9
72	Extra plates on spar	+ 0.77	+ 23.9
75	Holes in joint bolts	- 0.25	- 7.7
76	Longeron joint	+ 2.20	+ 154.0
77	Instruments for rear pilot	+ 11.10	- 821.4
78	Distance piece on c/s spar	+ 0.08	+ 2.48
79	Pilots' hood strengthened	+ 0.20	- 7.2
85	Stabilizing spool on main plane joints	+ 1.43	+ 44.33
86	Guard at frame 6 for flap lever	+ 0.08	- 6.56
87	Hand guard for flap lever	+ 0.17	- 17.34
89	Inspection doors in floor by cabin doors	+ 0.15	+ 7.65
90	Substitution of nose-towing for belly-towing	+ 21.0	- 3,276.0
96	Access holes for control surfaces hinge fittings, fin, tail plane and main plane	+ 0.50	+ 100.0
104	Dual flap operation	+ 9.0	- 612.0
107	Strengthening floor between frames 1 and 3	+ 0.02	- 2.42
112	Hood attachment hinges	+ 0.02	- 1.42
115	Deletion of interior finish	- 10.0	- 310.0
118	Stronger cable for main wheel jettisoning	+ 0.04	+ 1.2
134	Nose of elevator covered with madapollam	+ 0.15	+ 45.0

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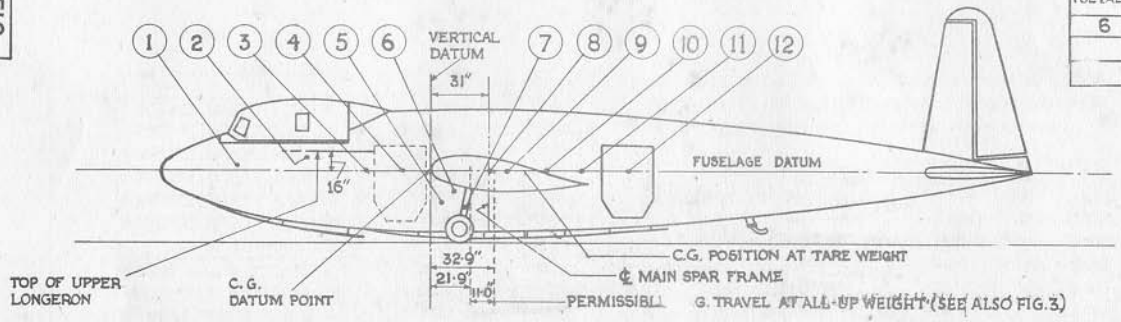
FIG. 1



REMOVABLE ITEMS OF MILITARY LOAD	ITEM	WEIGHT (LB.)	ARM. (IN.)	MOMENT (LB. IN)
FIRST PILOT AND EQUIPMENT	1	200	-101	-20,200
SECOND PILOT AND EQUIPMENT	2	200	-63·7	-12,740
TROOP IN SEAT No 3, & EQUIPMENT	3	235	-32·5	-7,640
TROOP IN SEAT No 4, & EQUIPMENT	4	235	-14·8	-3,480
TROOP IN SEAT No 5 & EQUIPMENT	9	235	41·6	9,780
TROOP IN SEAT No 6 & EQUIPMENT	10	235	60·1	14,120
TROOP IN SEAT No 7 & EQUIPMENT	11	235	80·8	18,990
TROOP IN SEAT No 8 & EQUIPMENT	12	235	106·1	24,930
BATTERY	5	34	5·5	187
THERMOS FLASKS AND SANITARY BOTTLES	6	22	13·0	286
UNSPECIFIED EQUIPMENT	8	60	31·0	1,860
TOTAL REMOVABLE ITEMS OF MILITARY LOAD		1,926		26,093
GLIDER AT TARE WEIGHT		1,539	52·3	80,477
UNDERCARRIAGE AND TAIL SKID	7	133	30·65	4,077
ALL-UP WEIGHT (TAKE-OFF)		3,598	30·75	110,647

C.G. MOVEMENT	PARACHUTE DRILL
	GLIDER WITH PILOTS AND TROOPS. UNDERCARRIAGE AND TAIL-SKID JETTISONED
	TROOP No 8 OUT
	TROOP No 4 OUT AND No 7 IN SEAT No 8
	TROOP No 7 OUT AND No 3 IN SEAT No 4
	TROOP No 6 IN SEAT No 8 AND No 5 IN SEAT No 7
	TROOP No 6 OUT
	TROOP No 3 OUT AND No 5 IN SEAT No 8
	No 5 OUT
	GLIDER WITH PILOTS, LESS TROOPS

FRONT LIMIT

REAR LIMIT

NOTE :– FOR THE PURPOSE OF THESE CALCULATIONS, TROOPS ARE NUMBERED IN ACCORDANCE WITH THE SEAT THEY OCCUPIED AT TAKE OFF. ITEM 8 IS CONSIDERED JETTISONED SEPARATELY BEFORE No 8 LEAVES

MAXIMUM PERMISSIBLE ALL-UP WEIGHT--- 3,635 LB.
LIMITS OF PERMISSIBLE C.G. TRAVEL------ 21·9" TO 32·9" AFT OF C.G DATUM POINT

※ C.G. POSITION IF TROOP No 3 LEAVES IN ERROR BEFORE No 6

FIG. 1

HOTSPUR II. LOADING AND C.G. DIAGRAM

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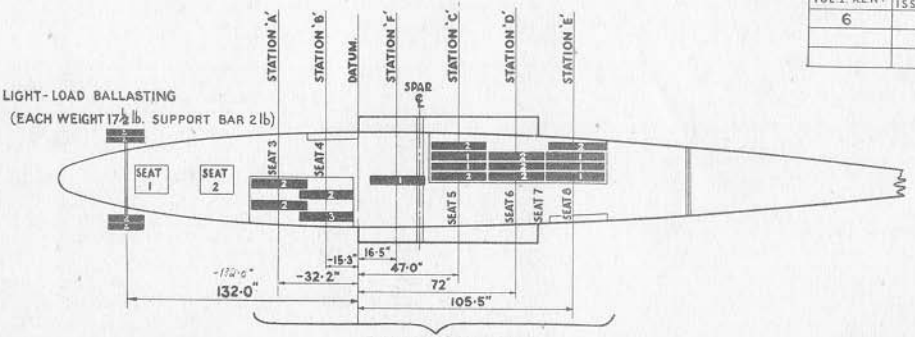
FIG. 2

BALLASTING



FULL-LOAD BALLASTING

ITEM.	WEIGHT (LB)	ARM (IN)	MOMENT (LB. IN.)
GLIDER AT TARE WEIGHT.	1544·5	50·0	77,201
UNDERCARRIAGE AND TAIL SKID.	133	30·65	4,077
BATTERY	34	5·5	187
THERMOS FLASKS & SANITARY BOTTLES.	22	13	286
SET OF BALLAST SUPPORTS	82·5	43·9	3,620
FIRST PILOT & EQUIPMENT	200	-101	-20,200
SECOND PILOT & EQUIPMENT	200	-63·7	-12,740
TOTAL WITHOUT BLOCKS	2216·0	23·6	52,431
4 BALLAST BLOCKS STATION 'A'	206	-32·2	-6640
5 BALLAST BLOCKS STATION 'B'	257·5	-15·3	-3,940
6 BALLAST BLOCKS STATION 'C'	309	47·0	14,500
6 BALLAST BLOCKS STATION 'D'	309	72·0	22,230
5 BALLAST BLOCKS STATION 'E'	257·5	105·5	27,150
1 BALLAST BLOCK STATION 'F'	51·5	16·5	850
	3606·5	29·5	106,581

EXAMPLES OF INTERMEDIATE LOADINGS

	ITEM.	WEIGHT (LB)	ARM (IN)	MOMENT (LB. IN)
I	TOTAL WITHOUT BLOCKS.	2216·0	23·6	52,431
	4 BLOCKS STATION 'A'	206	-32·2	-6,640
	3 BLOCKS STATION 'C'	154·5	47·0	7,260
	2 BLOCKS STATION 'D'	103	72·0	7,420
	GLIDER LOADED (I)	2679·5	22·6	60,471
II	TOTAL WITHOUT BLOCKS	2216·0	23·6	52,431
	3 BLOCKS STATION 'A'	154·5	-32·2	-4970
	5 BLOCKS STATION 'B'	257·5	-15·3	-3,940
	6 BLOCKS STATION 'D'	309	72·0	22,230
	4 BLOCKS STATION 'E'	206	105·5	21,720
	GLIDER LOADED (II)	3143·0	27·8	87,471

NOTE:-
IN ALL CASES OF LOADING, IT IS ESSENTIAL THAT A POINT REPRESENTING THE TOTAL WEIGHT AND C.G. ARM OBTAINED, WHEN PLOTTED ON THE C.G. LIMITS GRAPH, SHALL LIE WITHIN THE SHADED AREAS, SEE FIG. 3.

FIG. 2

CHAPTER 2 - HANDLING AND GENERAL PREPARATION

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LIST OF ILLUSTRATIONS

CHAPTER 2 - HANDLING AND GENERAL PREPARATION

1. General.- This chapter contains information on handling the glider on the ground and preparing it for flight; a list of ancillary equipment is given in relevant M leaflet of Vol.II of this Publication.

2. Ground towing.- A tow rope may be attached to the tubular ferrule incorporated in the front landing skid at its point of attachment to the fuselage, aft of the nose fairing. The glider should not be towed backwards by a rope attached to the landing skid, and before it is towed over a concrete or similar surface, the undercarriage units should be fitted, in order to avoid damage to the landing skid.

3. Jacking and trestling.- The jacking and trestling points are shown in fig.1; the location of fuselage frames referred to in this paragraph is given in Sect.7, Chap.1, fig.1. At the rear end the fuselage may be lifted by means of a sling passed under frame 39 and a trestle put in position at frame 42. At the front end the fuselage may be lifted at the jacking points on the underside of the main plane centre section, just inboard of the wing root joints, and the appropriate trestle placed in position at frame 8. The steadying trestles should then be placed under the main plane at rib 10 on each side. It may be necessary to pack-up the base of the jacks in several stages in order to raise the fuselage to the required height, during which operation the trestles should remain in position and should be adjusted accordingly before the jacks are removed. After finally removing the jacks, place additional trestles in position at frames 16 and 31.

4. Inspection of main undercarriage units.- Main undercarriage units which have been jettisoned during take-off must be inspected, in the following manner, for possible damage, before being assembled to the glider.

(i) Remove any trace of dirt or foreign matter from the components and, in particular, ensure that the spline and the upper portion of the outer tube are clean and that they slide freely in the housing.

(ii) Remove the attachment bolts (5) (see Chap.3, fig.4) at the lower end of the outer tube and withdraw the inner tube, lower bearing and piston. Examine the rebound piston (6) and the main piston (7) for visible signs of damage or deformity.

(iii) Check that the inner tube (8) and the outer tube (9) are in correct alignment.

(iv) Examine the axle to ensure that it is not bent and that the landing wheels revolve freely.

(v) Carry out a general inspection of the wheels, hubs and tyres; check that the tyres have not burst or punctured.

(vi) Before re-assembling the strut, the rubber discs should be examined to ensure that they are not perished, particularly if the unit has been in service for an appreciable length of time.

If, as a result of this inspection, the undercarriage unit is found to be damaged in any way, it must be rejected for maintenance operations (see Chap.3) and a new unit used in its place.

5. Undercarriage assembly - general.- In order to assemble the undercarriage units the glider should be trestled clear of the ground (see para.3) or drawn up on a ramp, so that ample clearance is available for inserting the units in their housings. The tail skid, if of the jettisonable type, must be assembled before the main units.

6. Undercarriage assembly - tail skid.- The procedure for assembling the jettisonable-type tail skid to the fuselage is as follows :-

(i) Free the release plunger of the jettison mechanism by operating the undercarriage jettison lever in the cockpit (see Sect.1).

(ii) Push the tail skid strut home in the fuselage housing tube.

(iii) Operate the jettison lever in the cockpit to free the release plunger of the jettison mechanism and enable it to engage the annular groove at the upper end of the tail skid.

(iv) Check that the tail skid is locked securely.

7. Undercarriage assembly - main units.- The procedure for assembling each main undercarriage unit to the glider is as follows :-

(i) Fit the jettison spring to the undercarriage leg and compress it sufficiently to enable a bolt to be inserted in the hole (see Chap.3, fig.4) in the outer tube (9) to retain the spring in this position.

(ii) Ensure that the upper portion of the outer tube is clean and adequately lubricated.

(iii) Insert the outer tube of the strut in the undercarriage housing and, holding the unit by its external skid, push it upwards as far as it will go.

(iv) Hold the unit so that no movement can take place, using blocks beneath the wheels if necessary, and withdraw the bolt which was inserted temporarily to hold the jettison spring; push the unit fully home in the housing.

(v) Pull the release pin of the jettison mechanism back against its spring and engage it with the hole in the link plate on the end of the cable attachment.

NOTE:- After all three undercarriage units have been assembled to the glider the jettison lever in the cockpit (see Sect.1) should be operated while the glider is still supported clear of the ground, and a check made to ensure that the system is functioning correctly, and that the flaps which close the lower ends of the main unit housings shut correctly after the main undercarriage units have been jettisoned. If this is the case, the tail skid and main units should be re-assembled as described in paras. 6 and 7. After the trestles have been removed and the glider is resting on its wheels, check that the length of inner tube protruding from the outer tube is approximately 4 in.

8. Tow cable attachment.- The cable connecting the glider to the tug aeroplane is attached to the former in the following manner:-

(i) Feed the chain in which the cable terminates up through the fairlead tube on the underside of the fuselage.

(ii) Open the jaws of the hook which retains the tow cable by holding the lever to which the cockpit control-cable is attached, back against its spring.

(iii) Place the end link of the tow-cable chain in the open jaws of the hook and release the control-cable lever, thus allowing the jaws of the hook to close and secure the chain.

NOTE:- After attachment of the tow cable has been accomplished, an inspection should be made to ensure that the jaws of the jettison hook are properly closed, while a pull is exerted on the cable from outside the glider. Still exerting a pull on the cable, operate the cockpit jettison control (see Sect.1) and check that the cable releases freely. If this is the case, re-attach the cable as described above.

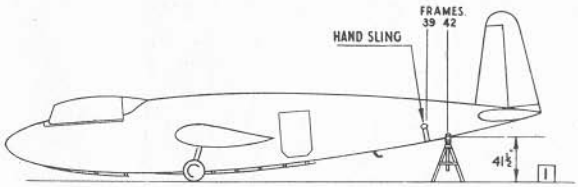
9. Picketing.- Permanent picketing rings are fitted on the undersurface of the main plane near the wing tips. Ropes may also be passed through the front landing skid attachment and through the tubular fairlead at the lower end of fuselage frame 47 (see Sect.7, Chap.1, fig.1).

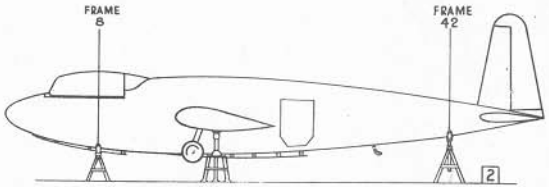
10. Weather-proof covers.- A weather-proof cover is provided for the cockpit hood of the Mk.II glider, fastened by means of three pairs of tapes passing round the fuselage and tied on the underside. A cover is also provided for the fuselage; it fits round the wing root and tail plane root and is fastened by tapes passing round the fuselage and tied on the underside. Covers for the upper surfaces of the main plane and tail plane are also supplied and are retained in position by tapes tied on the underside of the planes. Another cover is supplied, which slides over the top of the fin and rudder unit.

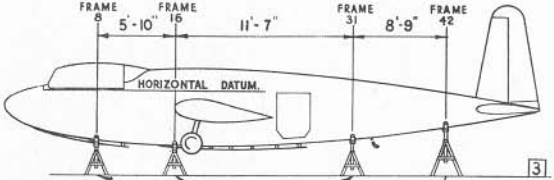
11. Lifting a crashed glider.- To lift a crashed Mk.I glider the cabin hood should be removed and a lifting beam placed under the cross members at

fuselage frames 16 and 19 (see Sect.7, Chap.1, fig.1), to which a single lifting cable may be attached. If necessary, steadying lines may be run from the picketing points described in para. 9. The Mk.II glider may be lifted by means of the eyebolt on the top fuselage frame 26, and steadying lines attached to the picketing points, or, if slinging tackle is used, by means of this eyebolt and the wing-attachment bolts on the upper wing-spar boom lugs, after the planes have been removed.

FIG. 1

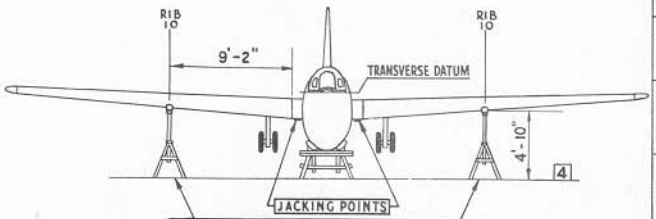






ONE TRESTLE 'B'
TWO SUPPORTS 'C'
ONE FUSELAGE BEAM 'E'
TWO ADJUSTABLE JAWS 'F'
AT EACH OF THESE POINTS

ONE TRESTLE 'A'
TWO SUPPORTS 'C'
ONE FUSELAGE BEAM 'E'
TWO ADJUSTABLE JAWS 'F'



ONE TRESTLE 'A' TWO SUPPORTS 'D'
ONE WING TIP BEAM 'H' AT THESE POINTS

ITEM	DETAIL	AIRBORNE FORCES EST ORG. Nº REF.
TRESTLE 3'-0"	A	209
TRESTLE 2'-0"	B	209
SUPPORTS 2'-2½"	C	135
SUPPORTS 3'-8½"	D	136
FUSELAGE BEAMS	E	135
ADJUSTABLE JAWS	F	135
WING TIP BEAMS	H	136

FIG. 1

JACKING & TRESTLING

CHAPTER 3 - MAINTENANCE

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

CHAPTER 3 - MAINTENANCE

Introduction

1. The information in this chapter describes the procedure to be adopted when carrying out certain of the operations called for in the Maintenance Schedule, Vol.II, Part 2 of this Publication; therefore it does not necessarily cover all the operations that may be involved in the maintenance of this glider. A list of special tools and equipment necessary for maintenance is contained in Vol.III of this Publication, and in the relevant M leaflet of Vol.II. For information and maintenance notes on equipment not dealt with in this chapter, reference should be made to the appropriate Air Publication; instruments are dealt with in A.P.1275.

RIGGING

General

2. Rigging is limited to a general check of the setting of the outer planes, tail plane and fin, relative to the fuselage and to checking and, if necessary adjusting, the range of movement of the control surfaces; the correct settings are set out in fig.5. If the corresponding port and starboard diagonal dimensions exceed the limits given in fig.5, the whole structure should be examined to ascertain the cause.

Rigging position

3. The glider should be supported on trestles as described in Chap.2 and the trestles adjusted until the fuselage datum is truly horizontal and the main plane level transversely. A check should be carried out by applying a straightedge and spirit level, respectively along and across the top longerons at the cockpit, after the hood has been opened or removed.

Checking the outer planes

4. The rigging of the outer planes may be checked by placing incidence boards in position at ribs 2 and 16 (*see* Sect.7, Chap.2) and measuring the dihedral along the upper surface of the spar centre-line of each plane.

