

Chapter 1

RIGGING AND FLYING CONTROLS

CONTENTS

	Para.
General	1
Rigging	3
Rigging sequence	4
Control movements	5
Lubrication	6

ILLUSTRATIONS

	Fig.
Rigging diagram	1
Control settings	2
Rudder and elevator control runs	3
Aileron control run	4
Flap mechanism	5
Lubrication diagram	6
Calibration of Mk.4 tensioner	7

General

1. This chapter gives instructions, mainly in pictorial form, for rigging the aircraft and for adjusting and lubricating the flying controls. Reference should be made to Part 2, Sect.1, Chap.1 for the equipment necessary for these operations and for the location of the access panels. Control locking is described and illustrated in Part 2, Sect.1, Chap.2.

2. Complete, cable-operated circuits are provided for the elevator, aileron and flap controls, with short, adjustable push-pull rods transmitting the final movement to each surface; it is thus possible to change any of these components without disturbing the cable circuits. The rudder, however, incorporates an operating lever instead of a push-pull rod.

Note...

Whenever a new control cable is fitted, the identification tag must be removed.

Rigging (fig.1)

3. Since the main plane, fin and tail plane are fixed structures, the only rigging operations are those concerned with checking the diagonal measurements, the incidence and dihedral of the main and tail plane units, and with the settings and ranges of movement of the control surfaces.

Rigging sequence

4. The sequence for checking the incidence, dihedral and diagonal measurement tolerances is shown in the key which faces fig.1.

Control movements

5. The cockpit-controlled movable surfaces comprise an aileron and flap on each wing unit, two elevators, a single rudder, and one trim tab fitted to the starboard elevator. Fixed metal tabs are incorporated on the starboard aileron, and the rudder for adjustment, if necessary, on the ground. The control surface movements are shown on fig.2 and the method of adjusting the various control settings is shown on fig.3, 4 and 5, and accompanying texts.

Lubrication

6. The lubrication details are shown on fig.6. All ball bearings are packed with grease, XG-275 (Stores Ref.34B/9100512), upon assembly and should need no further routine lubrication. For lubrication of Bowden cables, use grease XG-273 (Ref. No.34B/9423151). The lubrication of the alighting gear is covered in Chap.2.

KEY TO FIG.1 (RIGGING DIAGRAM)

Symmetry check

- A Between the centre of spinner to centre-line of ball race housing on aileron outboard hinge.
- B From centre-line of ball race housing on aileron outboard hinge to a point on underside of rear bulkhead.
- C From a point rear of canopy centre-line to rear tip of tail plane. The difference between port and starboard measurements, A, B and C (above) must be equal ± 1.25 in.

Rigging sequence

1. Trestle the aircraft (Part 2, Sect.1, Chap.1) and level it longitudinally and laterally. For longitudinal levelling, use a clinometer on top of a straight-edge placed across the two datum pegs on the port side of the fuselage, outside the front cockpit. For lateral levelling, use the clinometer and straight-edge laid across the canopy rails of the front cockpit.
 2. Check the incidence of the mainplane at the flap and aileron centre hinge ribs. The mainplane incidence board (1) is inverted (7) after use at the flap location, for checking at the aileron rib. Mounting brackets (2) and (8) for a clinometer are provided, and the clinometer readings should be $0 \text{ deg.} \pm 30 \text{ min.}$ at both positions; the difference between incidence readings at the outboard rib location must not be greater than $0 \text{ deg.} 30 \text{ min.}$ for the two mainplanes of one aircraft.
 3. Check the dihedral of the main plane, using the same board turned over on one side (9), and a clinometer on bracket (10). The board should be level $\pm 20 \text{ min.}$
 4. Check the dihedral of the tail plane, using board (5) and a clinometer on bracket (6). The board should be level $\pm 1 \text{ deg.}$
 5. Using the same board inverted (4), check the incidence of the tail plane with a clinometer mounted on bracket (3). The board should be level $\pm 15 \text{ min.}$
 6. Check that the fin is vertical.
-

KEY TO FIG.2 (CONTROL SETTINGS)

Aileron

Movements are measured at the inboard end in line with the rib. The stops are on the front section of the rockshaft, in the control box immediately aft of the front seat (fig.4).

Flaps

Movements are measured at the inboard end in line with the root rib. The stop, limiting upward movement, is the contact between the control arm and the layshaft (fig.5).

Rudder

The movement is measured at the base. The stops are mounted on the front rudder bar (fig.3).

Elevator

The stops are on the lever bracket on the rear bulhead (fig.3).

