

Chapter 4 FLYING CONTROLS

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DESCRIPTION AND OPERATION

General

1. The control column, column handle and rudder pedals, operate their relevant control surfaces by conventional cable runs, levers and connecting-rods. The aileron, rudder and the elevator and elevator trim tab control runs, are shown in fig. 13, 14 and 15 respectively. Whilst the levers and rods in the elevator and rudder systems operate their surfaces directly, those in the aileron system are connected to hydraulic servodyne units mounted on the rear spars, thereby under normal circumstances, providing indirect control of their surfaces from the column handle via the aircraft hydraulic system. Under power OFF (selector *in*) or power

failed conditions, the ailerons can be operated directly (*Sect. 3, Chap. 6*).

2. A simple gearing arrangement incorporated in the aileron and rudder control runs, progressively increases the surface-to-control movement towards each full travel position. In the aileron system, this gearing takes the form of an elliptical sprocket at the column base and in the rudder system, elliptical pulleys bracketed to the rear spar in the forward end of each tail boom. A length of bungee cord, connected between the elevator controls in the aft end of the starboard boom and the rear spar in the forward end of it, assists the pilot in recovering the aircraft from a dive.

3. Tabs are fitted to all the control surfaces, each aileron having a balance tab at its inboard end, the elevator a trim tab to port and a spring tab to starboard, and each rudder a trim tab at its base. Of these, the elevator trim tab and the port aileron balance tab (under power OFF conditions) alone are controllable in flight, when they can be mechanically and electrically-operated respectively, from a handwheel and a switch mounted on the engine control box. The rudder tabs may be re-positioned by ground adjustment only. The elevator spring tab is operated via its main surface control system directly.