Checking the tail plane

5. The rigging of the tail plane may be checked by placing an incidence board at frame 2 (*see* Sect.7, Chap.1, fig.1) and measuring the incidence.

Checking the rear fuselage

6. The rear fuselage may be checked by applying a straightedge and spirit level along the top of the rear spar of the tail plane and comparing

Amended by A.L.No.4

the transverse level with that of the longerons at the cockpit (see para.3). The tail plane should first be checked as described in para.5.

Checking and adjusting the control surfaces

7. Ailerons.- The ailerons should be set so that their trailing edges are in line with the trailing edge of the main plane (no droop intended) when the control columns are vertical. Adjustment is made by means of the turnbuckles B, C and D (see fig.6), which should be adjusted so that the outboard edge of the lever at the wing root is parallel with the centres of the outer plane attachment bolts. The adjacent lever on the main plane spar should be parallel with the end rib. The differential unit should be adjusted by means of the turnbuckles L so that a line drawn through the attachment holes for the cable would be at right angles to the main plane spar, which may be checked with a set square. Further adjustment is provided on the aileron connecting rod. Check that the range of aileron movement is correct.

8. Elevators.- The elevators should be set so that their trailing edges are in line with the trailing edge of the tail plane when the control columns are vertical; adjustment is made by ensuring that the connecting rod between the elevator and the balance lever has approximately 13.9 in. centres. If further adjustment is necessary, it should be made by means of turnbuckles F (see fig.6). Check that, thus adjusted, the range of movement is correct.

9. Rudder.- The rudder should be set so that it is line with the fin when the rudder slides, or bars, are in the neutral position; adjustment is made by means of turnbuckles H and K on the rudder lever (see fig.6). Check that, thus adjusted, the range of movement is correct.

10. Flaps.- The flaps should be set so that they are firmly closed by the return-cord when the control levers are in the forward position (see Sect.1). Examine the return-cord at the flap end to ensure that it is positioned correctly and adjust the operating cable by means of the turnbuckle A, just aft of the front pilot's seat, and turnbuckle E (see fig.6). Check that, thus adjusted, the range of movement is correct.

11. Elevator trimming tabs.- The tab on the port elevator should be set so that its trailing edge is in line with the trailing edge of the elevator when the control lever (see Sect.1) is held by the ratchet midway between the stops; adjustment is made by means of the Bowden adjusters V, at the rear of the control lever quadrant in the cockpit. Check that, thus adjusted, the range of movement is correct. The tab on the starboard elevator should be set approximately 16° upwards in relation to the chord of the elevator and fixed in this position.

UNDERCARRIAGE

Jettison mechanism

12. With the control lever (see Sect.1) in the rearward position ensure

that the release pins for the main wheel units and tail skid (jettisonable-type) are recessed within their guide tubes to an extent of at least 0.1 in.. Check that the link plate at the upper end of the main wheel unit support-cable drops freely from the release catch (see fig.4 and Sect.7, Chap.4, fig.1). If the actuating-cord of the housing-tube flap fails to close the flap securely after the undercarriage leg has been jettisoned, it should be removed and a new cord substituted.

13. Adjustment is made by means of a turnbuckle adjacent to the control lever and by the individual stops P (see fig.6) for the Bowden outer casings. Adjustment of the tail skid release cable is confined to the stops for the Bowden outer casing, one at each end of the cable.

Main wheel units

14. With the glider trestled clear of the ground (see Chap.2) check that the outer tube of the undercarriage leg (see fig.4) has not been distorted during the jettisoning process, as follows. Assemble the leg in the undercarriage housing tube, but do not fit the ejector spring. After the leg has been pushed home against the stop plate at the top of the housing it should fall out automatically under its own weight. An additional check for freedom of movement should be made by withdrawing the leg until the spline is free from its slot in the upper bearing and then rotating it in the housing. While withdrawing the leg, note that the spline is sliding freely in the slot. Conversely, there should not be unneccessary clearance between the unit and the housing and if this is the case the lower bearing should be renewed. If the leg is binding in the housing it should be eased where necessary by the application of emery cloth.

15. Examine the piston and lower bearing, which should be renewed if excessive wear is evident. At the same time, examine the rubber discs and rebound rubber and renew where necessary. To examine these parts, dismantle the undercarriage leg, as follows :-

(i) Unwire and remove the attachment bolts at the lower end of the outer tube.

(ii) Withdraw the inner tube and piston.

(iii) Remove the lower bearing and rebound rubber.

(iv) The rubber discs and separate plate may now be withdrawn.

With the leg dismantled, test that the inner tube slides freely in the outer tube with the rubber discs and plates omitted.

Tail skid

16. Jettisonable-type.- If the shock-absorber cord is slack, replace it with a new cord, stretched into position and formed into eight coils (four inner and four outer) between the two portions of the skid. If the shoe of the skid is worn it should be renewed. If the tubular portion is bent it may be straightened out, unless badly damaged, in which case it should be replaced.

17. Fixed-type.- If the rubber block is perished or loosely attached, the complete assembly, comprising block and the end plates to which it is vulcanised, should be replaced. The steel facing strip should be renewed if badly worn.

Fuselage skid

18. Replace the ash skids and the complete rubber shock-absorber units if they show signs of wear or deterioation.

TOW RELEASE UNIT

Checking and adjustment

19. With the control lever (see Sect.1) in the forward position ensure that the release-hook of the tow-release mechanism is fully closed. Adjust the control cable until it has just sufficient freedom to allow the hook to remain easily in the fully closed position. Adjustment is made by means of the cable outer casing stops either in the cockpit, or at the release hook end of the cable. After adjusting the cable, move the cockpit control lever to the rearward position and check that the release hook is fully open and, after fitting the tow-cable, test the release mechanism as described in Chap.2. If any serious wear has occurred the release mechanism should be replaced by a new unit.

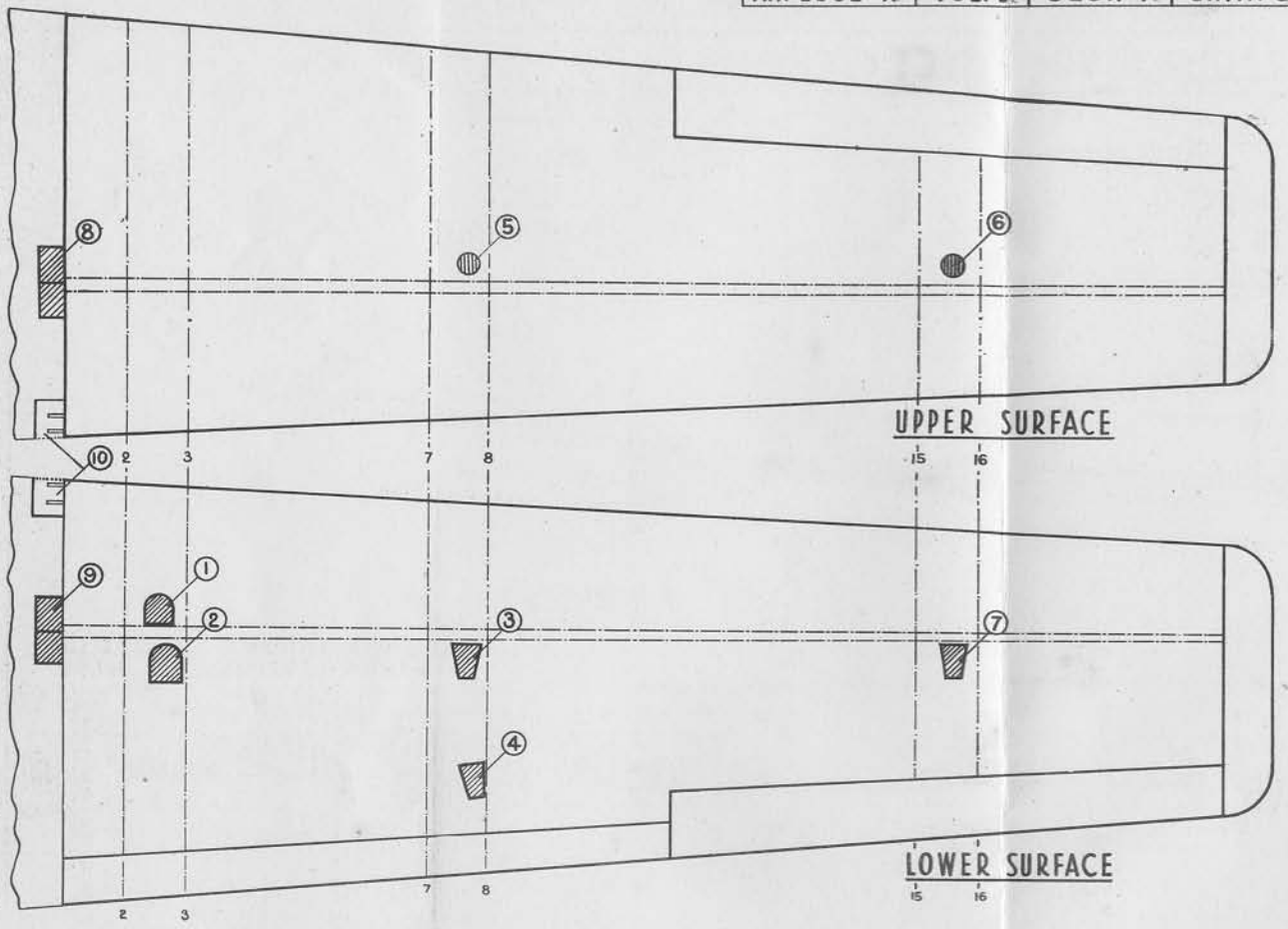
MISCELLANEOUS

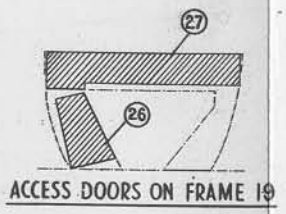
Pressure head

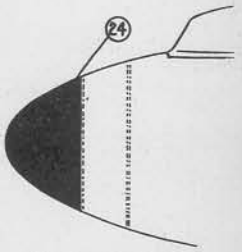
20. The pressure tube of the pressure head should be clear of the fuselage surface to an extent of at least 6 in..

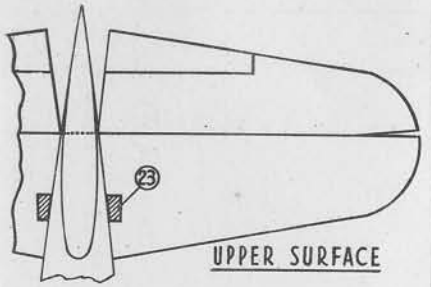
Bonding

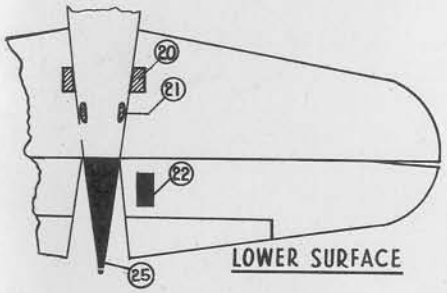
21. Bonding is confined to an external brass strip along the undersurface of the fuselage, from frame 1 to frame 49 (see Sect.7, Chap.1, fig.1). Ensure that this strip is properly secured to the bracket at the front of the landing skid, to the tow-release unit and to the tailskid housing.

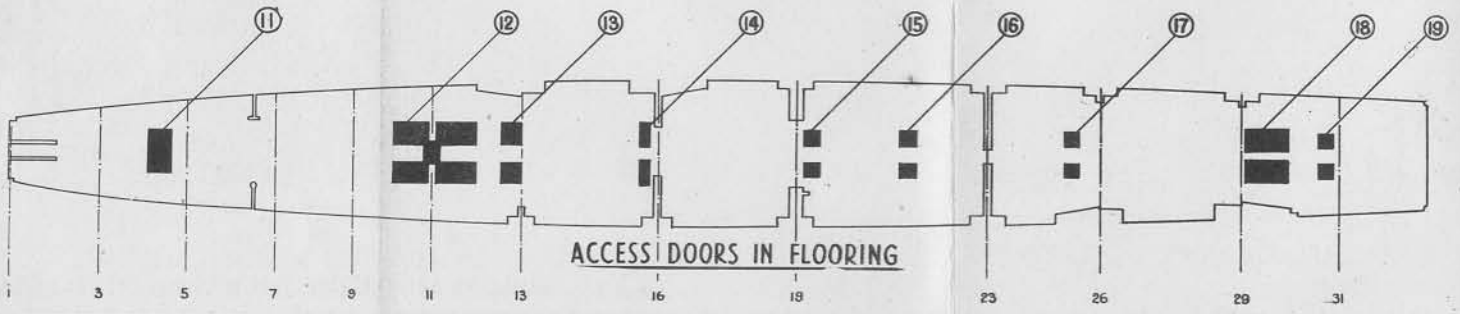












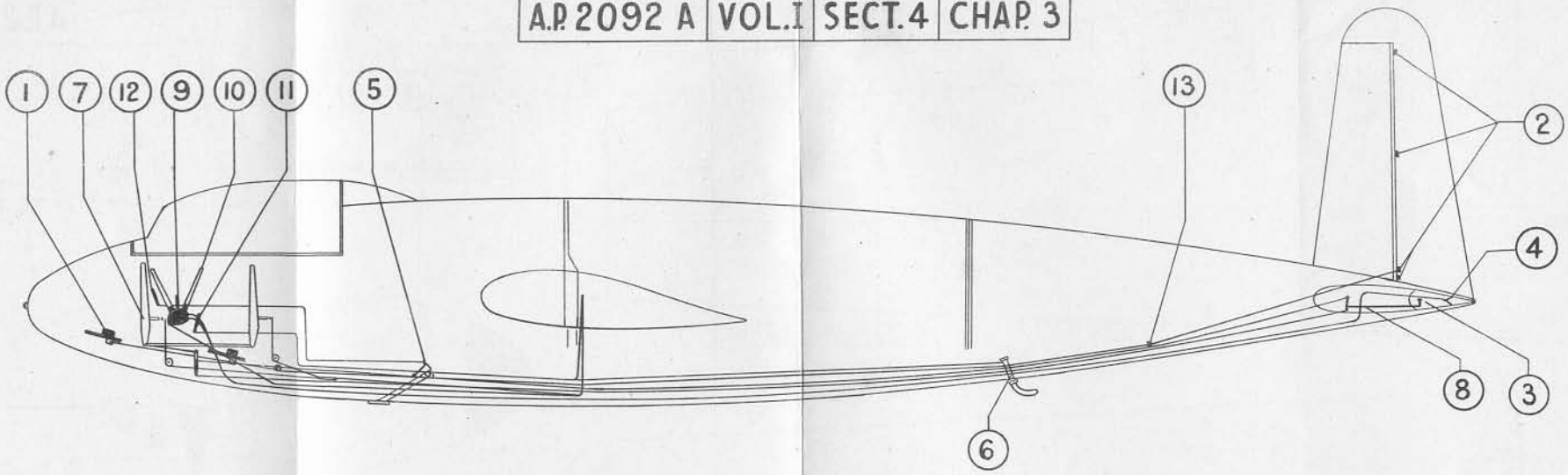
ACCESS DOORS
REMOVABLE PANELS
FABRIC PATCHES

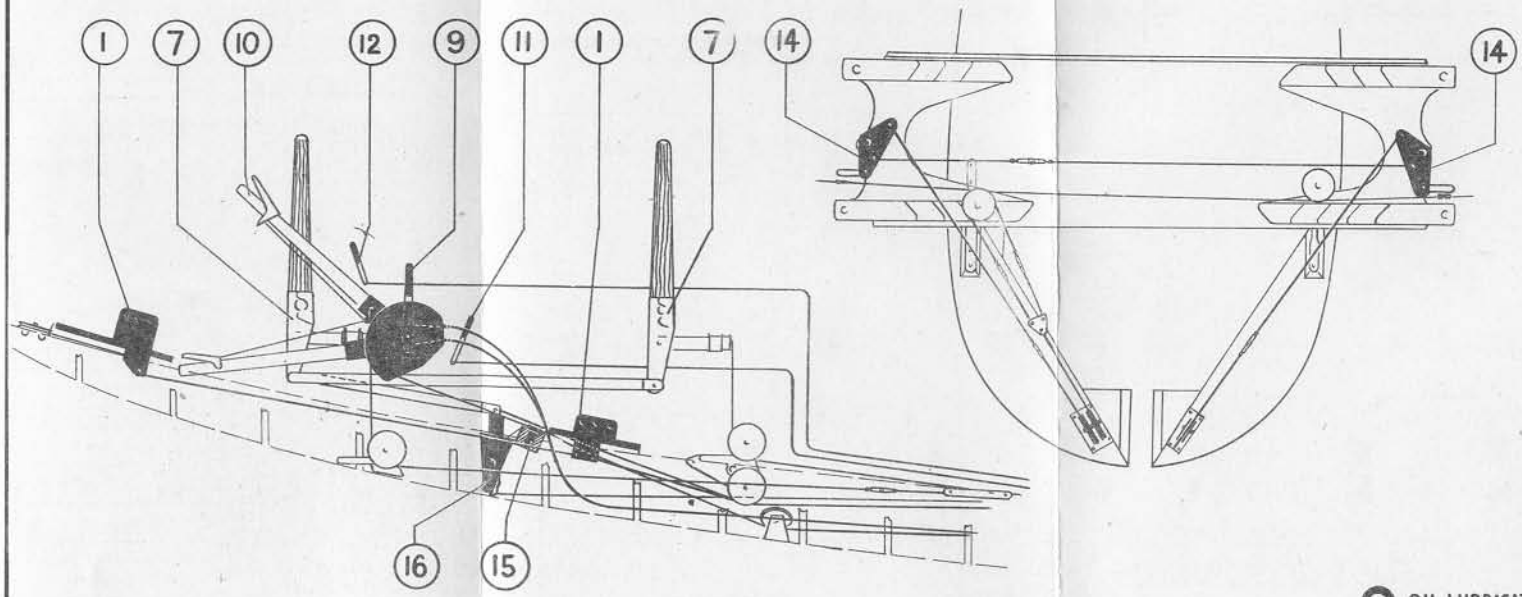
REF.	DESCRIPTION
27	ACCESS DOOR TO CONTROL CABLE ON CENTRE-SECTION SPAR
26	ACCESS DOOR TO CONTROL CABLE ON FRAME 19 (PORT)
25	DETACHABLE REAR FAIRING FOR ACCESS TO TAIL PLANE ATTACHMENTS ON FRAME 49
24	DETACHABLE NOSE FAIRING FOR ACCESS TO FRONT COCKPIT
23	ACCESS DOORS ON TOP SURFACE FOR TAIL PLANE ROOT JOINT
22	ACCESS PANEL TO FAIRLEADS FOR PORT TRIM TAB CONTROL
21	ACCESS DOORS FOR ELEVATOR CONTROL LEVER BETWEEN FRAMES 47 & 49
20	ACCESS DOORS ON BOTTOM SURFACE FOR TAILPLANE ROOT JOINT
19	ACCESS PANELS TO PULLEYS AT FRAME 31
18	ACCESS PANELS TO CONTROL CABLES AT FRAMES 29 & 30
17	ACCESS PANELS TO CONTROL CABLES AT FRAME 25
16	ACCESS PANELS TO CONTROL CABLES AT FRAME 21
15	ACCESS PANELS TO PULLEYS & FAIRLEADS AT FRAME 19
14	ACCESS PANELS TO FAIRLEADS AT FRAME 16
13	ACCESS PANELS TO FAIRLEADS AT FRAME 13
12	ACCESS PANELS TO AILERON CONTROL CABLES JOINT
11	ACCESS PANELS TO AILERON CONTROL PULLEYS
10	RHODOID ACCESS PANEL FOR L.E. ATTACHMENT
9	ACCESS DOORS TO LOWER WING ROOT JOINT PIN
8	ACCESS DOORS TO UPPER WING ROOT JOINT PIN
7	ACCESS DOORS TO AILERON DIFFERENTIAL
6	FABRIC PATCH FOR DIFFERENTIAL ACCESS
5	FABRIC PATCH FOR FLAP PULLEY ACCESS
4	ACCESS DOOR TO FLAP RETURN GEAR
3	ACCESS DOOR TO FLAP PULLEY
2	ACCESS DOOR TO UNDERCARRIAGE RELEASE CATCH
1	ACCESS DOOR TO UNDERCARRIAGE HOUSING

FIG. 1

DIAGRAM OF ACCESS DOORS, ETC.