- 1 WING INCIDENCE BOARD, 26AE/95003
- 2 BRACKET FOR CLINOMETER
- 3 BRACKET FOR CLINOMETER
- 4 TAIL PLANE INCIDENCE BOARD, 26AE/95004
(inverted)
- 5 TAIL PLANE DIHEDRAL BOARD, 26AE/95004
- 6 BRACKET FOR CLINOMETER
- 7 WING INCIDENCE BOARD, 26AE/95003 (inverted)
- 8 BRACKET FOR CLINOMETER
- 9 WING DIHEDRAL BOARD, 26AE/95003 (on its side)
- 10 BRACKET FOR CLINOMETER

Note . . . The locations for the rigging boards are marked on the aircraft.

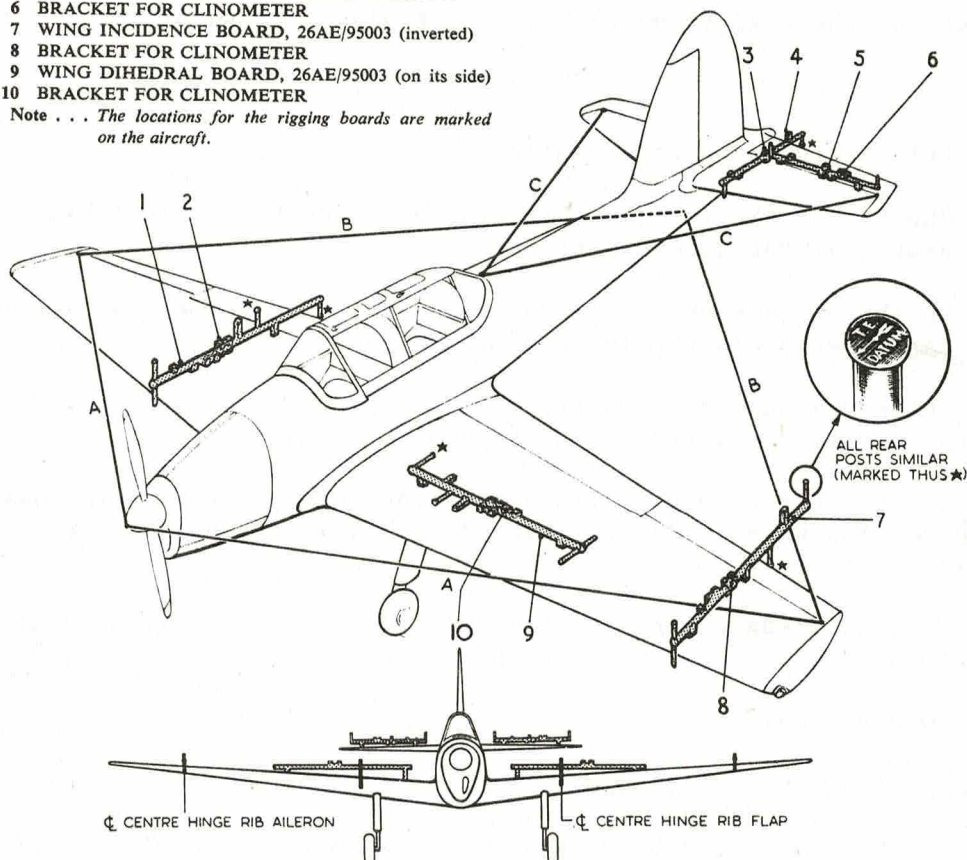


Fig. 1. Rigging diagram

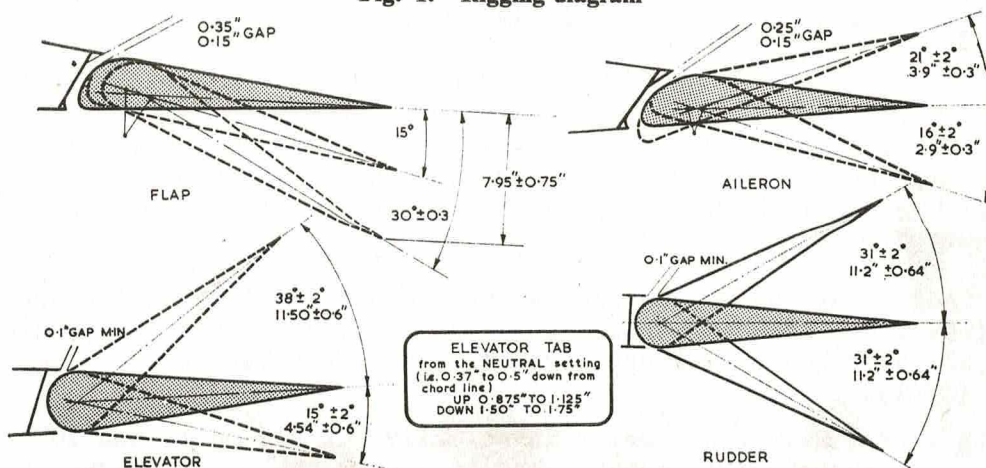


Fig. 2. Control settings

KEY TO FIG.3 (RUDDER AND ELEVATOR CONTROL RUNS)

To adjust the rudder and elevator controls, proceed as follows :-

RUDDER

1. Set the rudder pedals neutral.
2. Check that the rudder is in line with the fin, adjusting, if necessary, at the turnbuckles.
3. Check the tension in the run with a Mk.4 tensiometer. The tension load per cable should be 35 to 40 lb.
4. Check the surface movement with the figures given in fig.2, adjusting, if necessary, by the stops.
5. Check the turnbuckles for safety and relock with 20 swg. soft-iron locking wire. Lock the stop-bolts with the locknuts and similar wire as above.
6. With a spring balance, check that the static friction of the movement of the rudder bar does not exceed 6 lb.
7. 20 cwt. cables are used.