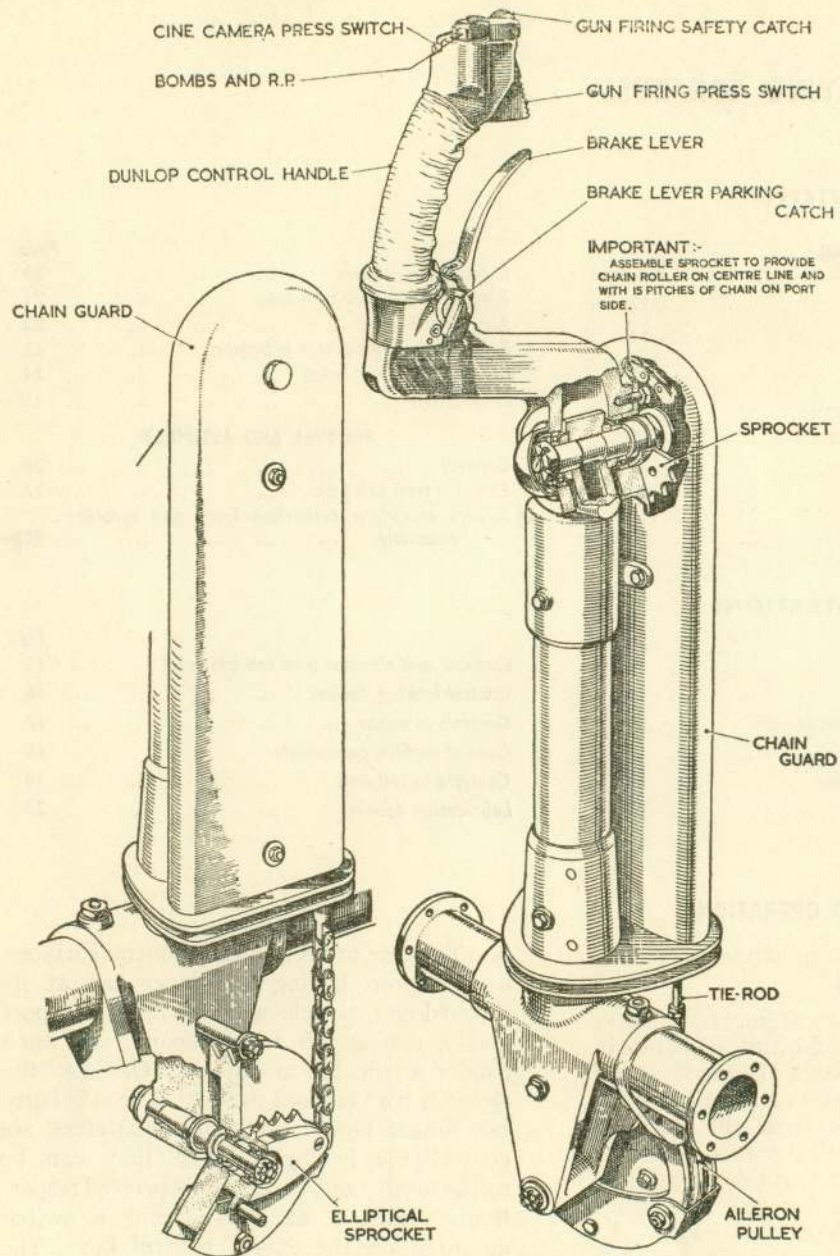


Fig. 1. Control column

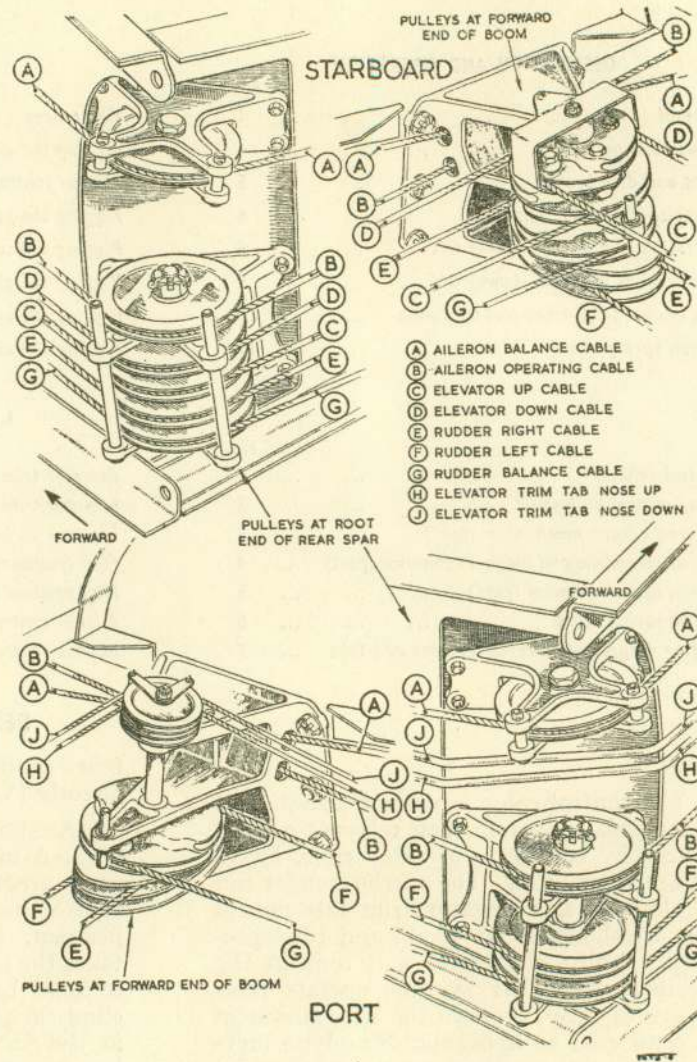


Fig. 2. Flying control pulleys

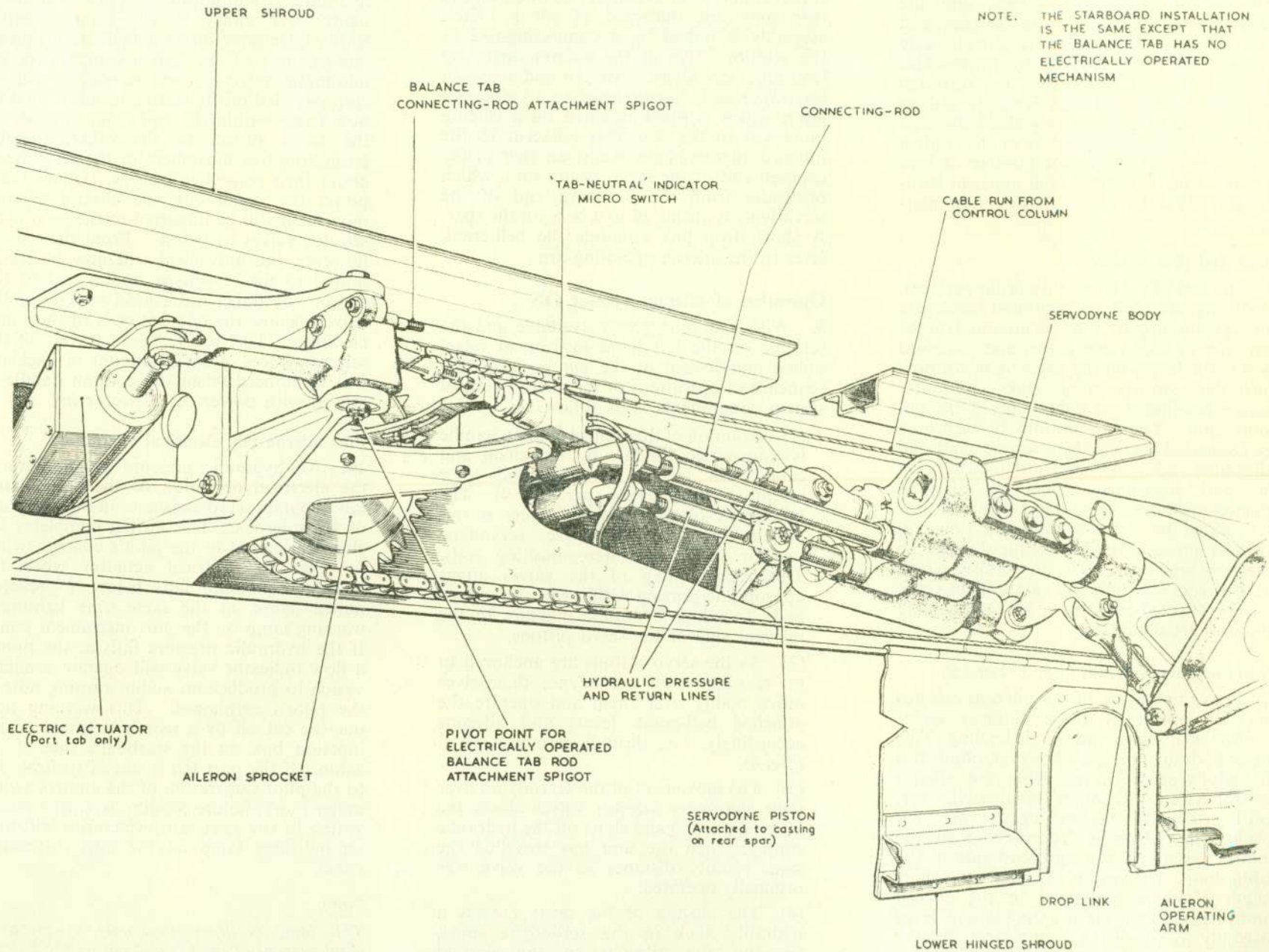


Fig. 3. Powered aileron mechanism (port)

Cables and pulleys

4. The aileron, elevator and rudder control runs consist of 25 cwt. cables, and the elevator trim control runs of Teleflex and 5 cwt. cables. All 5 cwt. and 25 cwt. cable sections are interconnected by turnbuckles and are directed throughout the airframe by pressure seals and fibre fairleads and by guarded pulleys mounted on sealed ball races. To prevent incorrect assembly of the control runs, each cable has a part number and an individual mark number, and adjacent turnbuckles and adapters are made non-interchangeable.

Flaps and dive brakes

5. The flap (*fig. 11*) and dive brake surfaces, which are operated by hydraulic jacks, are hinged from support brackets mounted on the rear spar of each main plane, and governed by selector levers on the engine control box. Each flap consists of an inner and outer section positioned on either side of the tail boom stub. The two sections in each case are connected together by a torque shaft and adjustable rods. An electrical indicator on the port instrument panel records the selected positions of the flaps. The indicator is operated by a transmitter unit (*fig. 12*) which is linked to the flap torque shaft in the starboard stub boom. The dive brakes, which are immediately outboard of the flaps, may only be selected IN or OUT, no intermediate positions are obtainable.