FIG. 1





ALL BOWDEN CONTROLS TO BE LUBRICATED WITH GRAPHITED WAX. STORES REF. 34A/94.

	LOCATION	No. OF POINTS	LUBTN
1	RUDDER SLIDES	24	
2	RUDDER HINGES & CONNECTIONS	5	
3	ELEVATOR HINGES & CONTROL CONNECTION	5	■ GREASE
4	TRIMMER TABS.	4	
5	TOW RELEASE CATCH	10	
6	TAIL SKID RELEASE DEVICE	4	
7	CONTROL COLUMNS	9	
8	ELEVATOR LEVER ON FRAME 47	2	
9	ELEVATOR TRIM. CONTROL LEVER	5	
10	FLAP CONTROL LEVER	8	
11	UNDERCARRIAGE JETTISON LEVER	3	O OIL
12	TOW RELEASE LEVER	3	
13	RUDDER LEVER AT FRAME 39	5	
14	AILERON LEVERS AT ROOT JOINT	8	
15	FLAP LEVER ON FLOOR	3	
16	ELEVATOR LEVER AFT OF FRAME 5	3	
-	ALL CABLE CONNECTING PINS	-	

O OIL LUBRICATING ANTI-FREEZING TYPE 'B' STORES REF. 34A/55 & 56

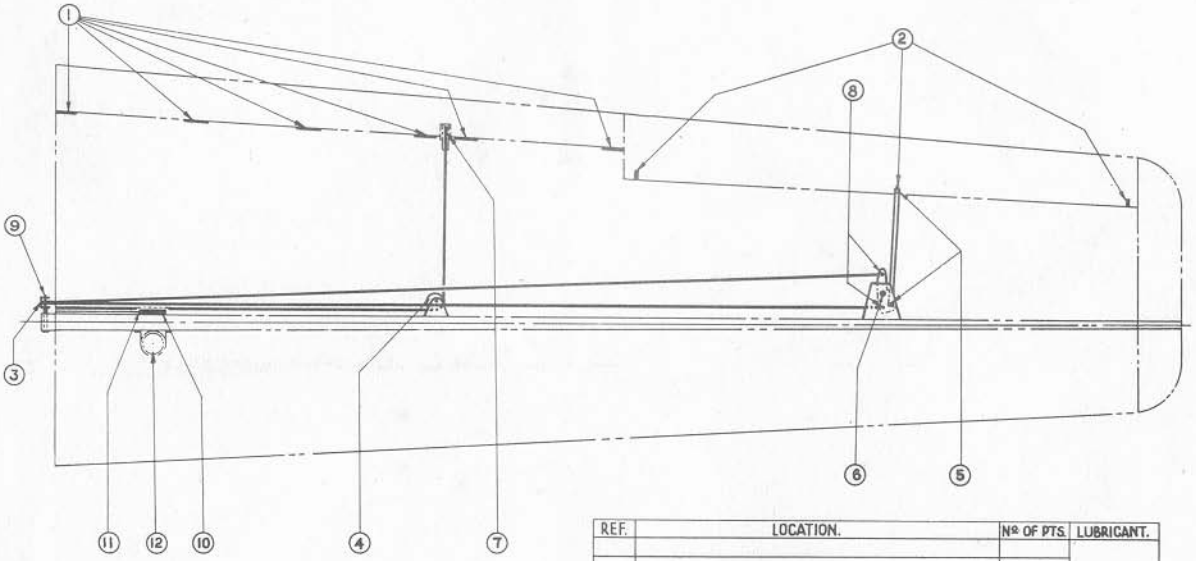
■ GREASE ANTI-FREEZING STORES REF. 34A/49

FIG. 2

GENERAL LUBRICATION DIAGRAM

FIG. 2

FIG. 3
F.S. 5



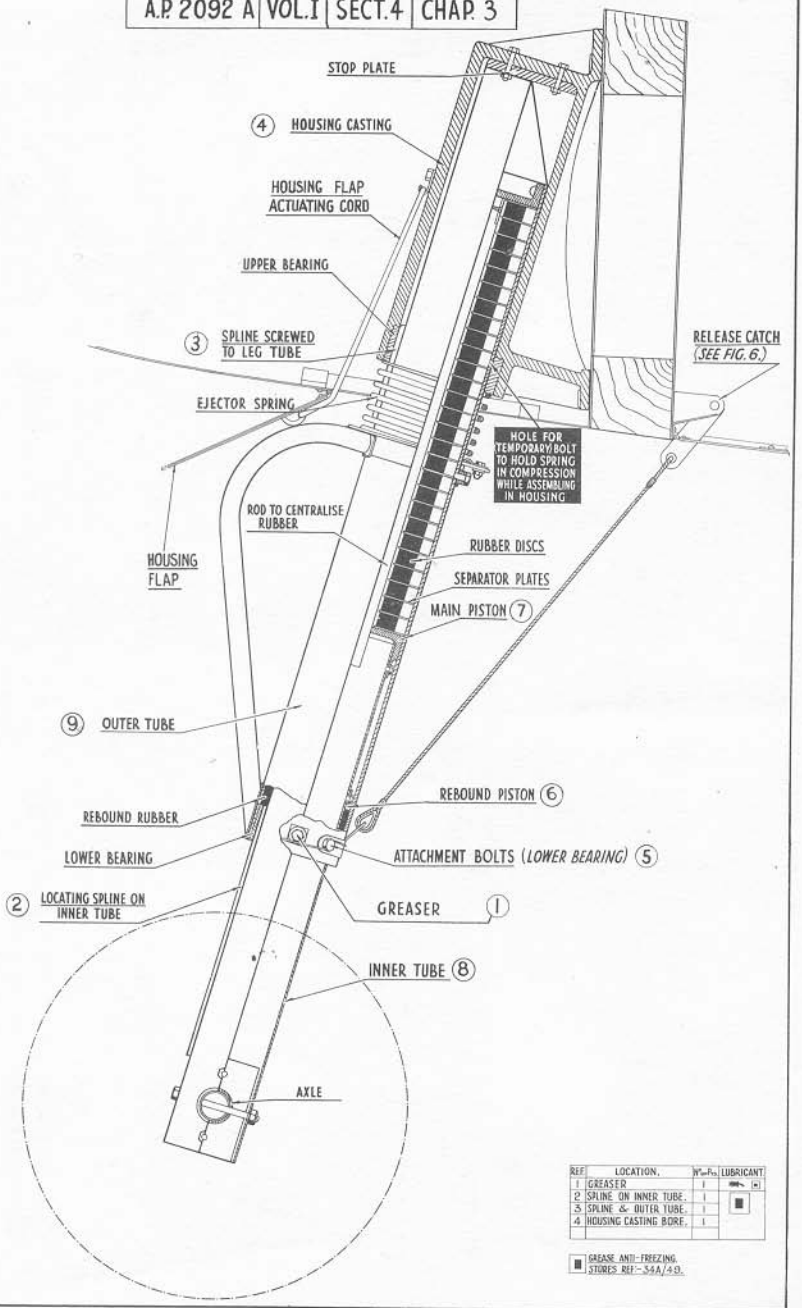
REF.	LOCATION.	Nº OF PTS.	LUBRICANT.
12	UNDERCARRIAGE HOUSING BUSH.	1	
11	UNDERCARRIAGE RELEASE CATCH PULLEY.	1	
10	UNDERCARRIAGE RELEASE CATCH.	3	
9	AILERON LEVER AT ROOT JOINT (CABLE CONNECTIONS.)	2	
8	AILERON DIFFERENTIAL (CABLE CONNECTIONS.)	2	
7	FLAP OPERATING LEVER (CABLE CONNECTIONS.)	1	
6	AILERON DIFFERENTIAL LEVER BUSHES.	2	SELF LUBRICATING BEARINGS.
5	AILERON PUSH ROD BALL RACES.	2	
4	PULLEY FOR FLAP CONTROL.	1	
3	AILERON LEVER BUSH AT ROOT JOINT.	1	
2	AILERON HINGES.	3	OIL CAN.
1	FLAP HINGES.	6	

OIL, LUBRIGATING, ANTI-FREEZING, TYPE B. STORES REF. 34A/55 & 56.

GREASE, ANTI-FREEZING, STORES REF. 34A/49.

LUBRICATION DIAGRAM – MAIN PLANE

FIG. 3

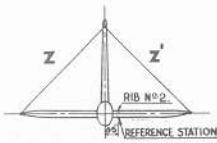


REF	LOCATION.	No. of Pts.	LUBRICANT
1	GREASER	1	▬ ■
2	SPLINE ON INNER TUBE.	1	■
3	SPLINE & OUTER TUBE.	1	
4	HOUSING CASTING BORE.	1	

■ GREASE ANTI-FREEZING. STORES REF - 34A/43.

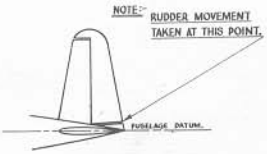
FIG. 4 **MAIN WHEEL UNDERCARRIAGE UNIT** – SHOWING LUBRICATION POINTS FIG. 4

DETAIL OF TAIL UNIT



TAIL PLANE TO BE RIGGED HORIZONTAL TO FUSELAGE DATUM, LIMITS ± 10 MINS.
INCIDENCE −1° TO FUSELAGE DATUM ± 30 MINS.

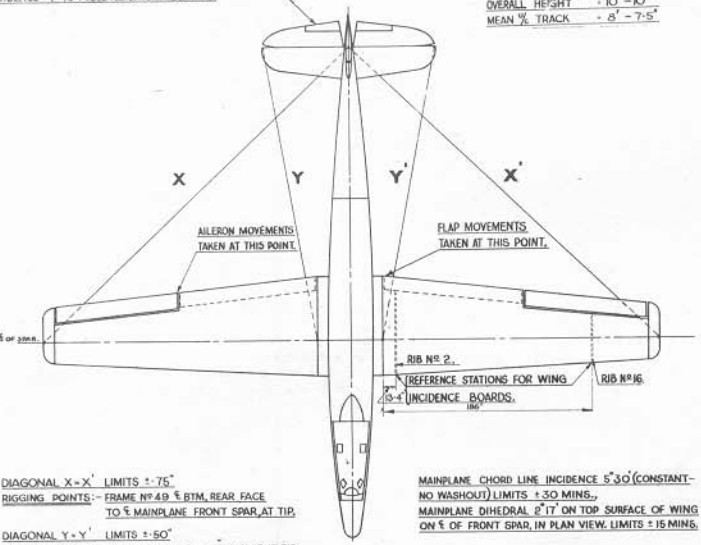
FIN & RUDDER



STARBOARD TAB TO BE SET AT 16° UP.

DIMENSIONS

OVERALL LENGTH	39'-3·5"
WING SPAN (NORMAL WING)	45'-11"
OVERALL HEIGHT	10'-10"
MEAN ℄ TRACK	8'-7·5"



1. DIAGONAL X - X' LIMITS ± ·75"
   RIGGING POINTS:- FRAME No 49 ℄ BTM. REAR FACE TO ℄ MAINPLANE FRONT SPAR AT TIP.
2. DIAGONAL Y - Y' LIMITS ± ·50"
   RIGGING POINTS:- TAILPLANE REAR SPAR, REAR FACE AT TIP TO ℄ TOP FORWARD WING JOINT PIN.
3. DIAGONAL Z - Z' LIMITS ± ·375"
   RIGGING POINTS:- TAILPLANE REAR SPAR, REAR FACE, AT TIP TO ℄ FIN POST, REAR FACE.

MAINPLANE CHORD LINE INCIDENCE 5°30' (CONSTANT - NO WASHOUT) LIMITS ± 30 MINS.,
MAINPLANE DIHEDRAL 3°17' ON TOP SURFACE OF WING ON ℄ OF FRONT SPAR, IN PLAN VIEW. LIMITS ± 15 MINS.

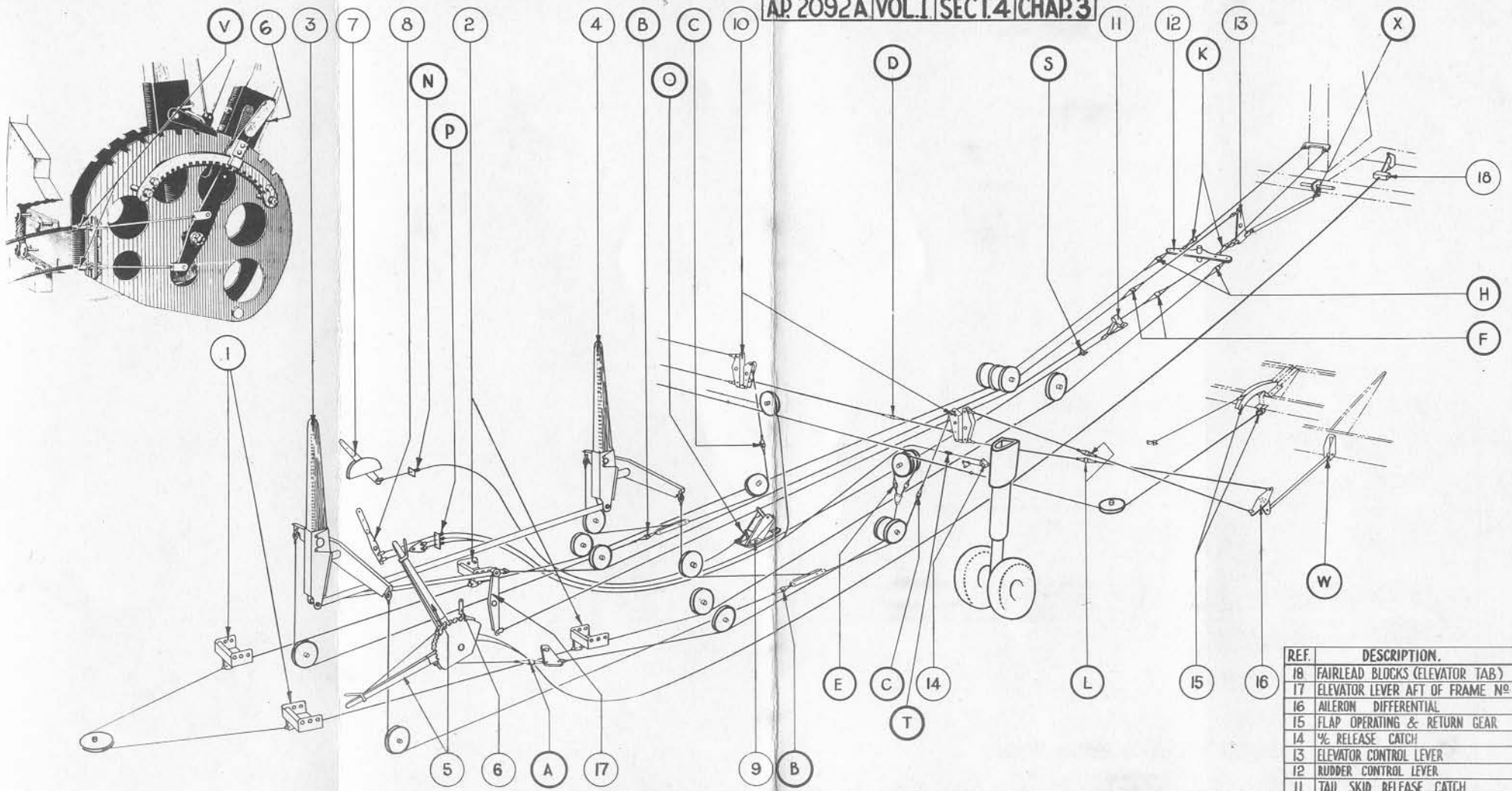
RANGES OF MOVEMENT OF CONTROL SURFACES

AILERONS.	25° UP OR 5·57" AT INBOARD RIB T.E. 12° DOWN OR 2·68" AT INBOARD RIB T.E.	LIMITS ± 0·25" ± 0·125"
ELEVATORS.	15° UP OR 4·65" AT T.E. ON RIB No 2. 25° DOWN OR 7·55" AT T.E. ON RIB No 2.	LIMITS ± 0·15" ± 0·25"
FLAPS.	60° AT FIRST POSITION OR 13·50" AT T.E. INBOARD. 90° AT 2nd. POSITION OR 19·10" AT T.E. INBOARD.	LIMITS ± 0·50" ± 0·75"
RUDDER.	25° TRAVEL TO PORT OR 9·10" AT T.E. ON BTM., RIB. 25° TRAVEL TO STBD OR 9·10" AT T.E. ON BTM., RIB.	LIMITS ± 0·50"
ELEVATOR TAB (PORT)	15° UP OR 1·70" AT T.E. ON RIB No 2. 15° DOWN OR 1·70" AT T.E. ON RIB No 2.	LIMITS ± 0·10"
ELEVATOR TAB (STARBOARD)	16° UP OR 1·85" AT T.E. ON RIB No 2. 0° DOWN.	LIMITS ± 0·10"

FIG. 5

RIGGING DIAGRAM

FIG. 5



REF.	LOCATED AT/BETWEEN	DESCRIPTION OF ADJUSTMENT.	No. OF PTS.
A	FRAMES 5 AND 6	FORWARD FLAP CABLE	1
B	FRAMES 10 AND 11	AILERON CABLE - 1ST PILOT	2
C	FRAME 19	AILERON CABLES	2
D	CENTRE SECTION SPAR	AILERON BALANCE CABLE	1
E	FRAME 19 PORT	FLAP OPERATING CABLES	2
F	FRAMES 31 AND 32	ELEVATOR CABLES	2
H	FRAMES 39 AND 40	RUDDER CABLES	2
K	FRAMES 39 AND 40	RUDDER CABLES	2
L	RIBS 7 AND 8	AILERON CABLES IN MAINPLANE	2 PER WING.