NOTE : A nominal clearance of 0.1 in. must be maintained between the rudder and the top of the fin, and a nominal clearance of 0.15 in. must be maintained between the base of the rudder and the adjacent fairings. The clearance between the rudder and shroud must be at least 0.1 in.

ELEVATOR

1. Set the elevators neutral, i.e. : in line with the tailplane, checking by the T.E. Datum post at the rear of the incidence board (Ref. No.26AE/95004), which should be located correctly as on Figure 1.
2. Adjust at the turnbuckles so that the cable lengths are approximately equal and the tension load is 50 lb. $\pm$ 10 lb. The readings should be taken on the upper cable with a Mk.4 tensiometer (Ref. No.1C/6135).

NOTE : The Mk.4 tensiometer is normally for use on 15 and 20 cwt cables but it can be used on 10 cwt cables in conjunction with the correction graph (fig.7).

3. Move elevators to the maximum up position (fig.2). Adjust the rear connecting rod to bring the operating lever (Fig.3) into contact with the up stop.

4. Check for full elevator down movement and lever contact with the down stop.

NOTE : It is not essential for the flanges of the control lever to make full contact over the width of the fibre stops, but it is important that both port and starboard flanges should contact the stop simultaneously in the upper and lower positions.

5. Using locking gear (Ref. No. 26AE/439), lock the control column. (Part 2, Sect.1, Chap.2). Adjust the elevator connecting rod in the control box until the elevator trailing edge is 5 in. $\pm$.5 in. above the trailing edge of the tailcone fairing; the elevator will then be 15 deg. $\pm$ 1 $\frac{1}{2}$ deg. up from the neutral position. This procedure will automatically bring the control column into the correct position relative to the elevators.

NOTE : Adjustment of this rod should not normally be necessary except on replacement of the rod or eye-end. If however, adjustment is required a new undrilled eye-end must be fitted. After adjustment, tighten lock nut and drill eye-end through existing holes in connecting rod end, using a No.41 (2.45 mm) drill, insert a 3/32 in. split pin and lock.

6. Remove the locking gear and again check the surface movement with the figures given in fig.2. Ensure that the control stick has sufficient clearance at the extremes of travel.

Elevator trim tab (fig.3)

1. With the cockpit trim wheels in the neutral position, the tab is rigged 0.37 to 0.50 in. down from the chord line. Adjusters are mounted on the aft face of the rear bulkhead and the four turn-buckles are mounted, two between the hand wheels and two aft of the rear hand wheel.

2. Check the tension of the trim tab cables with a tensioner Part No.402-1B-2; the tension load should be 6 lb.

3. Lock the turnbuckles with 20 swg soft iron locking wire.

NOTE : Turnbuckles of the elevator trim control handwheel inter-connecting cables are covered with PVC tubing (Ref.No. 5F/9471184). Following wirelocking of these turnbuckles, slide tubing back over turnbuckles and whip the ends with waxed twine to secure.

4. 5 cwt. cables are used.

WARNING : WHEN AN ELEVATOR OR TRIM TAB IS REMOVED, THE RESULTING SLACKNESS IN THE TRIM TAB CABLES, MAY CAUSE THE PEG ON THE CABLE TO COME ADRIFT FROM THE LOCATING HOLE IN THE REAR CONTROL WHEEL DRUM. IT IS ESSENTIAL, THEREFORE, TO ENSURE ON REASSEMBLY THAT THE LOCATING PEG IS IN POSITION ON THE DRUM, PRIOR TO ADJUSTING THE TRIM TABS AND TENSIONING THE CABLES.