Power-operated ailerons (*fig. 3, 4 and 5*)

6. Power operation of the ailerons ensures efficient control of those surfaces under conditions of high aerodynamic loading. This use of hydraulic pressure however, eliminates the pilot's sense of feel from the aileron control system. To offset this disadvantage, feel is artificially simulated by a spring strut mechanism, which is incorporated in the control system on the starboard side of the cabin floor. The strut is operated by a short length of chain embodied in the aileron control cable run, via a sprocket and lever assembly to which the spring strut plunger is attached.

7. The control surface ends of the aileron

cables in each main plane are inter-connected by a chain, which is disposed about a sprocket and lever assembly mounted on the rear spar just outboard of rib 8. Each assembly is linked by a connecting-rod to the selector valve of the aileron operating hydraulic servodyne. An eye end on each servodyne body is connected to a bell-crank lever, which is pivot-mounted on a casting bracketed to the rear spar adjacent to the inboard aileron hinge, whilst another in the exposed end of the servo piston ram, which protrudes from the outboard end of the servodyne, is anchored to a boss on the spar. A short drop link connects the bell-crank lever to the aileron operating arm.

Operation of ailerons—power ON

8. With hydraulic power available and the selector on the left hand instrument panel pulled and locked in the *out* position, the sequence of operations of the aileron control system components is as follows:—

(1) Rotation of the control column handle is transmitted initially by the chain and cable runs to the sprocket and lever assembly on each rear spar (*fig. 4*). The movement of the sprocket levers is imparted to their respective servodyne selector valves by interconnecting rods. This repositioning of the valves aligns appropriate porting within each servodyne body to admit hydraulic pressure to the relevant side of the servo pistons.

(2) As the servo pistons are anchored to the rear spars, the servodynes themselves move bodily over them and operate the attached bell-crank levers and ailerons accordingly, i.e., through points A to E (*fig. 4*).

(3) The movement of the servodynes over their stationary selector valves closes the internal porting and shuts off the hydraulic supply, when the unit has travelled the same relative distance as the valve was originally operated.

(4) The closing of the ports creates a hydraulic lock in the servodyne units, securing the ailerons in the desired position until the column handle is moved again.

Operation of ailerons—power OFF

9. Should the fluid pressure in the aileron hydraulic system fall below a pre-determined figure, due either to the pilot selecting MANUAL (selector *in*) or a fault occurring in one or more of the system components, an automatic valve in each servodyne will be spring-loaded off its seating to allow fluid to flow freely within the unit from one side of the servo piston to the other, thereby permitting free movement of the servodynes about their respective pistons. Under these power OFF conditions, the control column movement will be imparted to the servodyne selector valves as before. From the valves, however, the movement will now be transmitted to the servodyne bodies and to the ailerons by direct mechanical contact of the valves against the relevant ends of their unit chambers. Due to the "dead travel" of the selector valves, a small amount of backlash will be noticed when the column handle is moved with power OFF (selector *in*).

Port aileron tab, electrical operation

10. An hydraulic pressure switch governs the electrical operation of the port aileron tab to obtain servo assistance in the operation of the ailerons. This switch completes the electrical circuit to the pilot's control switch for the tab electrical actuator when the hydraulic pressure falls below a predetermined figure, at the same time lighting a warning lamp on the port instrument panel. If the hydraulic pressure fails at the pump, a flow indicator valve will operate a micro-switch to produce an audio warning note in the pilot's earphones. This warning note may be cut off by a switch mounted on the junction box on the starboard side of the cabin. If the port tab is out of neutral, due to the pilot's operation of the control switch under power failure conditions, then a micro-switch in the port tab mechanism will light an indicator lamp on the port instrument panel.

Note...

This lamp is illuminated only by electrical displacement of the tab and not by tab balance movement due solely to the operation of the ailerons from the column handle.