REF.	LOCATED AT/BETWEEN	DESCRIPTION OF ADJUSTMENT.	No. OF PTS.
N	FRAME 5	TOW RELEASE CABLE	1
O	FRAME 14	TOW RELEASE CABLE	1
P	1ST PILOTS SEAT	UNDERCARRIAGE JETTISON CABLES	3
S	FRAMES 32 & 33	TAIL SKID JETTISON CABLE	1
T	STUB WING RIB	UNDERCARRIAGE JETTISON CABLE	1 PER WING.
V	ELEV. TAB CONTROL	ELEVATOR TAB CABLE	2
W	RIBS 15 & 16	AILERON PUSH ROD	1 PER WING.
X	FRAME 49	ELEVATOR PUSH ROD	1

REF.	DESCRIPTION.
18	FAIRLEAD BLOCKS (ELEVATOR TAB)
17	ELEVATOR LEVER AFT OF FRAME No. 5
16	AILERON DIFFERENTIAL
15	FLAP OPERATING & RETURN GEAR
14	½ RELEASE CATCH
13	ELEVATOR CONTROL LEVER
12	RUDDER CONTROL LEVER
11	TAIL SKID RELEASE CATCH
10	AILERON LEVERS AT WING ROOT JOINT
9	TOW RELEASE MECHANISM
8	½ & TAIL SKID JETTISON LEVER
7	TOW RELEASE LEVER
6	ELEVATOR TAB CONTROL LEVER
5	FLAP CONTROL LEVERS
4	AFT CONTROL COLUMN.
3	FORWARD CONTROL COLUMN
2	AFT RUDDER SLIDES
1	FORWARD RUDDER SLIDES

FIG. 6

CONTROLS — ADJUSTMENT POINTS

FIG. 6

Rudder slide assemblies

24. Removal.- The procedure for removing the alternative rudder slide assemblies is as follows:-

(i) Disconnect the rudder control cables at the lever (12) (see Sect.4, Chap.3, fig.6) in the rear fuselage.

(ii) Unscrew the wood screws securing the outboard pedal slide rails to the wooden members and withdraw the metal slides.

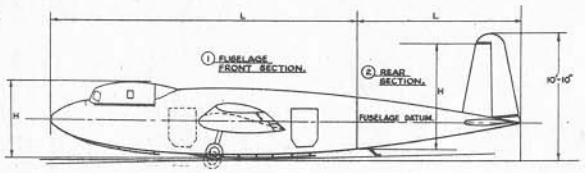
(iii) Move the pedals outwards to disengage them from the inboard slide rails.

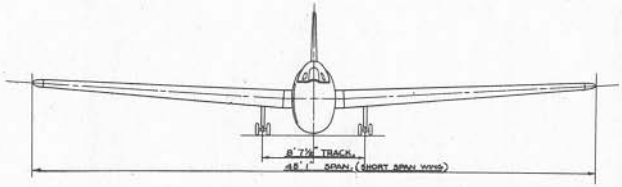
(iv) Disconnect the cables at the pedal brackets and tie them together.

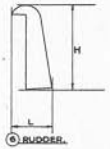
(v) Remove the pedals.

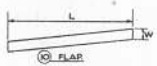
25. Assembly.- When re-assembling, the control cables should be attached to the pedal brackets before the pedals are assembled in the slides.

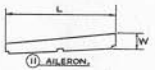
FIG. 1

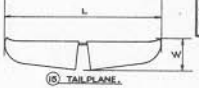












	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮
LENGTH L	25' 7"	12' 2"	5' 7⅛"	2' 5"	8⅛"	3'	7' 1"	12' 6"	5' 3½"	10' 1½"	9' 2¾"	20' 6¼"	3"	12' 9"	13' 1"
WIDTH W	5' 4"	2' 9"	2' 10⅜"	5⅛"	5"	4¾"	4½"	4⅛"	1' 3½"	1' 4½"	1' 5¼"	7' 4¾"	7¼"	1' 7⅛"	2' 6½"
HEIGTH H	6' 3½"	9' 10"	1' 10¾"	3' 4"	1' 7"	7' 3"	5"	4"	1' 4"	2⅛"	4¼"	1' 5¾"	1¾"	4¼"	5½"

FIG. 1

PACKING DIAGRAM

SECTION 5 - REMOVAL AND ASSEMBLY OPERATIONS

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LIST OF ILLUSTRATIONS

SECTION 5 - REMOVAL AND ASSEMBLY OPERATIONS

GENERAL

Introduction

1. This Section refers generally to the removal of components, and unless additional or contrary instructions for assembly are given, it may be assumed that they are similar to those for removal, but in the reverse order.

Division for transport

2. For transport purposes, the components may be separated as follows (see fig.1) and stowed in a single packing case.

Mk. I.-

(i) Fuselage

(ii) Port outer plane

(iii) Starboard outer plane

(iv) Undercarriage legs

(v) Tail plane and elevators

(vi) Rudder

(vii) Nose fairing

(viii) Tail fairing

(ix) Tail skid (if of jettisonable-type)

Mk. II.- As for Mk. I above, but with the fuselage separated into front and rear portions at the transport joint.

Instructions for the removal of these components, and, where necessary, for assembly, are given in the following paragraphs.

FUSELAGE

General

3. Before commencing removal operations, trestle the glider as described in Sect.4, Chap.2, so that the undercarriage legs may be withdrawn from their housings.

Rear fuselage - Mk. II only

4. Removal.- The procedure for removing the rear fuselage from the front fuselage at the transport joint is as follows. For location of control cable joints refer to Sect.4, Chap.3, fig.6:-

(i) Disconnect the elevator trimming tab control cables at the lever on the tab and draw them into the rear fuselage clear of the tail plane.

(ii) Remove the flooring immediately forward of the transport joint.

(iii) Unclip the trimming tab control cables from the rear fuselage frames; coil them to avoid kinking.

(iv) Disconnect the elevator cables at the turnbuckles F near the transport joint.

(v) If the tail skid is of the jettisonable-type, disconnect the release cable from the release pin on the tail skid release catch (11).

(vi) Disconnect the rudder cables at the rudder lever on the fuselage keel aft of the transport joint; remove the fibre guides for these cables from the rear fuselage.

(vii) Disconnect the electrical cables at the terminal block on the starboard top longeron.

(viii) Disconnect the bonding strip on the bottom of the fuselage, at the transport joint.

(ix) Remove the eleven 5/16 in. bolts connecting the boundary frames.

(x) Tear off the fabric strip around the joint between the front and rear fuselage.

(xi) Remove the nuts and washers from the three attachment castings.

(xii) Withdraw the main attachment bolts from the castings, at the same time supporting the rear fuselage which will be top-heavy by reason of the non-detachable fin, etc.

(xiii) Withdraw the rear fuselage carefully away from the front fuselage.

Nose fairing

5. Removal.- The procedure for removing the nose fairing from the front fuselage is as follows:-

(i) Disconnect the nose lamp electrical cable from the terminal block attached to the inside of the fuselage near frame 1, and remove the clips attaching the cable to the fuselage.

(ii) Tear off the fabric sealing strip at the junction of the nose fairing and frame 1.

(iii) Remove the studs around the junction and withdraw the nose fairing, taking care not to break the lamp glass.

Pilots' seats

6. Removal.- The procedure for removing the pilots' seats from the fuselage is as follows:-

(i) Remove the corner blocks from the feet of the seat legs, taking care not to damage the legs.

(ii) Separate the seat structure from the aileron-control mounting posts.

7. Assembly.-

(i) If the plywood on the front face of the seat was damaged during the removal operation, check that it has been renewed.

(ii) Clean the feet of the seat legs.

(iii) Replace the seat structure, using new corner blocks.

MAIN PLANE

Flaps

8. Removal.- The procedure for removing the flaps from the main plane is as follows:-

(i) Remove the pin from the bracket inside the flap to release the elastic return cord.

(ii) Remove the pin connecting the control cable to the bracket on the undersurface of the flap.

(iii) Remove the set screws securing the flap hinges to the main plane and withdraw the flap.

Ailerons

9. Removal.- After the flaps have been removed (see para.8), the procedure for removing the ailerons from the main plane is as follows:-

(i) Uncouple the connecting rod between the aileron lever and the aileron differential gear.

(ii) Remove the hinge pins and withdraw the aileron, complete with the mass-balance: care should be taken not to damage the spar.

Outer planes

10. Removal.- After the ailerons and flaps have been removed (see paras. 8 and 9), and the undercarriage main wheel units withdrawn (see para.18), the procedure for removing the outer planes from the centre section is as follows:-

(i) Remove the access panels (see Sect.4, Chap.3, fig.1, items 8, 9 and 10) at the wing root, by removing the wood screws and, in the case of the hinged-type panel, releasing the fastener.

(ii) Disconnect the flap control cables, at the wing-root joint.

(iii) Disconnect the undercarriage main wheel unit jettison cable, at the wing-root joint.

(iv) Disconnect the link between the ailerons, at the wing-root joint.

(v) Remove the nuts and washers from the outer plane attachment pins and extract the pins, using the special extractor tool.

(vi) Ease the outer plane from the centre section and lower it into suitably padded supports.

11. Assembly.- When assembling the outer planes to the centre section they should be supported on adjustable trestles so as to bring the holes in the joint plates into line. The distance tubes should be inserted between the plates and the bullet noses fitted to the attachment pins before the pins are inserted and tapped home. If necessary, shims should be used between the joint plates to ensure correct assembly. Then fit the washers, nuts and split pins to the pins, check the rigging as described in Sect.4, Chap.3, couple up the control cables and connections and replace the access panels.

TAIL UNIT

General

12. The fin of the tail unit is integral with the fuselage and cannot be removed.

Tail fairing

13. Removal.- The procedure for removing the tail fairing from the rear fuselage is as follows:-

(i) Disconnect the navigation lamp electrical cable at the terminal block on the keel of the fuselage between the fin posts; access is obtained through the access door (21) (see Sect.4, Chap.3, fig.1).

(ii) Remove the studs securing the tail fairing to the rear fuselage and withdraw the fairing, taking care not to damage the electrical cable.

Elevators

14. Removal.- The procedure for removing the elevators from the tail plane is as follows:-

(i) Disconnect the trimming tab control cables at the lever on the tab on the port elevator; access is through access door (22) (see Sect.4, Chap.3, fig.1).

(ii) Remove the trimming tab fairlead (19) from the port elevator spar (see Sect.4, Chap.3, fig.6).

(iii) Disconnect the elevator connecting rod at the elevator.

(iv) Remove the hinge pins and withdraw the elevator; in the case of the port elevator, care should be taken not to damage the trimming tab cables.

Rudder

15. Removal.- The procedure for removing the rudder from the fin is as follows:-

(i) Disconnect the control cables at the lever on the rudder spar.

(ii) Remove the hinge pins and withdraw the rudder.

Tail plane

16. Removal.- After removing the tail fairing, elevators and rudder (see paras. 13, 14 and 15), the procedure for removing the tail plane from the rear fuselage is as follows:-

(i) Remove the nuts from the front attachment joints and the four nuts from the attachment bolts in the centre of the rear spar; access is through access doors (20, 23 and 25) (see Sect.4, Chap.3, fig.1).

(ii) Withdraw the front attachment bolts.

(iii) Slide the tail plane aft until it clears the four bolts in the centre of the rear spar and lift it clear of the fuselage,

taking care not to damage the elevator trimming tab cable, which should slide easily out of the guide tube in the tail plane.

17. Assembly.- When assembling the tail plane care should be taken that the elevator trimming tab cable is fed progressively into its guide tube, to obviate kinking.

UNDERCARRIAGE

Main wheel units

18. Removal and assembly.- The procedure for removing the main wheel units from the undercarriage housings is as follows:-

(i) Place a suitable block under the wheels to check the action of the jettison spring and release the support cable from the release bracket (see Sect.4, Chap.3, fig.6); access is through the access door (2) (see Sect.4, Chap.3, fig.1). The assembly procedure is described in Sect.4, Chap.2.

Tail skid - jettisonable-type

19. Removal and assembly.- Pull the spring-loaded pin of the jettison mechanism into the "release" position. Care should be taken not to force the tail skid past the release pin when reassembling in the housing; the assembly procedure is described in Sect. 4, Chap.2.

FLYING CONTROLS

Control column assemblies

20. Removal.- The procedure for removing the control column assembly is as follows:-

(i) Disconnect the inter-connecting rod between the front and rear control columns.

(ii) Disconnect the elevator connecting rod at the bottom of the front control column.

(iii) Remove the bearing bolt securing the control column from the tube carrying the aileron lever and withdraw the column; replace the bolt in the column and screw on the nut, before storage.

Aileron control assemblies

21 Removal.- The procedure for removing the aileron control

assemblies is as follows:-

(i) Remove the sloping plywood fairing between the top of the controls posts and the pilot's seat.

(ii) Remove the cross-member at the top, and to the rear of, the controls posts and detach the upper six inches of the vertical glued panel immediately behind the controls posts.

(iii) Disconnect the aileron control cables at the aileron lever on the rear end of the control column supporting tube.

(iv) Remove the bolts securing the tube and its bearing assembly to the controls posts.

(v) Withdraw the tube and bearing assembly upwards off the controls posts; this assembly can now be withdrawn, together with the control column, if this has not been removed previously.

Note.- As it is necessary to remove a number of glued panels, which are liable to suffer damage in the process, in order to gain access to the aileron control assemblies, these assemblies should be removed from the fuselage for essential operations only

Elevator control assemblies

22. Removal.- The procedure for removing the elevator control assemblies is as follows:-

(i) Disconnect the elevator connecting rod at the lever on the fuselage keel; one cable is then disconnected.

(ii) Disconnect the remaining cable at the lever and stow the free end.

(iii) Remove the taper pin and collar securing the lever to its mounting bracket and withdraw the lever.

(iv) Unscrew the nuts securing the bracket to the fuselage, withdraw the bolts, and remove the bracket.

Rudder bar assemblies

23. Removal.- The procedure for removing the rudder bar assemblies is as follows:-

(i) Disconnect the inter-connecting cables at both rudder bars.

(ii) Disconnect the rudder control cables and stow the free ends.

(iii) Remove the bolts securing the mounting block to the fuselage keel and withdraw the assembly from the block.

Rudder slide assemblies

24. Removal.- The procedure for removing the alternative rudder slide assemblies is as follows:-

(i) Disconnect the rudder control cables at the lever (12) (see Sect.4, Chap.3, fig.6) in the rear fuselage.

(ii) Unscrew the wood screws securing the outboard pedal slide rails to the wooden members and withdraw the metal slides.

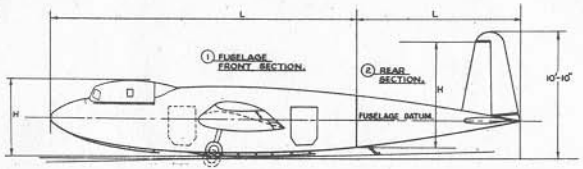
(iii) Move the pedals outwards to disengage them from the inboard slide rails.

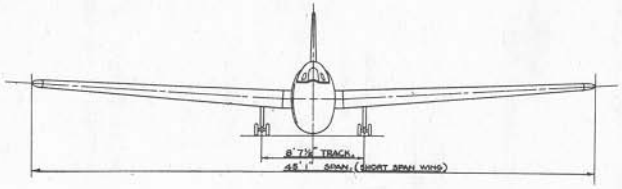
(iv) Disconnect the cables at the pedal brackets and tie them together.

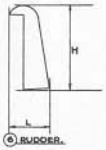
(v) Remove the pedals.

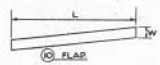
25. Assembly.- When re-assembling, the control cables should be attached to the pedal brackets before the pedals are assembled in the slides.

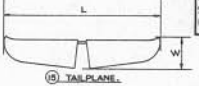
FIG. 1











	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮
LENGTH. L	25' 7"	12' 2"	5' 7⅛"	2' 5"	8½"	3'	7' 1"	12' 6"	5' 3½"	10' 1½"	9' 2¾"	20' 6¼"	3'	12' 9"	13' 1"
WIDTH. W	5' 4"	2' 9"	2' 10⅛"	5½"	5"	4¾"	4⅛"	4⅛"	1' 3½"	1' 4½"	1' 5¼"	7' 4¾"	7¼"	1' 7½"	2' 6½"
HEIGTH H	6' 3½"	9' 10"	1' 10¾"	3' 4"	1' 7"	7' 3"	5"	4"	1' 4"	2¼"	4¼"	1' 5¾"	1¾"	4¾"	5½"

FIG. 1

PACKING DIAGRAM

SECTION 6

ELECTRICAL INSTALLATION - MAINTENANCE

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LIST OF ILLUSTRATIONS

SECTION 6

ELECTRICAL INSTALLATION - MAINTENANCE

Introduction

1. Information covering those maintenance operations called for in Vol.II, Part 2, Sect. 2D of this Publication is given in A.P.1095, Vol.I. This Section deals with the dismantling of electrical components necessary before carrying out these maintenance operations. A circuit diagram, together with a schematic circuit diagram, is given in fig.1 and the approximate physical location of the terminal blocks, conduits and electrical equipment is shown in fig.2. A description of the electrical installation is given in Sect.10.

Preparation for maintenance

2. Accumulator.- To remove the accumulator for maintenance, disconnect the terminals and release the retaining wing-nuts, open the two holding-down handles outwards and withdraw the accumulator.

3. Navigation and identification lamp.- The combined navigation and identification lamp should be dismantled as follows:-

(i) Unscrew the three 8 B.A. set screws from the flange of the lamp and remove the hood and lamp glass, taking care not to break the latter.

(ii) Unscrew the two countersunk set screws from the bracket housing the red and green glasses and withdraw the housing, complete with the glasses.

(iii) Remove the bayonet-type bulb.

(iv) If it is necessary to dismantle the remaining portion of the lamp, unscrew the three 2 B.A. countersunk set screws and withdraw them sufficiently to disconnect the electrical cables.

4. Tail lamp.- The tail lamp should be dismantled as follows:-

(i) If it is necessary to withdraw the lamp body complete with bulb and glass, unscrew the two 4 B.A. countersunk set screws and remove the lamp body from its socket.

(ii) If it is necessary to remove the bulb, first unscrew the two dome-headed screws and withdraw the hood and glass complete, taking care not to break the latter. Then remove the bulb from its bayonet holder.

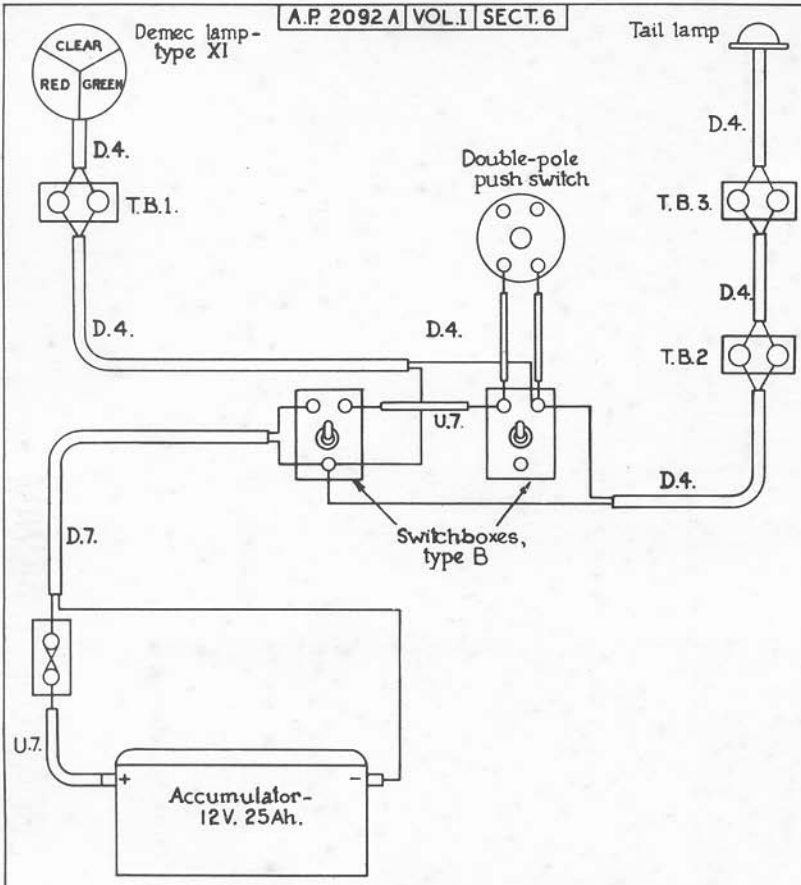
(iii) To remove the lamp socket, it is necessary to remove the tail fairing (25) (see Sect.4, Chap.3, fig.1) to gain access to

the two 4 B.A. Simmonds nuts, which can then be unscrewed, enabling the bolts to be removed and the lamp body withdrawn sufficiently to disconnect the electrical cables and free the socket.