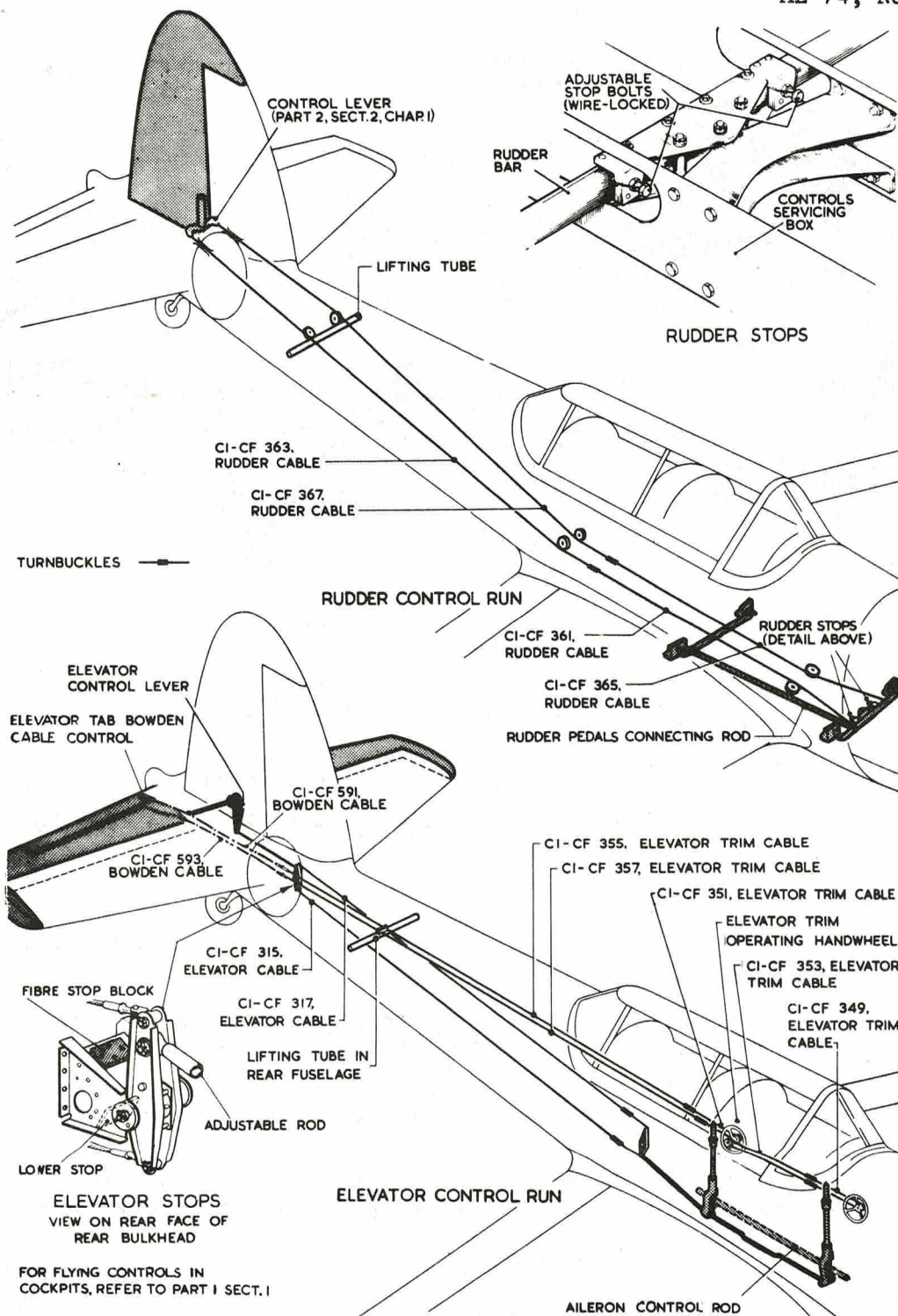


Fig.3 Rudder and elevator control runs

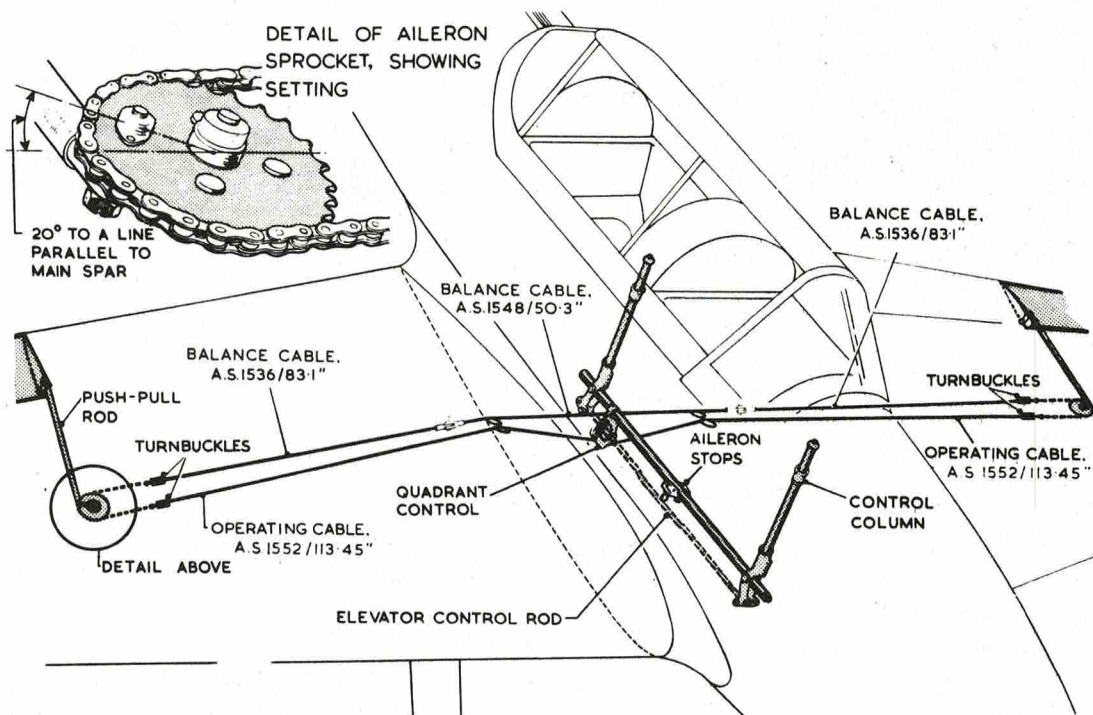


Fig.4 Aileron control run
 ◀ Cable Part No's. transposed ▶

Key to Fig.4 (AILERON CONTROL RUN).

The sequence for rigging the ailerons is as follows and must be carried out on both ailerons simultaneously:-

CAUTION...

During the following setting up procedure it is very important to ensure that:-

- (1) The aileron sprocket is correctly placed in the neutral position both before and after the cable tensions have been adjusted.
- (2) The cable adjustment is taken up equally on all the turnbuckles.
- (3) There is no distortion or damage at the stop bolts or brackets on the rockshaft and that they are correctly adjusted to provide the range of movement.

...Key to Fig.4 (AILERON CONTROL RUN) continued

- (4) With the ailerons at full travel there is at least 3/8 in. clearance between the locknuts at each end of each turnbuckle and its associated fairlead.
- (5) All locknuts and turnbuckles are locked.
1. Lock the control column in the neutral position, using control locking gear, Stores Ref.26AE/439 (Part 2, Sect.1, Chap.2), and locate the sprockets in the neutral position as shown in detail above..
2. With the aircraft in the rigging position, apply a spring balance at the trailing edge and pull upwards to a tension of 2 lb; in this position and with the incidence board (Stores Ref. 26AE/95003) located correctly on the aileron centre hinge rib (fig.1), the trailing edge, should be in line with the appropriate T.E. DATUM post at the rear of the incidence board, i.e. should form a continuation of the fixed wing profile.
3. Whilst in this neutral position check that the chains are equidistantly disposed round the sprockets.

Note...

Each sprocket is formed with a gap equivalent to two teeth and the chain provided with a blank line which mates with this gap. The gap is located so that the portion of chain on the operating side of the blank link is considerably shorter than that secured to the balance cable, and the ends of the chain are secured to turnbuckles with opposite threads. There is thus no possibility of the controls being crossed at this point.