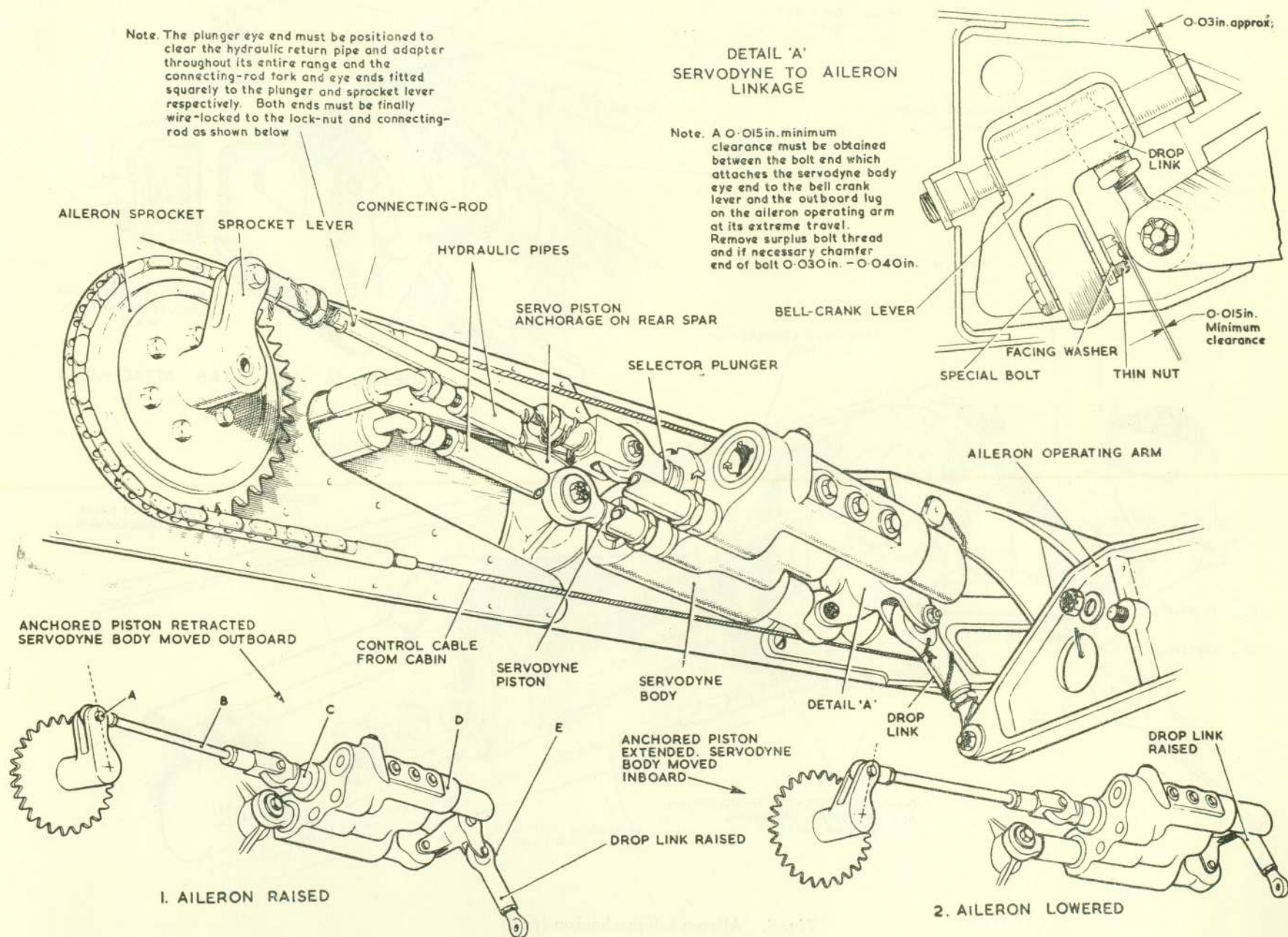


Fig. 4. Aileron servodyne and hinge mechanism (port)