5. Switches.- The switches are removed from the instrument panel for maintenance by unscrewing the retaining bolts and withdrawing the switches sufficiently to disconnect the electrical cables.

Fuse

6. If it is necessary to replace the fuse in the fusebox mounted on the rear face of frame 16 (see Sect.7, Chap.1, fig.1) a 10 amp. fuse should be used.



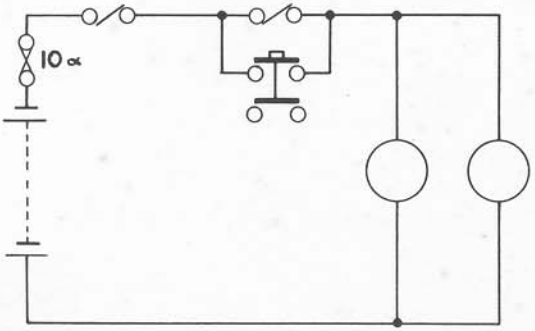
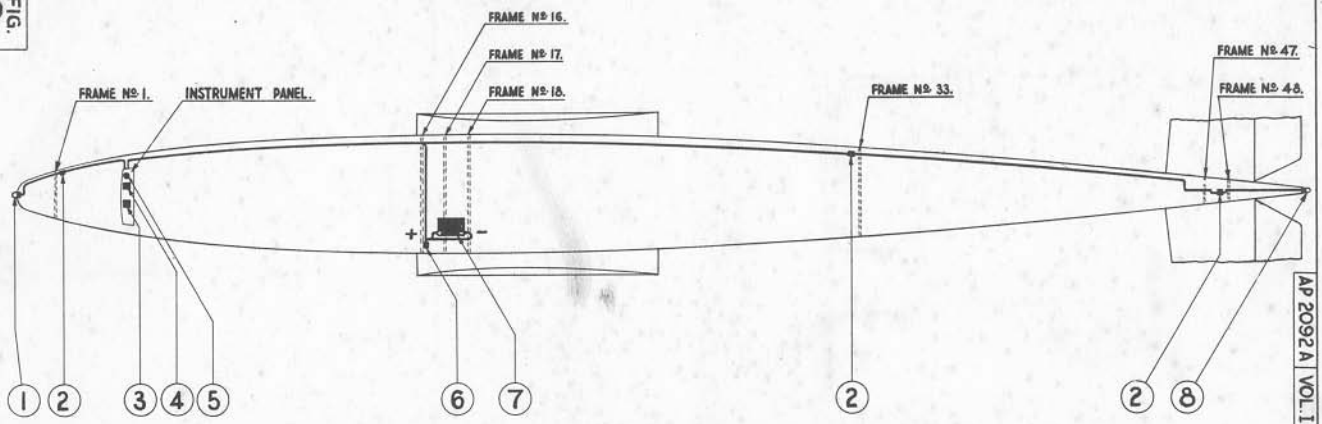


FIG. 1 — CIRCUIT DIAGRAM — FIG. 1

F.S. 3

FIG. 2



REF.	DESCRIPTION.
1	FORWARD NAVIGATION LIGHT.
2	TERMINAL BLOCKS.
3	BATTERY SWITCH.
4	NAVIGATION LIGHT & MORSE SWITCH.
5	MORSE PUSH-SWITCH.
6	FUSE BOX.
7	ACCUMULATOR.
8	TAIL NAVIGATION LIGHT.

FIG. 2

LOCATION DIAGRAM

SECTION 7

CONSTRUCTION OF AIRFRAME

WARNING:—The chapters have not yet been amended to cover the later Hotspur II and Hotspur III gliders. They apply only to Hotspur I and early Hotspur II gliders (*see* note on inside of front cover). (A.L. No. 8)

CHAPTER 1—FUSELAGE

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Fuselage structure

Tow release mechanism

LIST OF ILLUSTRATIONS

CHAPTER 1—FUSELAGE

General

1. The fuselage construction of the Mk. I and Mk.II gliders differs mainly in respect of the cabin portion of the structure; the Mk.I has frames which terminate at the upper longerons in order to accommodate a detachable hood in four sections, while that of the Mk.II has continuous frames to form a monocoque cabin, except at the pilots' cockpits, where the frames terminate at the upper longerons and a hinged transparent hood is fitted. The fuselage is of wooden construction, one-piece in the case of the Mk.I and divided by a transport joint in the case of the Mk.II. The description which follows is applicable to both types, and features peculiar to the Mk.I are mentioned in the appropriate place. Fig. 1 shows the disposition of the fuselage frames, the numbering of which is the same as that used in the Schedule of Spare Parts, Vol. III, Part 1 of this publication; this numbering is applicable to both the Mk.I and Mk.II gliders.

2. The fuselage is of wooden monocoque construction, comprising two upper and two lower longerons and a box-section keel member which follows the contour of the fuselage. The floor level coincides with the lower longerons. The main frames 16 and 19 are situated adjacent to the leading edge of the main plane and the main plane spar, and are attached to the keel member by angle-brackets. Similar frames are used at intermediate positions, notably at the cabin door openings (Mk.II), and lighter frames are spaced between them; attachment to the keel member is by means of glued corner blocks. Spruce stringers are secured to the frames by means of spruce corner blocks or flexible plywood angle gussets and the frames are braced longitudinally by intercostal stiffeners. A plywood skin, treated externally with a protective paint and covering, is glued to the wooden framework. The main plane centre section is integral with the fuselage structure, the leading edge and spar being built into the main frames 16 and 19.

Front fuselage

3. The front fuselage extends from frame 1 to frame 33, the composite nose fairing being detachable. Between these points the keel is continuous and continuity of the upper longerons, although they are broken at frames 19, 23 and 33, is maintained by angle brackets bolted to the longerons and frame (*see* fig. 3). The lower longerons have similar angle-bracket connections at frames 13, 16, 19, 23, 26 and 29. The Mk.II glider has two doors (*see* para. 8) for purposes of parachute exit of troops, that on the starboard side serving the two front stations and that on the port side the four rear stations, while a transparent hood covers the pilots' cockpits. The Mk.I glider has a detachable hood extending over the pilots' cockpits and troops stations. In each case the hooded portion of the fuselage is strengthened by spruce cross struts at frames 3, 7 and 11, attached by means of gusset connections to the upper longerons. The flooring extends from frame 1 to frame 33 and consists of sections of plywood, some of which are glued to the lower longerons, the remainder being screwed to the longerons and frame members; removable panels are incorporated to give access to the control cables. A hole in the keel between frames 13 and 15 accommodates the tow cable guide tube. An attachment plate welded to the lower end of the guide tube is secured by an alloy casing, both the plate and the casting being bolted to spruce blocks glued to both sides of the keel. The hole in the casing is radiused to obviate damage to the tow cable.

4. In the case of the Mk.II glider only, there is a transport joint at frame 33; the front and rear portions of the fuselage are connected at the upper longerons and at the keel member by elektron castings (*see* fig. 3), through each of which passes a single connecting bolt. The end frames at the transport joint, which together constitute frame 33, are united by a number of bolts spaced round the flanges of the frames. The lower longerons terminate at the transport joint.

Rear fuselage

5. The rear fuselage, which incorporates an integral fin, extends from frame 33 to the detachable tail fairing. The upper longerons and keel-member extend the full length of the rear fuselage and the plywood covering is of monocoque form. Frames 47 and 49 are extended to form the fin posts and to provide attachment points for the tail plane.

Hooding and doors

6. *Mk.I.*—The cabin portion of the fuselage comprises a hood in four sections, of which the front section over the pilots' cockpits is transparent and incorporates a windscreen and direct-vision panels (*see* Sect. 1). This transparent section is hinged along the starboard side to provide means of entry and exit and is secured in the closed position by clip-type fasteners. The remaining three sections of the hood which cover the troops stations are non-transparent but have a number of small portholes. The hooding lifts completely away from the fuselage structure to provide a means of entry and exit for the troops and, when in position, is secured by bolt-type fasteners (*see* Sect. 3). There are no doors in the Mk.I fuselage.

7. *Mk.II.*—The transparent hood (*see* fig. 4) over the pilots' cockpits is hinged along the starboard side to provide a means of entry and exit, and incorporates a flat-fronted, safety-glass windscreen and four direct-vision panels. When in the closed position it is locked by sliding bolt-type fasteners controlled by a lever on the port side; a lanyard, within reach of either pilot, runs along the starboard side and enables the splayed-out hinge pins to be quickly detached should a state of emergency make it necessary to jettison the hood (*see* Sect. 1).

8. A detachable door immediately forward of the main plane on the starboard side of the fuselage provides a means of entry to, and exit from, the front troops stations and a similar door immediately aft of the main plane on the port side serves the same purpose for the rear troops stations. These doors are of wooden construction and are held in position in their frames by two spigots on the leading edge and a bolt-type lock on the rear edge (*see* Sect. 3). When removed the doors may be either jettisoned or stowed within the fuselage, as required. The door pillars have integral oval handgrips, and a parachute static line hook is situated about half-way up each rear pillar.

Instrument panel mounting

9. The instrument panel fitted in later Mk.I and all Mk.II gliders is mounted on the longerons and cross member aft of frame 3, and a separate shelf on the starboard decking adjacent to the panel accommodates the compass.

Pilots' seats

10. The pilots' seats are of wooden construction and accommodate seat-type parachutes; the structure of the seat forms a mounting for the control

column assembly. On some gliders the backs of the seats are separate and adjustable and provide an anchorage for two-piece safety belts; in later versions, lugs on the floor secure a second two-piece safety belt which acts as a thigh-strap. In those gliders having rudder control by bar, a small range of adjustment is provided for the seat itself.

Troops stations

11. In Mk.I gliders six men sit *one behind the other*, facing forward, behind the pilots' cockpits, each on a single bench-type seat. The Mk.II glider has divided troops stations, two men facing to starboard, immediately forward of the spar bulkhead and four men facing to port, immediately behind the apar bulkhead. In both Mk.I and Mk.II gliders the seats are of simple wooden construction and each has a lap-type safety belt. A number of portholes and a ventilator are incorporated in the hood of the Mk.I glider and in the cabin walls of the Mk.II glider.

Footsteps

12. To facilitate entry to, and exit from, the pilots' cockpits, three recessed footsteps are provided on the port side of the fuselage; each is closed automatically by means of a spring-loaded flap when not in use.

TOW RELEASE MECHANISM

General

13. The tow release mechanism (*see* fig. 2) provides the glider pilots with a means of releasing the glider from the tug aeroplane. The release unit is mounted on the fuselage keel between frames 13 and 15 and incorporates an attachment hook for the tow cable. It is connected to the control lever in the front cockpit by a flexible cable with a protective outer casing.

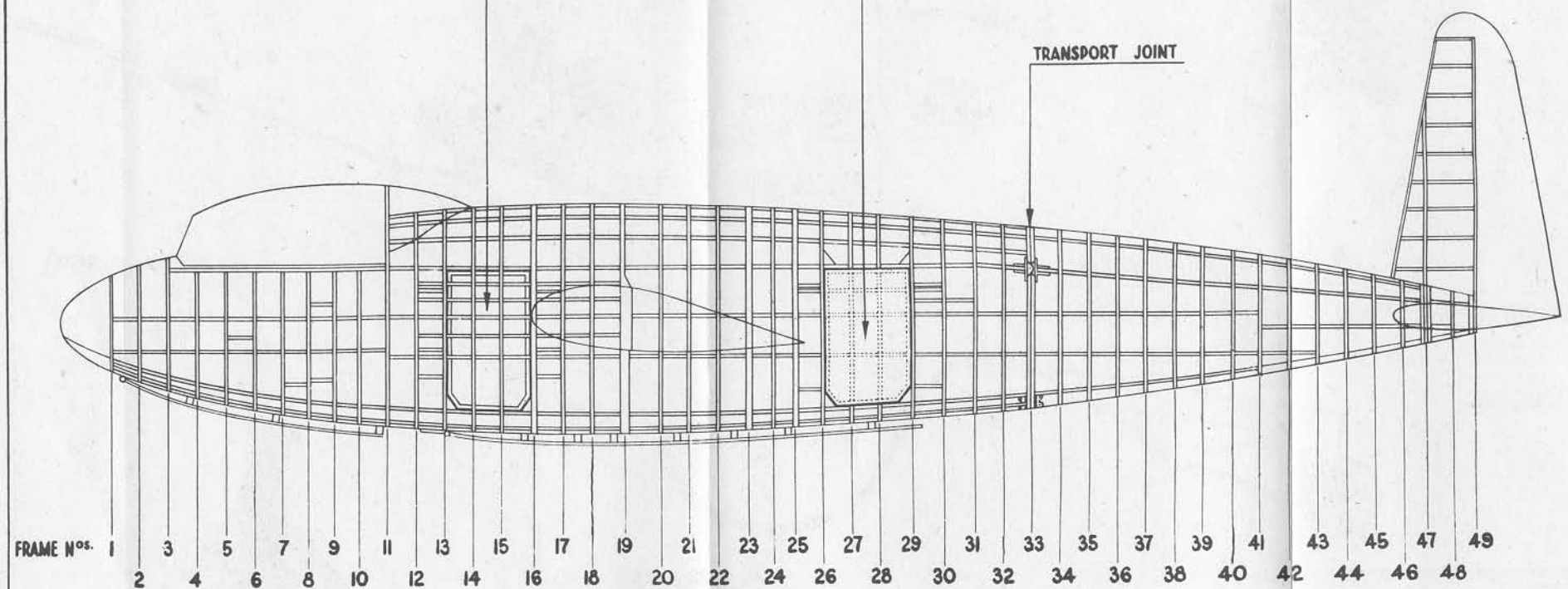
Cockpit controls

14. *Direct-type.*—In Mk.I and Mk.II gliders the tow cable is released by a control lever mounted on the starboard side of the front pilot's cockpit (*see* Sect. 1). The lever mounting is bolted to a wooden block glued to the fuselage skin and attached to frames 3 and 4 by means of corner blocks. The operating cable, which works in a protective casing, is secured to the lower end of the lever by two link-plates and passes aft through an adjuster mounted on a channel-section bracket at frame 5. From there it is led under the floor and terminates at the release unit on which is a bracket carrying an adjuster and a stop for the outer casing. When the control lever is pulled backwards, the tow cable is released from the jaws of the cable hook through the medium of the release mechanism described in para. 16.

15. *Remote-type.*—Later Mk.II gliders have a remote tow release control consisting of a knob mounted on the left-hand side of the instrument panel in each cockpit. The direct-type release lever (*see* para. 14) is in this case held in the forward position by a trip-catch, coupled to each remote-control knob by a flexible cable passing through a protective conduit. When either knob is operated, the catch is freed and the release lever is pulled into the rearward position by a length of elastic cord wound round a pulley, thus releasing the tow cable from the cable hook through the medium of the release mechanism described in para. 16.

Release unit

16. The release unit (*see* fig. 2) is bolted to spruce blocks attached to the fuselage keel between frames 13 and 15. A spring-loaded lever is pivoted to the side plates of the unit and at the lower end is connected to the tow-cable hook through a link-assembly. The cable from the tow-release control lever in the cockpit (*see* paras. 14 and 15) is attached to the upper end of the spring-loaded lever. The spring retains this lever in an upward position and the link-assembly against its stop. When the cockpit control is operated, the lever is pulled downwards by the control cable against its spring and the lower end moves rearwards, taking with it the link assembly which, in turn, opens the tow-cable hook, the pull on the tow cable facilitating this operation.



NOTE :—
THE NUMBERING OF THE FUSELAGE FRAMES IS ALSO APPLICABLE TO THE MK.I GLIDER

FIG. 1

FUSELAGE STRUCTURE. *(MK.II.)*

FIG. 1

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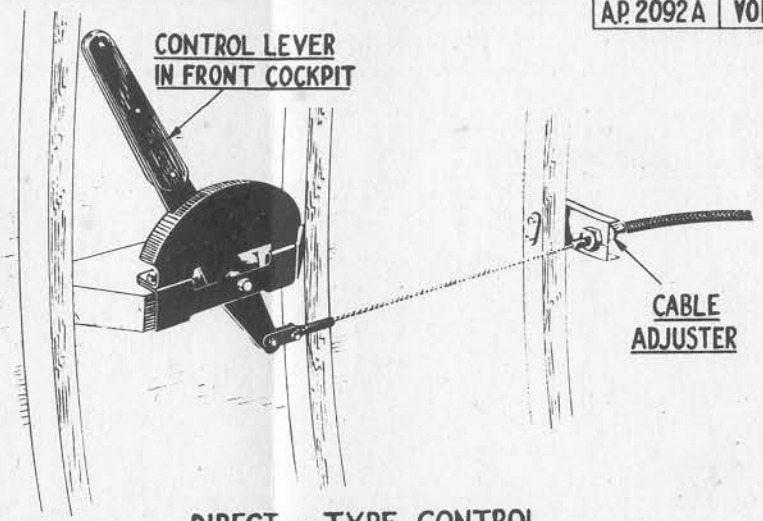
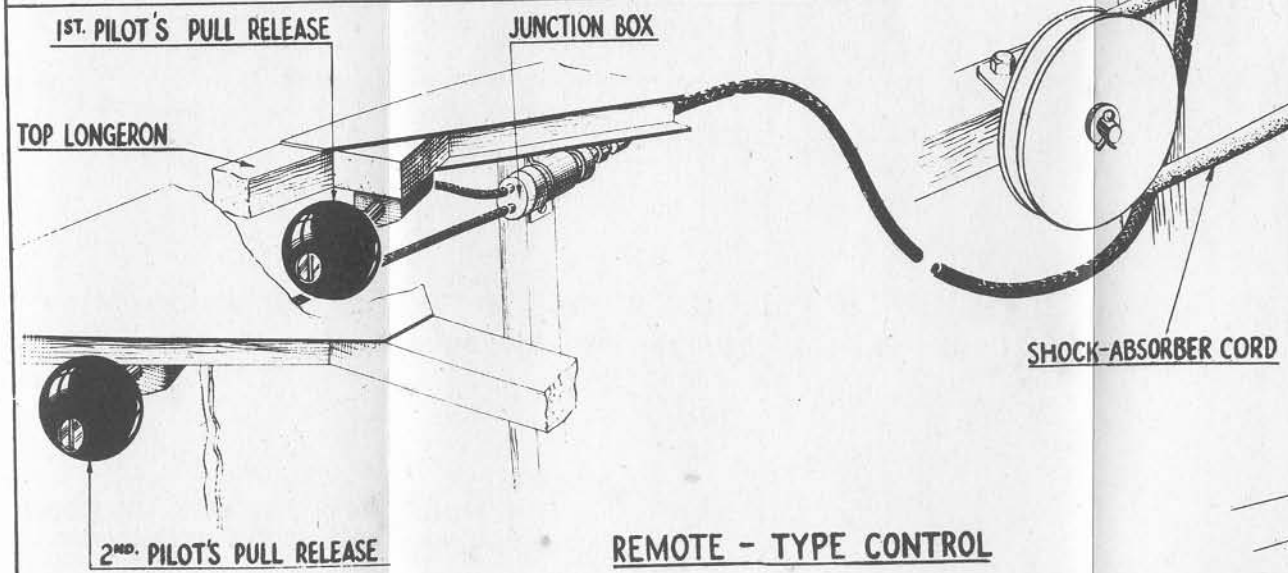