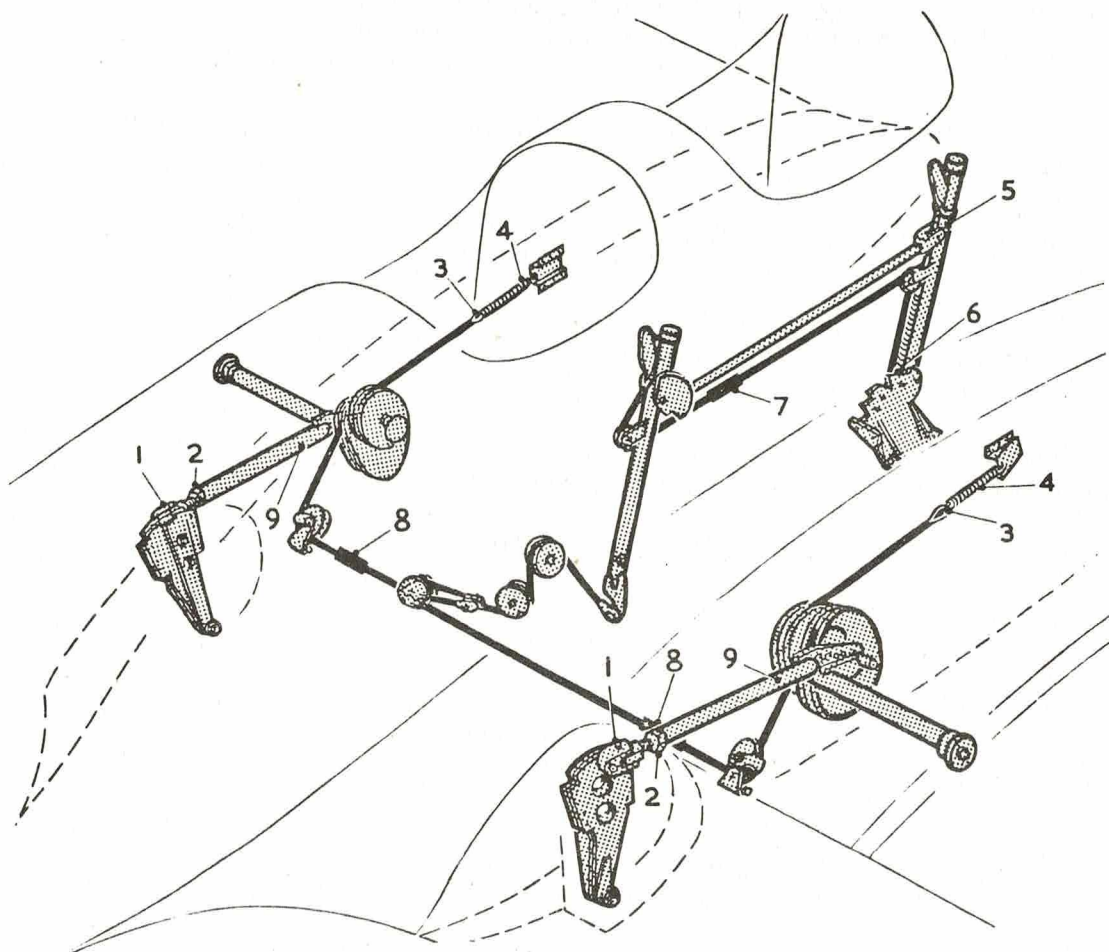
4. Check the tension in the run with a Mk.4 tensionmeter; the tension load should be 50 lb $\pm$ 10 lb. Adjust, if necessary, by the turnbuckles. Cable size is 15 cwt.
5. Remove the locking gear and check the surface movements against the figures given in fig.2, adjusting if necessary, by the stops. Using soft-iron locking wire across the top of the rock-shaft, lock the ends of the stop bolts together.
6. Lock the turnbuckles with the lock nuts and with 20 SWG soft-iron locking wire at the inboard ends.

...Key to Fig.4 (AILERON CONTROL RUN) continued

7. With a spring balance, check that the static friction of the aileron movement on the control column does not exceed 2 lb.

Notes...

- (a) The gap between the leading edge of the aileron and the shroud on the wing must not exceed 0.25 in. or be less than 0.15 in. (fig.2).
- (b) A nominal clearance of 0.1 in., must be maintained between each aileron and the adjacent wing tip and between each aileron and the adjacent flap.
- (c) The balance and operating cables can be identified, at the wing root end, in that the former has a fork end, whilst the latter has an eye end.
- (d) A leather sock is secured around the aperture in the auxiliary spar through which the aileron connecting extends. It is secured by a Jubilee clip, which should be replaced with the rod in the maximum aft position and the socket fully extended.



To set the flap controls, proceed as follows :-

1. Remove the wing root fillets (Part 2, Sect.2, Chap.1).
2. Slacken off the cables by the turnbuckles (8).
3. With the incidence board (Stores Ref. 26AE/95003) located correctly on the flap centre hinge rib (fig.1), adjust the control arm (9) so that the flap contour forms a continuation of the wing profile; this can be checked by ensuring that the trailing edge of the flap is level with the appropriate T.E. DATUM post at the rear of the incidence board. In this position, the spring (4) should hold the control arm against the layshaft.

Fig.5. Flap mechanism

...Key to Fig.5 (Flap mechanism) continued.

4. Adjust the cables at the turnbuckles (8) so that the locking pawl (6), on the front hand lever (5), enters the up lock cleanly with the cables moderately tight, i.e., so that the cables do not pull against the spring (4) and move the flap.

5. Check the down movement of the flaps with the figures given in fig.2.

6. Adjust the turnbuckle (7) on the pawl cable which interconnects the front and rear flap levers in the cockpit.

7. Lock the eyebolt (1) on the control arm (9) with the locknut (2), ensuring that the screwed end extends beyond the inspection hole in the arm.

Ensure that the connection (3) between the return cable and the tension spring end is bound securely with locking wire.

Check all the turnbuckles for safety and relock with 20 SWG soft-iron locking wire.

8. Replace the wing root fillets.

CAUTION ...