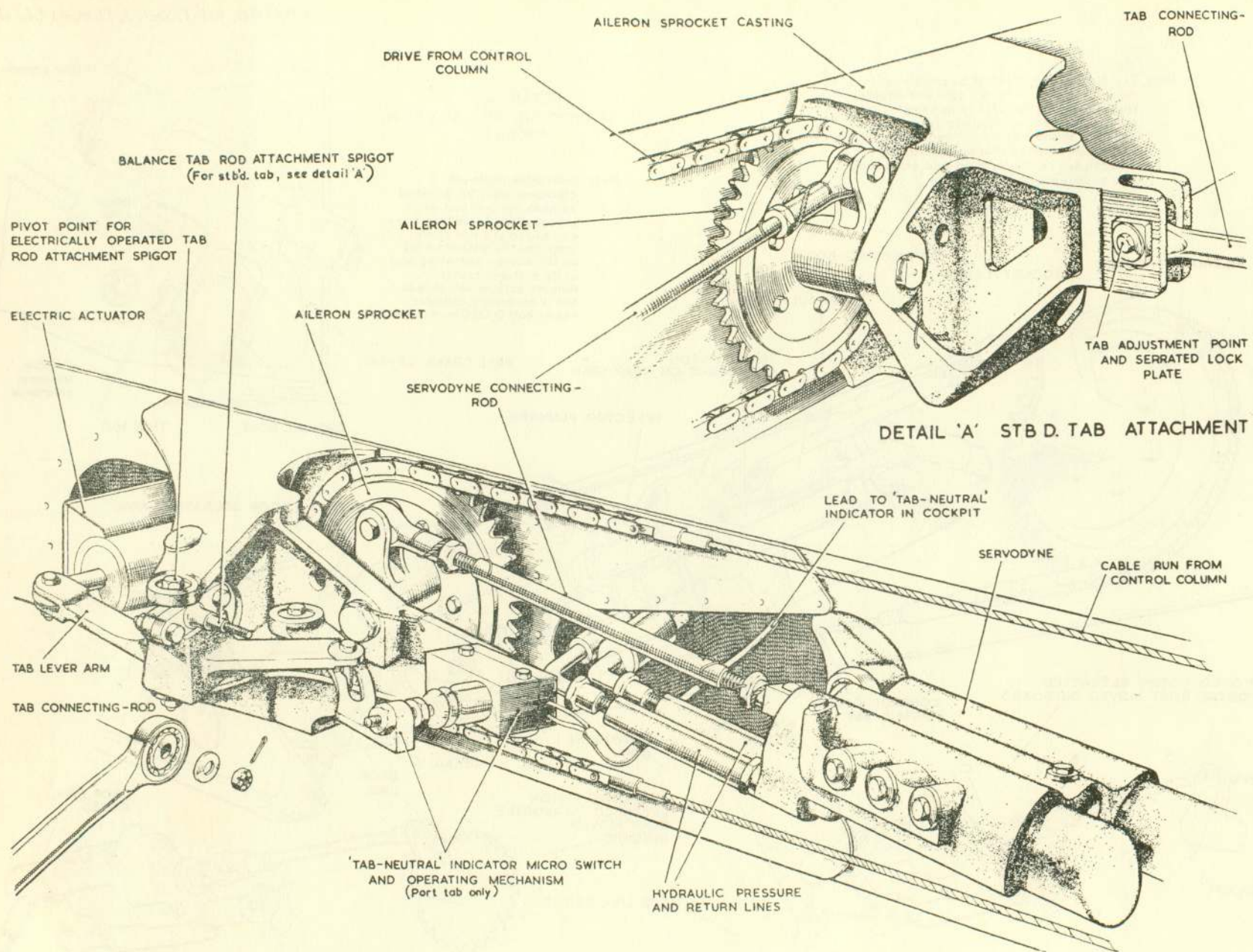


Fig. 5. Aileron tab mechanism (port)

RESTRICTED

Aileron spring strut

11. The spring strut, mounted on the starboard cabin floor, imparts a degree of spring loading to the aileron control system, proportionate to the deflection of the column handle either side of *neutral*. In this way, the sense of feel eliminated by the hydraulic operation of the surfaces is artificially replaced. In addition to this function, however, the strut provides a means of aileron trim, rotation of the barrel in one direction or the other causing the strut to extend or retract accordingly, without altering the spring tension.

Warning

Personnel must take special care to keep their hands clear of the ailerons and their operating mechanisms, whenever these surfaces are being power operated.

Clearances

12. The requisite clearances for the ailerons, aileron tabs, dive brakes and flaps are given in Chap. 2 of this Section, whilst those for the elevator, elevator tabs and rudders are given in Chap. 3.

Rigging the ailerons (fig. 7)

13.

Warning

Cases have occurred where control cables have been crossed in the ammunition bay aft of bulkhead No. 2, during rigging or cable replacement. It is of utmost importance that a visual inspection is made at this point by the removal of the V.H.F. radio, ammunition tanks and oxygen bottles.