DIRECT - TYPE CONTROL



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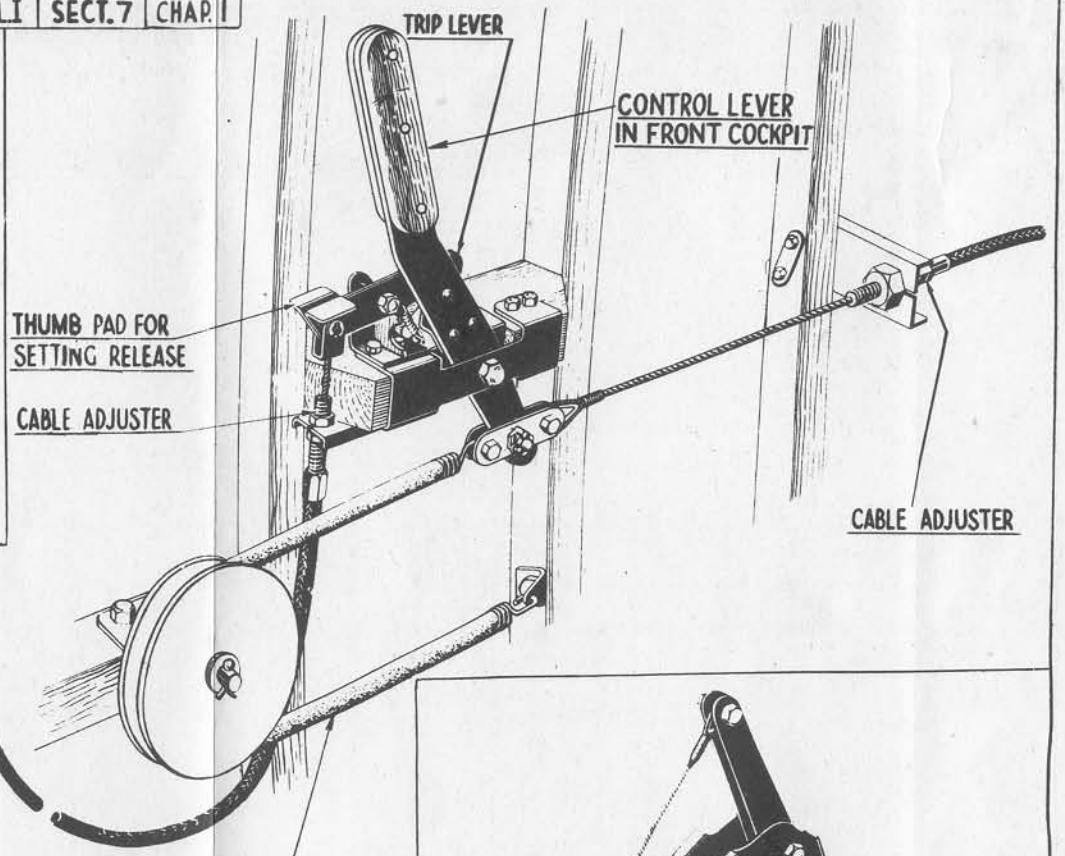

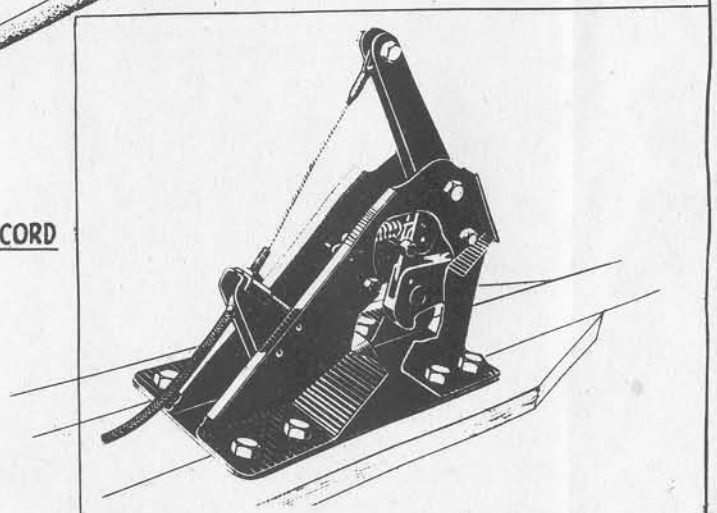

TOW CABLE RELEASE MECHANISM ON KEEL

TOW RELEASE MECHANISM

FIG. 2

FIG 2

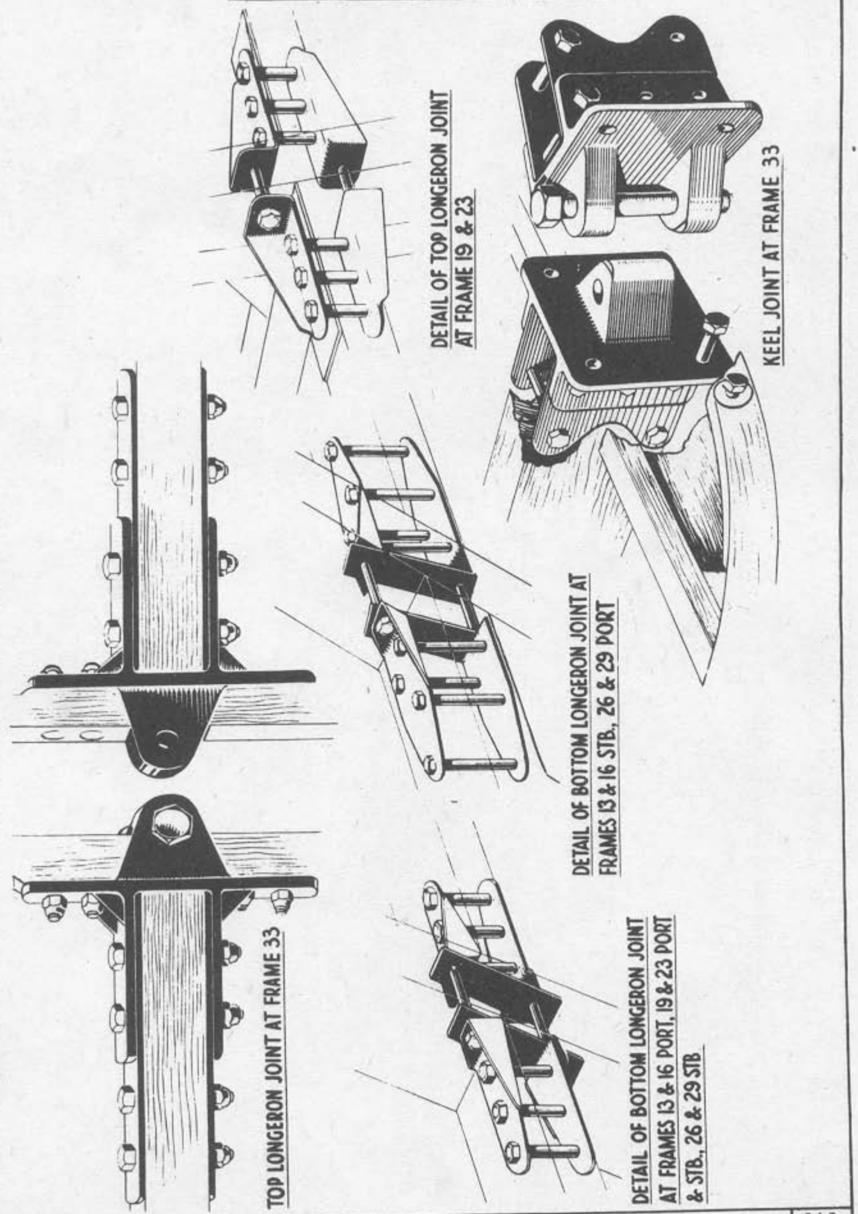

FIG. 3 — TYPICAL JOINTS — FIG. 3

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FIG 4

COCKPIT HOOD (MK.II)

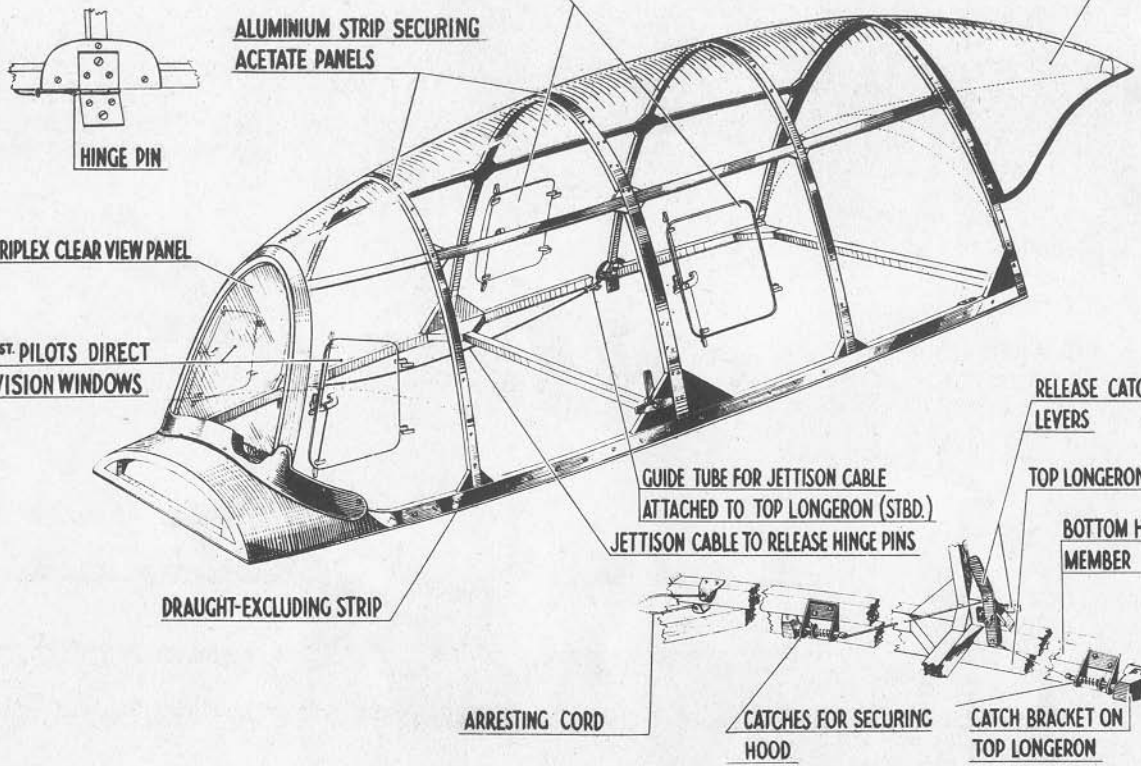

FIG 4

CHAPTER 2—MAIN PLANE

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CHAPTER 2—MAIN PLANE

General

1. The non-folding cantilever main plane comprises three portions, centre section and port and starboard outer planes; split flaps are fitted between the inner ends of the ailerons and the wing root. The tapered outer planes are attached to the centre section by means of horizontal pin joints, located at the upper and lower spar booms and the leading edge. The covering is of ply-wood throughout, the thick-section leading edge being moulded to shape before assembly. Some Mk.I gliders have a long span main plane with fixed wooden tips and the flaps in two sections. Most Mk.I and all Mk.II gliders have a shorter span main plane, with detachable composite tips and one-piece flaps. Fig. 1 shows the general construction of the short span main plane; the numbering of the ribs is the same as that used in the Schedule of Spare Parts, Vol. III, Part 1 of this publication. The long span main plane has six additional ribs outboard of rib 20, otherwise rib numbering is as given in the illustration.

Centre section

2. The centre section is integral with the fuselage structure, being built into fuselage frames 16 and 19 (*see* Chap. 1).

Outer planes

3. *General.*—The outer planes each have a single main spar and auxiliary spars which carry the aileron and flap. A thick leading edge, forward of the spar, spaces the nose ribs and the covering is of plywood throughout; a number of hinged doors in the undersurface give access to the control cables, etc. (*see* Sect. 4, Chap. 3, fig. 1), and the aperture in the undersurface at the undercarriage housing is automatically closed by a flap (*see* Sect. 4, Chap. 3, fig. 4) when the undercarriage has been jettisoned.

4. *Spars.*—The single spar tapers towards the outer end and is of box construction, with two spruce booms, one above the other, and plywood webs strengthened by diaphragm members. The spar carries a duralumin plate to which ribs 1 and 2 are attached by means of angle-brackets; this plate is bolted to a similar plate on the centre-section spar to provide for the attachment of the outer plane to the fuselage. The housing which accommodates the main wheel undercarriage unit is bolted to the spar, in the bay immediately outboard of the attachment plate assembly, and the bracket which carries the undercarriage release catch (*see* Chap. 5) is attached to the rear face of the spar by a number of the bolts which secure the undercarriage housing. The bracket for the flap control cable pulley is mounted on the rear face of the lower spar boom between ribs 7 and 8, and the bracket for the flap return cord is carried on the upper spar boom in the same bay. The aileron control differential gear is mounted on the rear face of the spar, between ribs 15 and 16.

5. *Ribs.*—The ribs are divided into nose and trailing-edge sections by the outer plane spar and have spruce booms; plywood webs are glued to one side of the booms and vertical stiffeners are spaced between them. The ribs are attached to the spar by means of glued corner blocks and by posts between the spar web and the webs of the ribs. Ribs 2 and 3 are connected to the spar by metal attachment brackets.

6. *Auxiliary spars.*—Two auxiliary spars carry the aileron and flap, respectively, the trailing-edge ribs being shortened to accommodate them.

The aileron spar is located between ribs 11 and 20, and is attached by corner brackets at the booms and by posts glued to the rib webs. Metal angle brackets attach the spar to the shortened ribs on either side of the centre aileron hinge-bracket. The aileron connecting rod runs through a hole in the spar web immediately below the centre hinge-bracket and the aileron mass balance assembly passes through an adjacent hole in the web. The flap spar is attached in a similar manner between ribs 1 and 11.

Ailerons

7. The ailerons are of conventional type, with a single box spar and separate nose and trailing-edge ribs; the covering is plywood throughout. Three hinge brackets bolted to the front face of the spar secure the aileron to the aileron auxiliary spar (*see* para. 6) in the outer plane. The centre hinge has an extension to accommodate the control rod and the nosing is cut away at each hinge joint to give access to the hinge pins. The mass balance consists of a lead weight, attached to a tube which is bolted to the front face of the aileron spar, close to the centre hinge-bracket; the mass balance extends into the outer plane through an opening in the aileron auxiliary spar in the plane.

Flaps

8. One-piece split flaps are fitted to the short-span main plane, and two-piece split flaps to those Mk.I gliders having the long-span main plane; the construction is the same for both types. The spar comprises two spruce booms, faced on one side with plywood and with spruce posts between the booms at the rib stations. The spruce ribs are glued to the posts in the spar and are connected together at the trailing-edge by a spruce member running the length of the flap. The covering is plywood and the flap is attached to the flap auxiliary spar (*see* para. 6) in the outer plane by a number of simple hinges. The return cord and control cable attachment brackets are mounted respectively on the upper and lower surfaces of the flap, approximately at mid-span.

Access doors

9. Access for the inspection and/or adjustment of specific parts is provided as follows, the reference numbers in brackets being those given in Sect. 4, Chap.3, fig. 1.

(i) *Aileron controls.*—A hinged door (7) in the undersurface aft of the main spar and approximately in line with the centre aileron hinge-bracket, gives access to the aileron differential gear, the cable connections and the control rod. Another hinged door (3) in the undersurface, approximately at mid-span immediately behind the spar, gives access to the aileron cable adjusters.

(ii) *Flap controls.* The doors (3) referred to in sub-para.(i) also gives access to the flaps-control pulley bracket. Another hinged door (4), approximately in line with door (3) but towards the trailing-edge, gives access to the connection for the flap return cord.

(iii) *Undercarriage main wheel housings and release catches.* A hinged door (2) in the undersurface between ribs 2 and 3, immediately behind the main spar, gives access to the release catch for the undercarriage main wheel unit, and another door (1) adjacent to it, provides access to the undercarriage housing.

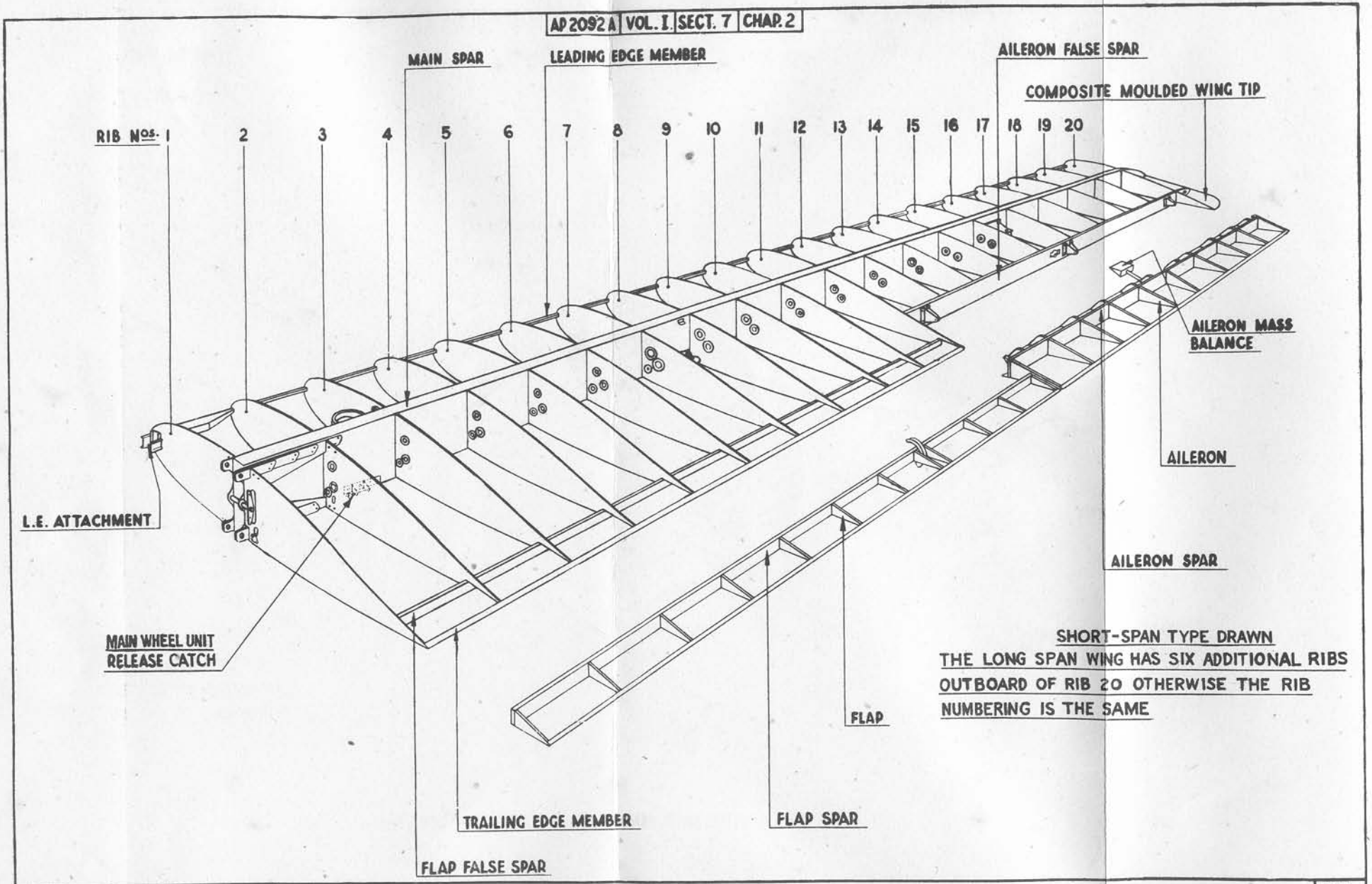

FIG. 1

MAIN PLANE

FIG. 1

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CHAPTER 3—TAIL UNIT

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CHAPTER 3—TAIL UNIT

General

1. The tail unit (*see* fig. 1) is of cantilever type without external bracing; it is of wooden construction with a plywood covering. The fixed tail plane carries the elevator, which has trimming tabs incorporated in the trailing edges, the tab on the port side being controllable during flight. The fin is integral with the rear fuselage and the rear fin post carries a horn-balanced rudder. A detachable tail fairing is fitted below the rudder and accommodates the rear navigation lamp.