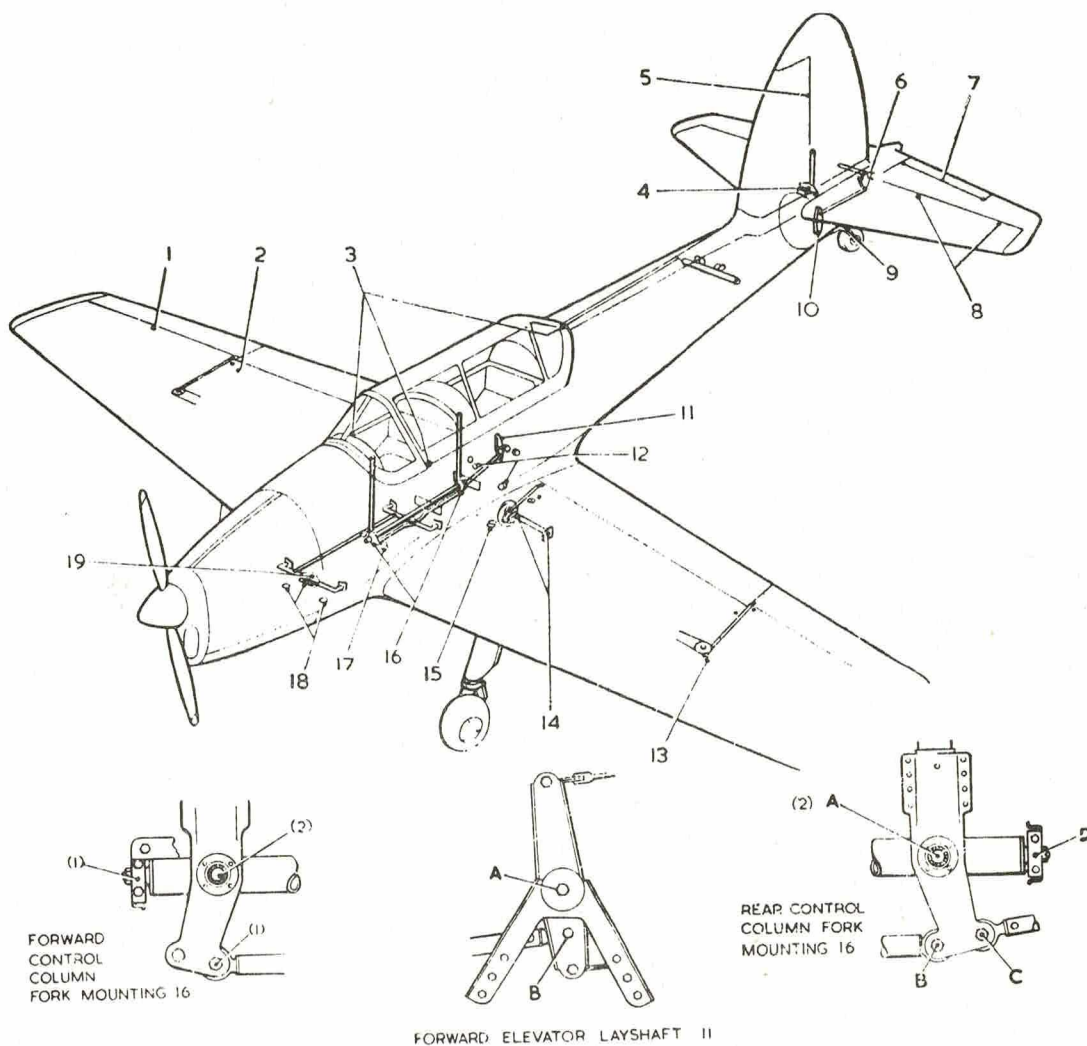
Should it be necessary at any time to remove flap operating cable, Ref. 26AE/348 (for reasons other than changing it for a new item) it is essential to mark the ends of the cable and the items to which it is attached so that it is refitted with the same lay, i.e. the position of the cable relative to its attachments remains unchanged. (AIL 1/70 incorporated).

Notes ...

(1) The gap, between the leading edge of the flaps and the shroud on the wing, must not exceed 0.35 in. or be less than 0.15 in. (fig.2).

(2) A nominal clearance of 0.1 in. must be maintained between each flap and the adjacent wing root, and between each flap and aileron. A nominal clearance of 0.05 in. must be maintained between the flap outboard hinge and the aileron pivot bolt.

(3) The dismantling and assembling of the flap mechanism is described and illustrated in Part 2, Sect.2, Chap.1.