(1) Check that the servodyne eye ends are correctly aligned with the fork ends of the aileron operating bell-crank levers (fig. 4, detail A). It may be necessary to fit laminated or solid shims to the servo piston anchorages on the rear spar, as illustrated in Chap. 6 of this Section. The alignment is corrected

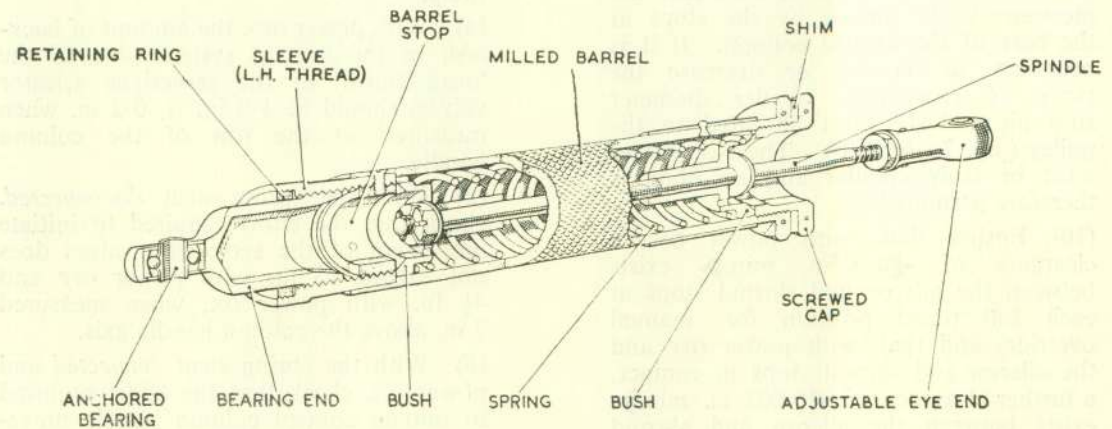


Fig. 6. Aileron spring strut

SERVICING

during initial assembly, and should not need adjustment unless the components concerned are subsequently renewed.

(2) Secure the elliptical sprocket at the base of the control column with the locking plate, as shown in fig. 16.

(3) With the column handle held *neutral*, assemble the chains to the upper and lower sprockets on the control column so that, with a roller on the column centre-line, there are fifteen pitches to port on each (fig. 1). Connect up and correctly tension the tie-rods equally, ensuring that the handle remains *neutral*.

(4) Secure the aileron operating sprocket on each rear spar in the *neutral* position, by inserting the locking pins as shown in fig. 7, detail A.

(5) With the spring strut disconnected at point 'A' (detail C), couple up the aileron control cables (the position of the turnbuckles is shown in fig. 13), and tension them to 65 lb. ± 10 lb. reading off the 20 cwt. scale of a Mk. 4 tensiometer, applied to the cables in the outer flap shroud of each main plane.

Note. . .

The optimum temperature for setting cable tensions is 60 deg. F. and the following corrections should be applied to compensate for other temperature conditions. For each 10 deg. above 60 deg. F., add 4 lb. to the required cable tension, and for each 10 deg. below 60 deg. F., deduct 4 lb. from the required tension. As far as is practicable, cable tensions should be set under constant temperature conditions, i.e. in an enclosed place, and should be checked at each full travel position as well as at neutral.

(6) With hydraulic power applied (i.e., cabin selector OUT), adjust the servodyne connecting-rods 'C' (detail A) until the arms of the bell-crank levers 'D' are parallel to the spar datum (Note in fig. 4).

(7) Adjust the length of the drop links 'E' (detail A) until the ailerons are *neutral*, and check the entire system for security, locking and safety.

(8) Remove the locking plate from the base of the control column and the locking pin from the aileron sprocket on each rear spar.

(9) With hydraulic power applied, check the ailerons for full, free and correct sense of movement. Ensure that their

range, measured at the trailing edge outboard of the tabs, agrees with the dimensions given in fig. 18 and that the movements are limited by the stops at the base of the control column. If it is necessary to increase or decrease the range of movement, smaller diameter stop pieces 'M' must be fitted to the pulley (fig. 7, detail F). The stop pieces must be truly circular and no filing is therefore permitted.

(10) Ensure that, with power ON, a clearance of $\llcorner 0.005$ in. min. \blacktriangleright exists between the aileron and shroud stops at each full travel position for manual override, and that, with power OFF and the aileron and shroud stops in contact, a further clearance of $\llcorner 0.002$ in. min. \blacktriangleright exists between the aileron and shroud structure.