Tail plane

2. *General.*—The tail plane has two spars, of which the front one is in two portions and the rear one is continuous for the full length of the span. Each portion of the front spar is connected to fuselage frame 47 by vertical pins passing through metal joints, and the rear spar is attached to the centre of frame 49 by four bolts.

3. *Spars.*—The spars are of semi-box construction, comprising upper and lower spruce booms with plywood webs glued to one side and spruce posts between them at the rib stations. On the rear face of the rear spar four hinges provide attachment for the elevators, and on the port side a curved metal guide tube, which accommodates the elevator tab control cables, is mounted on rib 2 and the spar.

4. *Ribs.*—The rib booms have spruce flanges and plywood webs glued to one side, vertical spruce stiffeners being glued to the webs and gusseted to the flanges. The nose and intermediate ribs are glued to the spar

5. *Covering.*—The covering is of plywood; hinged inspection doors give access to the upper and lower front attachment fittings, (*see* Sect. 4, Chap 3, fig. 1, items 20 and 23).

Elevator

6. The elevator is of single piece construction with a continuous spar of semi-box section. The ribs are glued and gusseted to the spar, with the exception of the inboard ribs which are staggered outwards to clear the tail fairings, and are bolted to brackets, which in turn are bolted to the rear face of the spar. The bracket attachment bolts secure additional brackets on the front face of the spar, which accommodate the inboard nose ribs and the elevator operating shaft. Between ribs 1A and 6 the trailing-edge ribs are cut away to accommodate the tabs and these shortened ribs are connected by spruce sub-spars of which the upper members are re-inforced by small blocks, which carry simple hinges for the tabs. A balsa fairing glued to the front face of the main spar extends from the tip of the elevator to rib 8 on either side. Between ribs 2 and 2A on the port side two fibre guide blocks for the trimming tab control cables are bolted to the front and rear faces of the spar. A removable plywood panel over this bay gives access to the cables. The elevator hinges are fitted between nose ribs 6 and 7, and at the inboard end, adjacent to the operating shaft brackets. The covering is plywood, glued to the spar and ribs.

Fin

7. The fin comprises two box-spar fin-posts, integral with fuselage frames 47 and 49, carrying a leading-edge member and with wooden ribs spaced between

them, the structure being covered with a plywood skin, the lower section of which is glued to a boundary member extending along the fuselage covering. The ribs have spruce and plywood webs. The rear fin post has three hinge brackets bolted to it to carry the rudder.

Rudder

8. The rudder is of similar construction to that of the fin, but has a single post, which carries the attachments securing the rudder to the fin. A lead-weighted horn balance is fitted.

FIG.

TAIL UNIT

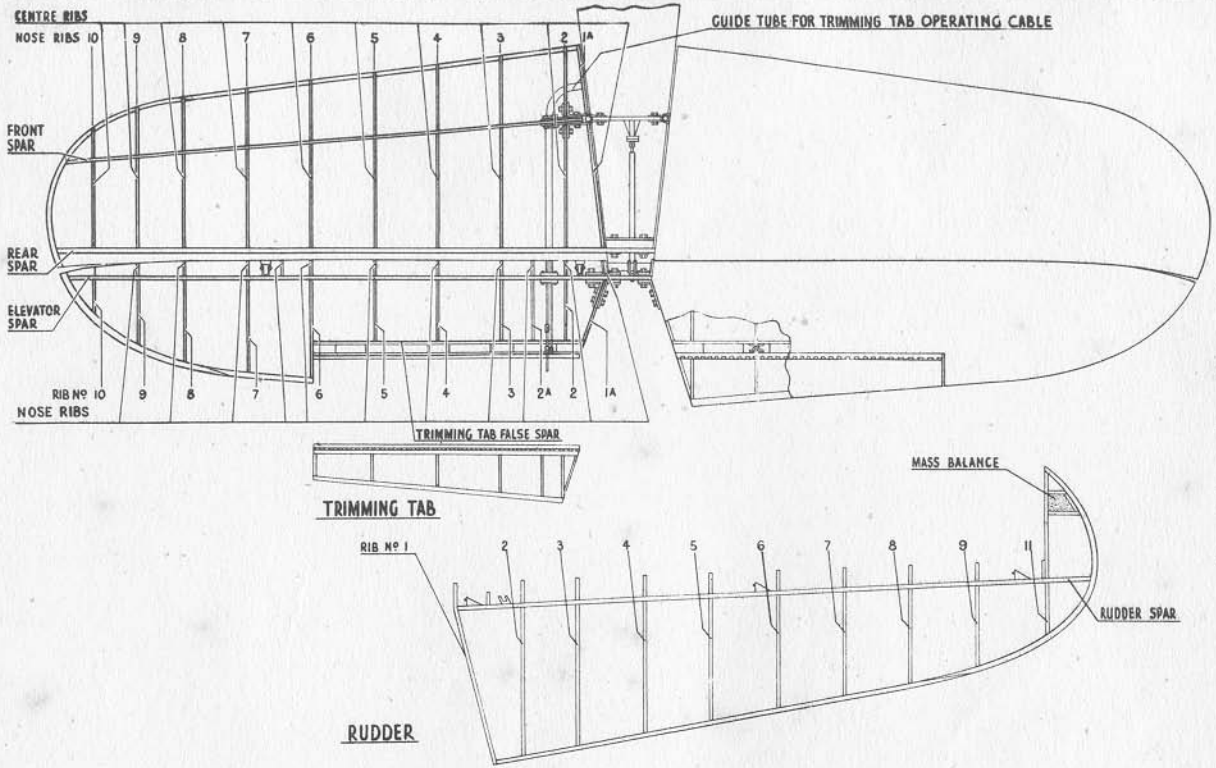

FIG.

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CHAPTER 4—FLYING CONTROLS

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CHAPTER 4—FLYING CONTROLS

General

1. The controls for the ailerons, elevator and rudder are of conventional type and are provided in both cockpits; some gliders have rudder slides and in others rudder control is by bar. The flaps control levers and the elevator trimming tab control lever are fitted only in the front pilot's cockpit. Cable connections are used throughout and the means of adjusting them is described in Sect. 4, Chap. 3; the layout of the cables is shown in Sect. 4, Chap. 3, fig. 6. The aileron, elevator and rudder controls may be locked by means of the locking gear described in para. 13 and illustrated in fig. 5.

Control columns

2. The simple, wooden control columns (*see* fig. 1) are of stick type; each is mounted at its lower end in a metal box-fitting, pivoted in the centre to a mounting tube by means of a single bolt. The mounting tube is carried in a bearing on the pilot's seat structure and terminates at its rear end in a transverse lever welded to the tube, to each end of which the aileron control cables are attached. The two control columns are interconnected by a tube attached to the lower ends of each box-fitting. The control columns are of two types; some gliders have straight tapered sticks and others have cranked sticks terminating at their upper end in a spade grip. Fore-and-aft movement of the front pilot's control column is transmitted to the elevator control cables by a rod connecting the base of the column to a rocking lever mounted on the starboard side of the fuselage keel, and to which the elevator control cables are attached. A self-aligning ball race is fitted to the joints at each end of this connecting rod.

Rudder slides

3. Mk.I and some Mk.II gliders have rudder control by means of rudder slides (*see* fig. 3). Each slide consists of two guide channels, bolted to wooden members which slope upwards towards the front of the cockpit, in which are accommodated rollers on which the slide platform travels. The range of forward movement of the front pilot's slides is limited by a simple adjustable stop at the front of each guide channel. The slide platform is of metal, with a roller at each corner; it carries a channel bracket, stiffened by web plates, in which the footrest is mounted. Three different mountings in the channel bracket provide means of adjustment for leg reach, the footrests being retained by quickly-detachable pins at the inner ends, to facilitate such adjustment. The slides in the front cockpit are coupled by passing the control cable round a pulley, which is mounted on a bracket on the fuselage keel ahead of the slide assembly.

Rudder bars

4. Those Mk.II gliders which are not fitted with rudder control by slides, have a conventional rudder bar (*see* fig. 3) in both cockpits. Each rudder bar consists of a solid ash member, the outer ends of which, shaped to accommodate the pilot's foot, carry toe straps secured to metal fittings. The bar pivots on a tube attached to a mounting block on the fuselage keel. The rubber control cables are connected to the inner pair of four eye-bolts on the front pilot's rudder bar. The interconnecting cables between the front and rear bars are attached to the rear bar by means of metal brackets bolted to the outer ends of the upper edge, and to the outer pair of eye-bolts on the front bar. The front bar has a short length of vertical tube protruding on the starboard side, which acts as an anchorage for the controls locking gear (*see* para. 13).

Flaps control levers

5. The main plane flaps are controlled by two interconnected levers (*see* fig. 2) mounted on the port side of the front pilot's cockpit. The rear lever is pulled upwards to operate the flaps for increased lift without imposing drag, and thereafter the front lever is moved upwards to vary the degree of drag exerted by the flaps; the position of the levers, which move together, thus gives some indication to the pilot of the position of the flaps. The levers are mounted in a V-shaped box-fitting, and their lower ends form a wooden cam round which flap-operating cable passes and to which it is anchored by a pin fitting. A fibre rubbing plate locates the cable. A spring-loaded pawl, carried on the rear lever and extending forward in the angular space between the levers, enables the levers to be held in any desired position; the pawl is connected by cables to a trip handle at the upper end of each lever, operation of which moves the pawl clear of the ratchet slots in the upper edges of the lever assembly side plates. The inboard side plate is attached to the outer plate by a number of bolts, some of which also support the bracket which carries the outer casing stops for the elevator trimming tab control (*see* para. 6); a stabilizing bracket is fitted at the rear of the assembly. Metal brackets, which incorporate the lever pivot bolt and to which the box-fitting is rivetted, are attached to the fuselage at floor level.

Elevator trimming tab control lever

6. The elevator trimming tab control lever (*see* fig. 2), which controls the setting of the port tab, operates in a quadrant bolted to the inboard side plate of the flaps control lever assembly (*see* para. 5). The lever pivots on the flaps control lever pivot bolt and has one hole above and one hole below the pivot point, to receive the control cables; it rides against a ratchet which holds it in any position, a subsidiary lever being provided to free the ratchet and enable the control lever to be moved. A bracket on the flaps control lever assembly (*see* para. 5) carries stops for the two control cable outer casings.

Aileron control

7. From the transverse lever (*see* para. 2) at the rear of the front pilot's control column mounting tube, cables run vertically through the cockpit floor and pass round pulleys mounted on each side of the fuselage keel. From these pulleys each cable runs rearwards through fairleads on the fuselage frames to a pulley mounted on the rear face of frame 19; another pulley, approximately halfway between these points, serves to locate the cable, which terminates at a pin attachment in the upper hole of a lever pivoted on the outboard end of the centre-section spar. The levers on the centre-section spar are connected by a balance cable attached to pins carried in intermediate holes between the pivot and the lowest holes in the lever. From the transverse lever at the rear of the second pilot's control column, cables run to pulleys on each side of the fuselage keel and then go rearwards and downwards to pick up with plate connections on the main aileron control cables. Immediately opposite and in line with the levers on the centre-section spar similar locking levers are mounted on the inboard ends of the outer plane spars, the adjacent pair of levers being coupled to each other by a link fitting, retained by pins which enter the lower holes in each lever. From each outer plane rocking lever tow control cables, one at each end of the lever, pass through the ribs just aft of the spar and are attached to the aileron differential lever adjacent to the centre aileron hinge bracket. A tubular connecting rod, having ball races at the joints and adjustable for length, couples the differential lever to the aileron.

Elevator control

8. From the lever on the fuselage keel (*see* para. 2), the elevator control cables run aft through fairleads on the frames to pulleys mounted on the rear face of the frame 29; the upper cable is led under a pulley mounted on the keel. From frame 29 the cables run upwards through fairleads attached to frame 47 and terminate at the rocking lever (*see* fig. 4) mounted on the rear face of this frame. A tubular connecting rod, adjustable for length, connects the rocking lever to the elevator.

Rudder control

9. *Rudder slides installation.*—The control cables from the second pilot's pair of slides (*see* para. 3) run under pulleys mounted beneath the seat and through fairleads on the fuselage frames, terminating at turnbuckles located in holes in the outboard ends of a rocking lever mounted on the keel at the rear end of the fuselage. The inner pair of holes in the rocking lever accommodate turnbuckles from which cables run upwards through two holes in frame 47, immediately above the tail plane attachment plates, and thence through two holes in frame 49, immediately above the lower rudder hinge bracket. The cables terminate at the operating lever on the rudder.

10. *Rudder bar installation.*—The cable run in the case of those gliders having rudder bars (*see* para. 4) is identical with that described in para. 9, with the exception that the cables run from the inner eyebolts on the underside of the front pilot's rudder bar, through fairleads at floor level and over pulleys mounted under the front pilot's seat on the fuselage keel, before being carried under the pulleys beneath the second pilot's seat (*see* para. 9).

Flaps control

11. From the flaps control levers (*see* para. 5) a cable runs to a turnbuckle attached to a lever mounted on the floor structure, adjacent to the rear of the front pilot's seat. From this lever another cable runs aft and downwards through the floor of the fuselage to a pulley mounted on the keel, and then through fairleads on the fuselage frames to a pulley mounted on the rear face of frame 19. The cable runs from the pulley diagonally upwards beside the rear face of the outer plane spar to the base of a triangular link plate. From the upper holes in the link plate, to which they are attached by means of turnbuckles, two cables run upwards to two pulleys mounted on the rear face of the centre-section spar, over which they pass, to change direction, running to shackles at the inboard ends of each outer plane. Cables connected to these shackles run over pulleys mounted on the rear face of the spars, where they change direction by 90°, and proceed aft to flap-operating levers carried on the outer plane flap spars. A rubber cord attached at one end to a bracket on the outer plane spar and at the other end to a bracket on the spar, returns the flap to the closed position.

Elevator trimming tab control

12. The control cables, which are enclosed in flexible outer casings, are attached by shackles and pins to holes above and below the pivot point of the control lever, the outer casings bearing against stops on a bracket on the lever assembly (*see* paras. 5 and 6). From here the cables run downwards through the fuselage floor to the rear of the fuselage and thence through a guide tube in

the tail plane (*see* Sect. 7, Chap. 3, fig. 1) and fibre blocks on the elevator spar, terminating at the upper and lower levers on the port trimming tab.

Control locking gear

13. The flying controls locking gear (*see* fig. 5) consists of three tubular struts pinned to a hinged clip. When it is required to lock the controls, this clip is secured to the control column in the front pilot's cockpit by means of pins. Two of the struts engage fittings on opposite sides of the cockpit, and the strut attached to the front portion of the clip is pinned to the rudder bar or slides. The attachment pins are secured to the gear by lengths of cord and, when not in use, the whole assembly is stowed in clips on the side of the fuselage between frames 16 and 19.