**LUBRICATING DETAILS**

- | | | |
|--|--|---|
| 1 AILERON HINGES (3) ● | 9 TAILWHEEL STRUT ATTACHMENT TO TAIL PLANE ■ | 15 ALL PULLEYS IN AILERON CONTROL RUNS (fig. 4) ○ |
| 2 FLAP HINGES (3) ● | 10 REAR ELEVATOR LAYSHAFT ● | 16 CONTROL COLUMNS |
| 3 CANOPY SLIDES (3) ● | 11 FORWARD ELEVATOR LAYSHAFT GREASE BEARINGS A AND B ON ASSEMBLY ● | FRONT—4 BALL RACES |
| 4 RUDDER OPERATING LEVER BALL RACE AT ATTACHMENT TO FIN ● | 12 ALL PULLEYS IN FLAP CONTROL RUNS (fig. 5) ○ | REAR—BALL RACES A, B, AND C (4) ● |
| 5 RUDDER HINGE ● | 13 AILERON OPERATING SPROCKET CHAIN ● | BALL RACE D ○ |
| 6 LEVER ON ELEVATOR TORQUE TURE ATTACHED TO CONNECTING ROD (3) ● | 14 FLAP CONTROL LAYSHAFT BALL RACES AT EACH END ● | 17 ALL PULLEYS IN RUDDER CONTROL RUNS (fig. 3) ○ |
| 7 ELEVATOR TAB HINGES (3) ■ | CONTROL CRANK ARM ○ | 18 ALL PULLEYS IN BRAKE CONTROL RUNS ○ |
| 8 ELEVATOR HINGES (2) ● | | 19 RUDDER BAR PIVOT BEARINGS 2 ON EACH BAR ● |

NOTES

FIGURES IN BRACKETS DENOTE NUMBER OF POINTS TO BE LUBRICATED

- XG-287, Grease, low temp. (Ref.No.34B/2241861).
- Sealed ball races.
- OM-150, oil (Ref.No.34B/9100550).

Fig. 6. Lubrication diagram

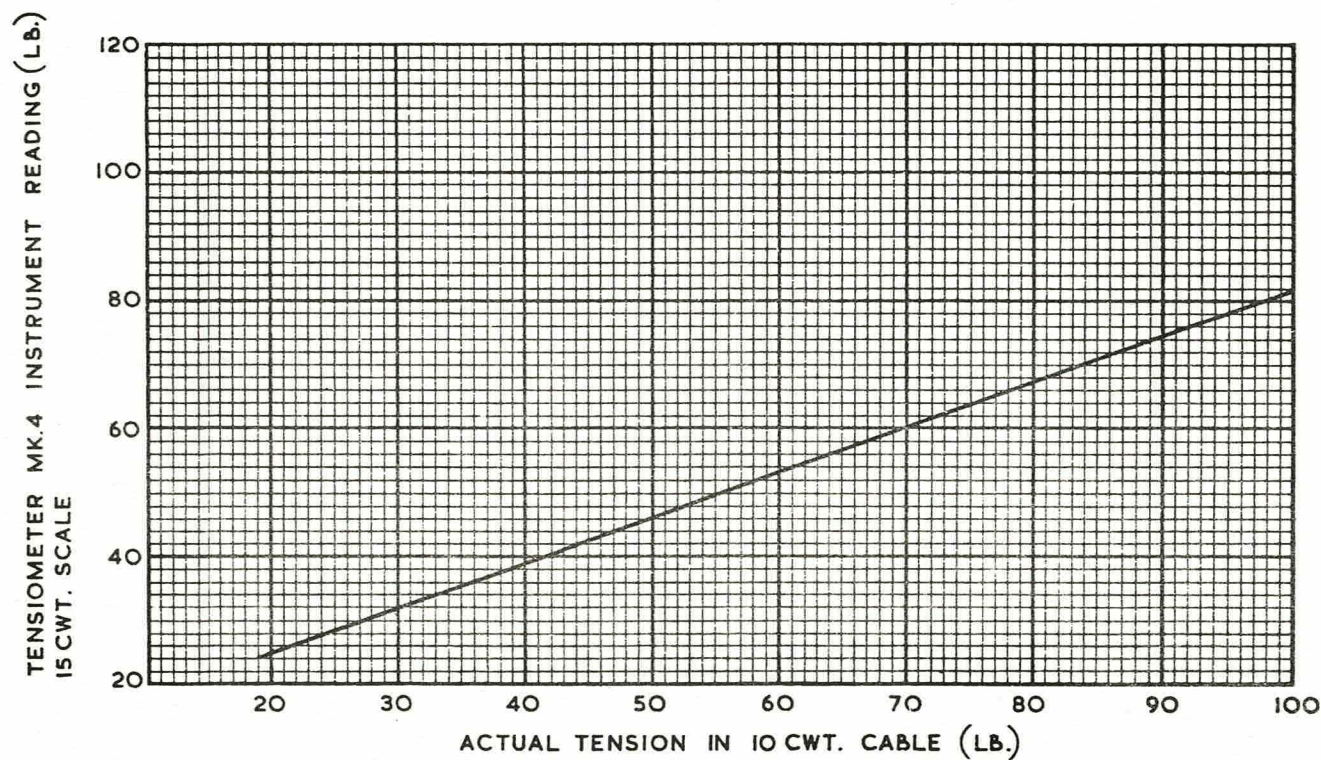


Fig. 7. Calibration of Mk.4 tensiometer (Stores Ref. IC/6135) on 10cwt. cable
RESTRICTED

This file was downloaded
from the RTFM Library.

Link: www.scottbouch.com/rtfm

Please see site for usage terms,
and more aircraft documents.