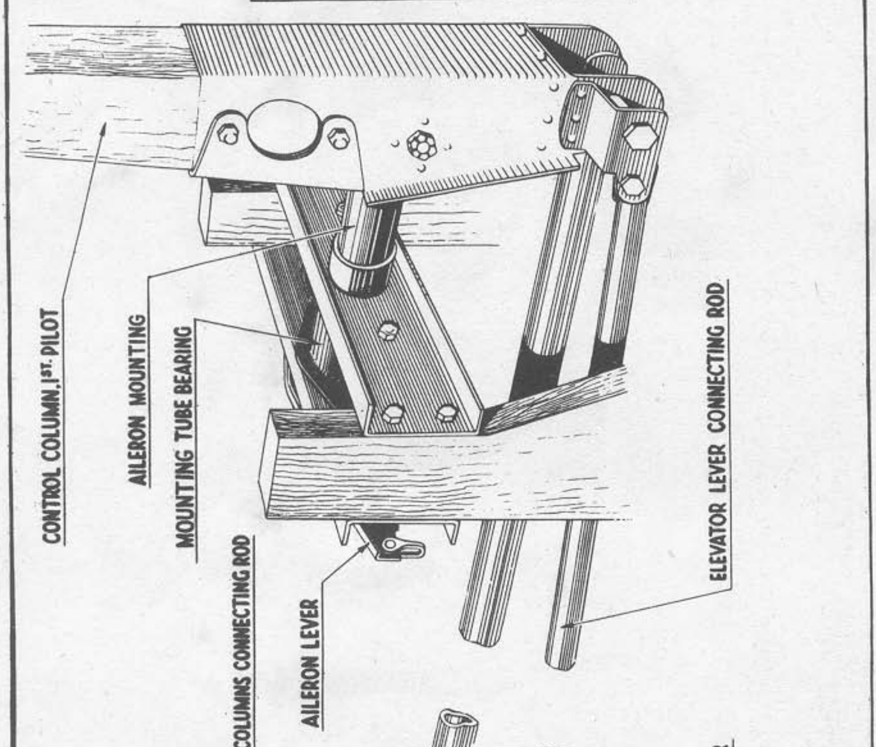

FIG. 1 CONTROL COLUMNS FIG. 1

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FIG 2

FLAPS CONTROL LEVERS

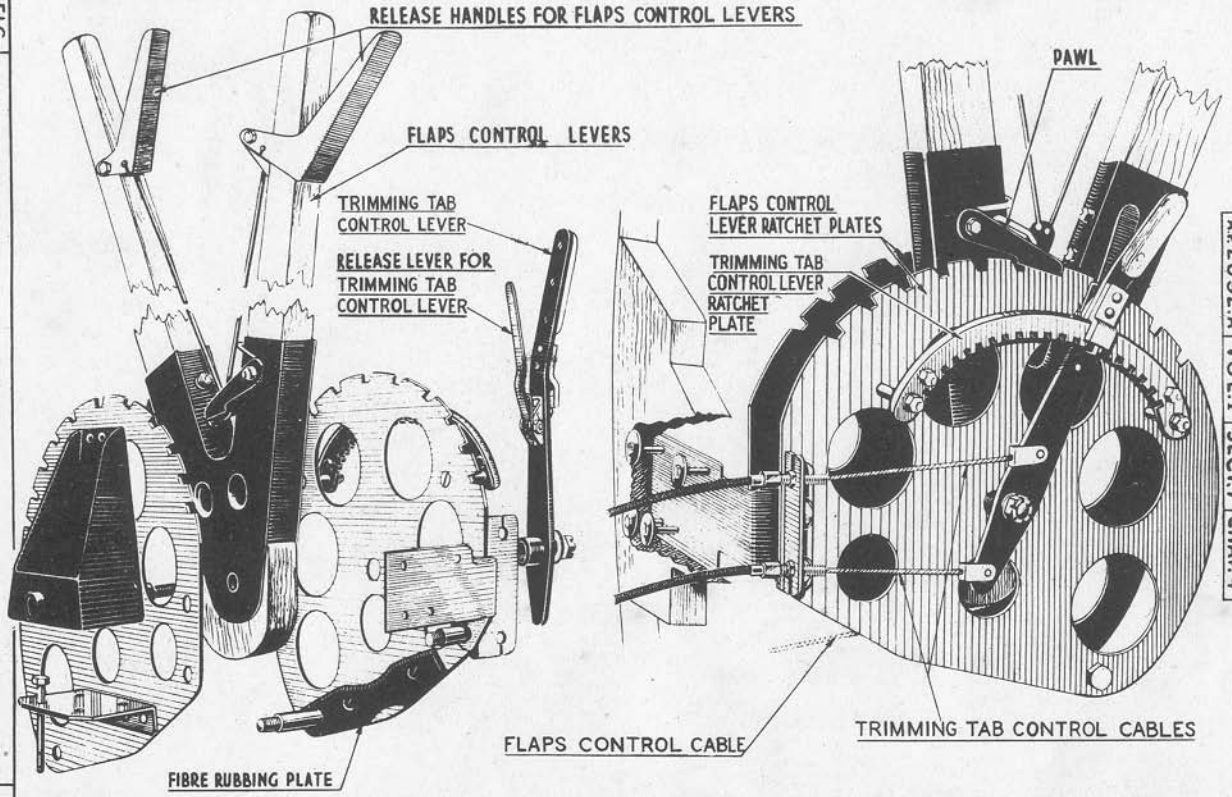
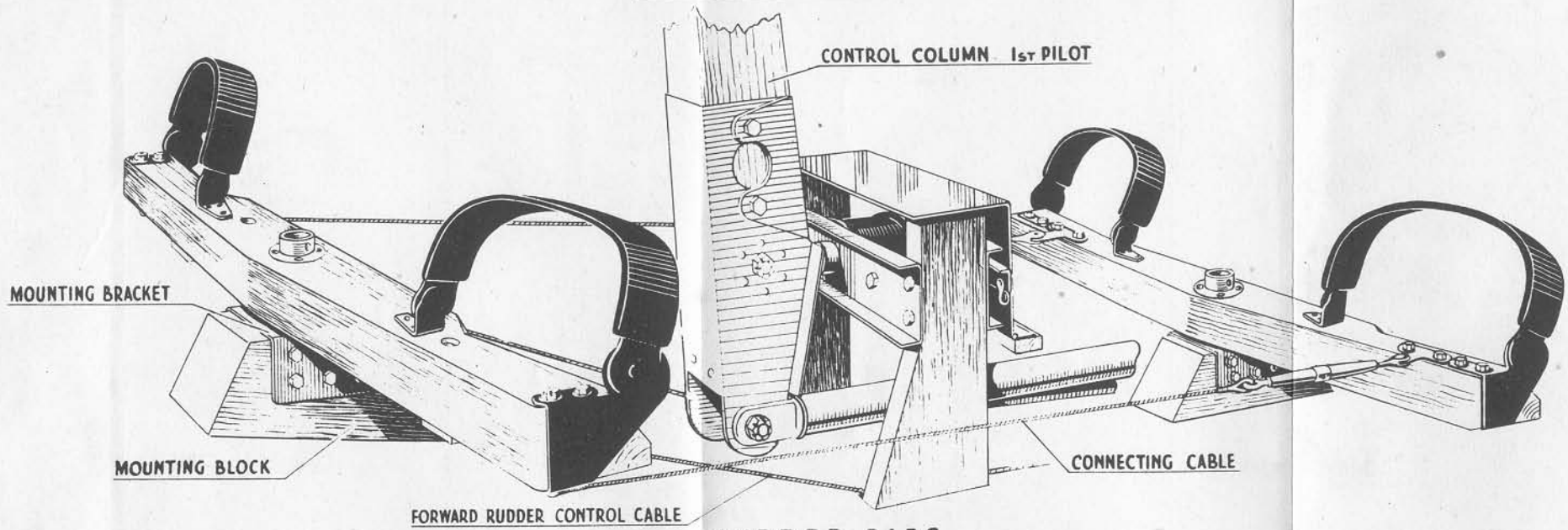
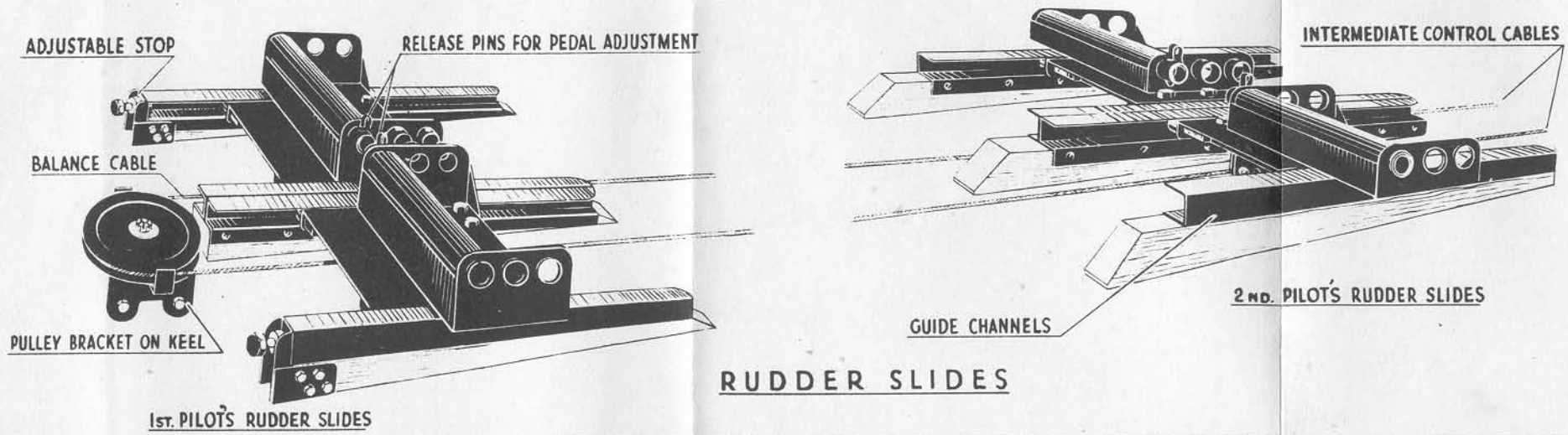


FIG 2



RUDDER BARS



RUDDER SLIDES

FIG 3

RUDDER CONTROLS

FIG. 3

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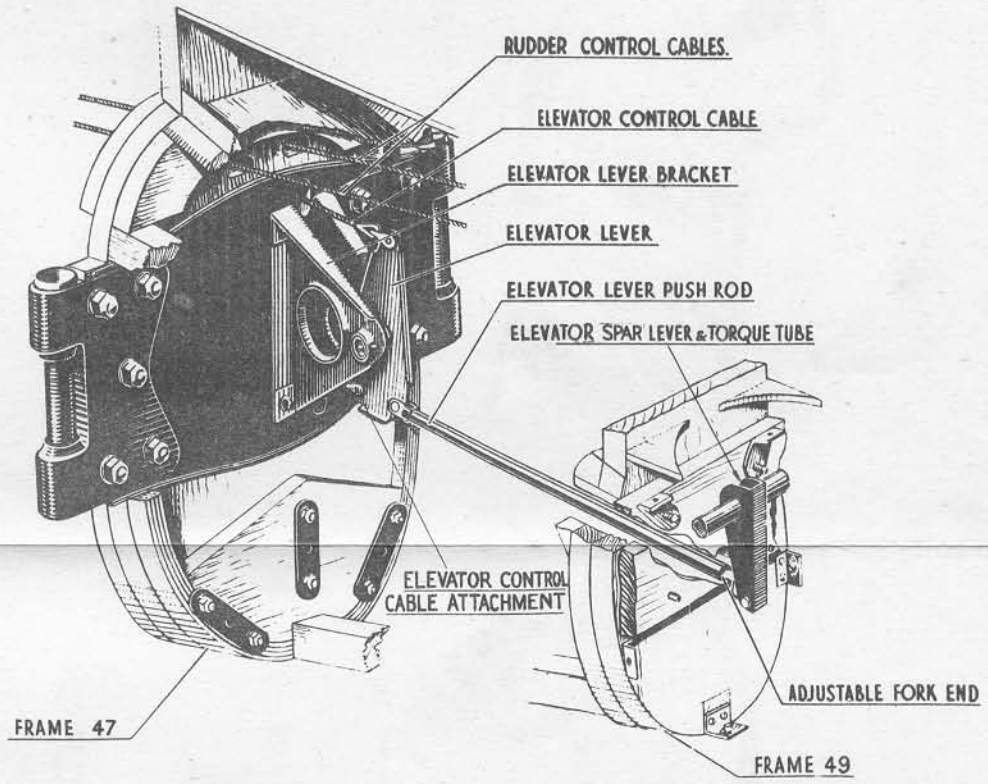
FIG. 4

ELEVATOR SHAFT ROCKING LEVER

FIG. 4



CHAPTER 5—UNDERCARRIAGE

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CHAPTER 5—UNDERCARRIAGE

General

1. The undercarriage consists of two main wheel units and a tail skid; if required, the main units, and the tail skid in later Mk.I and all Mk.II gliders, may be jettisoned by the front pilot after take-off, in which case the glider is landed on a single ash skid secured to the fuselage keel Each main wheel unit, is carried in a housing bolted to the main plane spar and has a shock-absorber strut and twin wheels. The tail skid is either of castoring, jettisonable-type or of simple, fixed construction. The undercarriage units are connected to the release mechanism, through a system of cables.

Main wheel units

2. *Shock-absorber and strut.*—Each main wheel unit (*see* Sect. 4, Chap. 3, fig. 4) consists of a steel outer tube (9) , to the lower end of which a bearing is retained by a number of attachment bolts (5). An inner tube (8), free to slide in the outer tube, is supported in this bearing. The outer tube houses a number of rubber shock-absorber discs, separated from one another by flat circular plates and located by a central rod secured to an end cup riveted to the closed end of the tube. The inner tube carries a main piston (7) with a central hole through which the locating rod on the upper tube is free to slide; the piston bears on the bottom rubber disc, so that as the inner tube moves upwards into the outer tube the discs are compressed. Approximately 7½ in. below the top of the main piston is a rebound piston (6), which contacts a rebound rubber secured between the inner tube bearing and the rebound piston, thus absorbing shocks on the return stroke and also retaining the inner tube in the outer tube.

3. The inner tube is prevented from turning in the outer tube by a spline (2) riveted on to its front face and engaging a slot in the lower bearing. The lower end of the inner tube is reinforced with an internal liner and drilled to accommodate the axle which carries the two wheels; the liner is secured by three bolts, the centre bolt holding the axle in place on the liner. The outer tube has a flange fitting against which the bottom of the jettison spring (*see* para. 4) bears, and a curved skid is attached to the tube to provide some measure of protection when the unit contacts the ground after being jettisoned. Immediately above the jettison-spring flange, a spline, riveted into the front face of the tube, engages a slot in the bearing at the base of the undercarriage housing tube (*see* para. 4), to prevent axial rotation of the outer tube in the housing. A threaded hole is provided in the outer tube, so that the jettison-spring may be held partially compressed during assembly operations (*see* Sect. 4, Chap. 2) by a bolt inserted in the hole.

4. *Main wheel unit housing.*—The housing which accommodates the main wheel unit described in paras 2 and 3, consists of a casting (4) (*see* Sect. 4, Chap. 3, fig. 4) bolted to the front face of the outer plane spar and having a brass bearing at its lower end in which the outer tube of the undercarriage unit slides. The top of the jettison spring bears against the base of the housing tube at the upper closed end of which is a stop plate for the outer tube. The front face carries an anchorage for an elastic cord actuating a flap which closes the undercarriage aperture in the fuselage, after the undercarriage has been jettisoned (*see* Chap. 1). The undercarriage unit is retained in the housing tube by a cable, which is attached to one of the lower bearing bolts on the inner tube at one end and to the jettison

release catch on the fuselage at the opposite end, (*see* para. 8). When the jettison control is operated the release catch frees the cable and the undercarriage unit falls from the housing tube, assisted by the jettison spring.

5. *Wheels.*—The wheels, mounted on a common axle, one on either side of each main undercarriage strut, are of the small hub, cast magnesium-alloy type. They are fitted with medium-pressure tyres. Each wheel runs on two ball-bearings and is retained on the axle by a collar secured by a bolt.

Tail skid

6. *Jettisonable-type.*—Later Mk.I and all Mk. II gliders have a jettisonable tail skid (*see* fig. 2), consisting of a heavy gauge tube with a pivoted U-shaped metal shoe at one end, and an annular groove which engages the jettison mechanism release pin, at the other. The shoe is attached to the tube by means of a rod, retained by split-pinned collars. A length of elastic cord, wound in four inner and four outer coils round the base of the tail skid tube, is attached to the shoe to act as a shock-absorber. The tail skid housing passes through the fuselage and is bolted at its upper end to a wooden block mounted on the keel; the jettison spring and release pin bracket (*see* para. 8) are mounted on the housing.

7. *Fixed-type.*—The fixed tail skid (*see* fig. 2) used on the earlier gliders comprises an ash member to which a steel shoe is secured by eight countersunk bolts. A bracket, attached to the front end of the skid by four bolts, is pivoted to a plate bracket held to the fuselage keel by four transverse bolts, the pivot permitting the skid a small amount of lateral, as well as up and down, movement. Shock is absorbed by a square rubber block, interposed between the skid and fuselage, which has two end plates vulcanised to it, one of which is secured by four short bolts to the skid and the other by four long bolts to the keel.

Jettison mechanism

8. *Release catches.*—The main wheel undercarriage unit is released for jettisoning purposes by freeing the supporting cable which secures the unit to a release pin (*see* fig. 1). This cable is attached to the inner tube of the undercarriage unit and at the opposite end terminates in a link plate with which the release pin engages. When the cockpit lever is moved to the rearward position it operates a cable passing round a pulley mounted in a trunnion to which the release pin is attached. The release pin is drawn inwards on its mounting bracket against the action of a coil return spring, freeing the link-plate which is jettisoned with the undercarriage unit and supporting cable. The jettisonable-type tail skid is released by withdrawing a release pin which engages an annular groove in the upper end of the tail skid tube. The release pin slides in a housing located immediately in front of the tail skid and mounted on a block in the fuselage keel, to which the upper end of the tail skid housing is bolted. A coil spring, in a simple casing above the skid housing, assists the jettisoning operation.

9. *Control lever and cable connections.*—The jettison control (*see* fig. 1) consists of a cranked lever with a suitable handgrip; it is pivoted to a bracket bolted to the starboard edge of the pilot's seat in the front cockpit in the case of early gliders with chest-type harness, and to the starboard side of the front cockpit in later gliders. There is no jettison control in the rear cockpit. The lever bracket incorporates a slotted gate in which the lever works. Below the pivot two holes in the lever arm accommodate the control cables. The tail skid

cable is connected by a link plate directly to the upper hole; the two main wheel unit cables are connected to a floating trunnion from which a short rod, incorporating a turnbuckle adjuster, runs to a link plate attached to the lower hole of the lever arm.

10. The three cables pass through a bracket, on the side of the seat, which carries an outer casing stop and an adjuster for each cable. From here the cables pass aft, the outer casings being clipped at suitable intervals to the fuselage structure, until they separate behind the centre-section spar. The main wheel cables run upwards, one on each side of the fuselage. and through the fuselage skin into the centre section, and the tail skid cable runs aft, where the outer casing terminates at an adjustable stop carried on a bracket on the keel at frame 33, the cable continuing, to connect up with the tail skid release pin. The main wheel outer casings terminate at adjustable stops carried on brackets secured by the lower bolts of each outer plane root joint. The cables have a shackle-connection to cables in the outer planes, which pass round the release pin trunnion pulleys (*see* para. 8) and are secured at their opposite ends to angle brackets held by two bolts to the lower face of the inboard trailing edge ribs of the outer planes.

Landing skid

11. When the undercarriage has been jettisoned, the glider lands on an ash skid in two sections running the length of the front fuselage and secured by rubber blocks to which metal attachment plates are vulcanised.

SECTION 11—EQUIPMENT INSTALLATIONS

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LIST OF ILLUSTRATIONS

WARNING:—This Section has not yet been amended to cover the Hotspur III glider. It applies only to Hotspur I and II gliders (*see* note on inside of front cover). (A.L. No. 8)

SECTION 11—EQUIPMENT INSTALLATIONS

Introduction

1. This section is limited to a description of items of equipment not dealt with in detail elsewhere in this publication; the disposition of the equipment is shown in fig. 1. The normal instruments are described in A.P.1275, Vol. I, and their disposition is described and illustrated in Sect. 1. The flying controls locking gear is described and illustrated in Sect. 7, Chap. 4 and the picketing rings and weather-proof covers are described in Sect. 4, Chap. 2.

Thermos flasks

2. A thermos flask for each occupant is fitted, each of which is secured by means of two metal clips. The flask for the front pilot is clipped on the starboard side of the fuselage between the front and rear cockpits, and that for the rear pilot is clipped to the rear port leg of the seat. The remaining flasks are clipped horizontally beneath the seats occupied by the troops.

Sanitary containers

3. Four double-type sanitary containers are fitted, each of which is secured at the rack by a simple metal clip. One is located on each side of the rear pilot's seat, for the use of both pilots and the occupants of seats Nos. 3 and 4. The remaining two are clipped opposite seats Nos. 6 and 7.

Map case

4. A fibre case to accommodate maps, etc., is mounted on the side of the fuselage, in the front cockpit. In those gliders having rudder control by slides it is located on the starboard side and in those gliders with rudder control by bar, on the port side.

Torches

5. Two electric torches are fitted, each secured by two metal clips. One is located at floor level on the starboard side of the fuselage forward of frame 6, for the use of the pilots; the other is clipped to frames 25 and 26, immediately below the top longerons for the use of the troops in the rear compartment.

Rate-of-climb indicator

6. An indicator to show the rate of climb and descent of the glider is fitted to the front pilot's instrument panel. It consists of two vertical glass tubes, tapered towards the bottom, one on each side of a scale graduated in hundreds of feet per minute. A coloured celluloid ball in each tube moves in relation to the scale, that in the tube marked UP indicating the rate of climb and that in the tube marked DOWN the rate of descent. Each tube has two connections protruding through the instrument panel; those from the top of the UP tube and the bottom of the DOWN tube run, via a single pipe and a T-piece, to two air flasks (at atmospheric pressure) secured by metal strips to a cross-member in the nose of the fuselage; the connections from the top of the DOWN tube and the bottom of the UP tube run to the static side of the pitot head, via the pipe to the altimeter and air-speed indicator. The variation in pressure occasioned by a change of altitude results in air flowing from the air flasks, through the indicator tubes and out through the pitot head when the glider climbs, and through the pitot head, through the indicator tubes and into the air flasks when the glider descends. The balls are raised by upward leakage of air past them; leakage increases in direct proportion to the rate of climb or descent and the height of the ball in the appropriate tube varies accordingly. When the glider is maintained in level flight air pressure is balanced between the pitot head and the air flasks and both balls assume a zero position.

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