(11) With the controls again secured in *neutral* by refitting the lock plate at the column base, and the spring strut adjusted to its mid-travel position (determined by halving the overall trim range (detail C)), adjust the eye end of the strut plunger at point 'N' until it can be attached to lever 'G' without the spring being compressed. Check the eye end for safety, tighten its lock-nut and secure the plunger to the lever. Remove the lock-plate from the column base.

Aileron control checks

14. After rigging the ailerons, the following checks must be carried out:—

(1) Ensure that there is no appreciable snatch at the control column handle when the hydraulic selector in the cabin is operated.

(2) Check the rate of operation of the powered ailerons and ensure that, except when the column handle is moved very rapidly, it is not possible to move the servodyne selector valves independently of the unit bodies.

(3) Check the controls for general smoothness and stability. Possible causes of judder and instability are slack control cables, or backlash in any other part of the control system. Any backlash

evident under power ON (selector OUT) conditions must be eliminated entirely.

(4) With power OFF, the amount of backlash in the control system (due to the 'dead travel' of the servodyne selector valves) should be 1.0 in. \pm 0.2 in. when measured at the top of the column handle.

(5) With the spring strut *disconnected*, check that the effort required to initiate movement of the servodyne valves does not exceed 15 lb. with power OFF and $4\frac{1}{2}$ lb. with power ON, when measured 7 in. above the column handle axis.

(6) With the spring strut *connected* and power ON, check that the effort required to initiate control column handle movement from *neutral* does not exceed 6 lb., and to move it to maximum deflection 20 lb. to 28 lb. when measured 7 in., above the column handle axis.

(7) With the spring strut, *connected* and power OFF, check that the effort required to initiate control column handle movement from *neutral* does not exceed 4 lb. to 5 lb., and to move it to maximum deflection 22 lb. to 28 lb., when measured 7 in. above the column handle axis.

(8) The column handle must return to within 0.75 in. of the *neutral* position from any degrees of deflection with power ON, measured 9 in. above the column handle axis.

(9) With power ON, finally check that the force required to hold the control column handle at either full travel position, is not less than 9 lb., measured 7 in. above the column handle axis.

Rigging the port aileron tab (fig. 7)

15. (1) With power OFF (selector IN) and the ailerons locked *neutral*, operate the electric actuator until the pin 'J' in the lever slot is on the peak of the cam 'F' (detail E).

(2) Adjust the connecting-rod 'K' (detail E) until the trailing edge of the tab is in line with that of the aileron, then tighten and wire-lock the lock-nut securely.

(3) Unscrew the adjusting screw 'L' on the cam lever (detail E) until it is clear of the micro switch button, then screw it in again until the switch is just operated, i.e., until the tab position indicator light in the cabin is extinguished.

(4) Check that the electrical movement of the tab trailing edge, during which the micro switch remains open and the light OUT, agrees with the dimensions given in detail G. Re-adjust the screw 'L' as necessary (for any greater degree of electrical movement, the light should be ON). Simultaneously, ensure that operation of the control switch to port causes the tab to move *down* and vice versa, and that the overall range of electrical servo movement agrees with the figures given in fig. 18.

(5) Finally, manually displace the aileron 15 deg. *up* and *down*, and check that the aileron to tab trailing edge dimension at each position agrees with that given in fig. 18.

Warning

After adjustment for 'nose up pitch' to the starboard tab connecting-rod, correction for asymmetric lateral trim (applied by the pilot electrically to the port tab in flight) may be embodied in the control system by equivalent ground adjustment of the port tab connecting-rod within the limits quoted in fig. 7, detail G; the maximum amount of trim adjustment at any one time is to be limited to that specified. \blacktriangleright

Rigging the starboard aileron tab (fig. 7.)

16. (1) With power ON (selector OUT) and the ailerons locked in *neutral* by inserting the pin through the sprocket and lever assembly and its mounting bracket on the starboard rear spar (detail A) adjust the height of the forward end of the tab connecting-rod, at its serrated attachment point 'P', to the dimension shown (detail B).

Warning

Whenever the nut securing the tab connecting-rod attachment bolt at point 'P' is tightened, great care must be taken that, whilst the serrated lock plates are

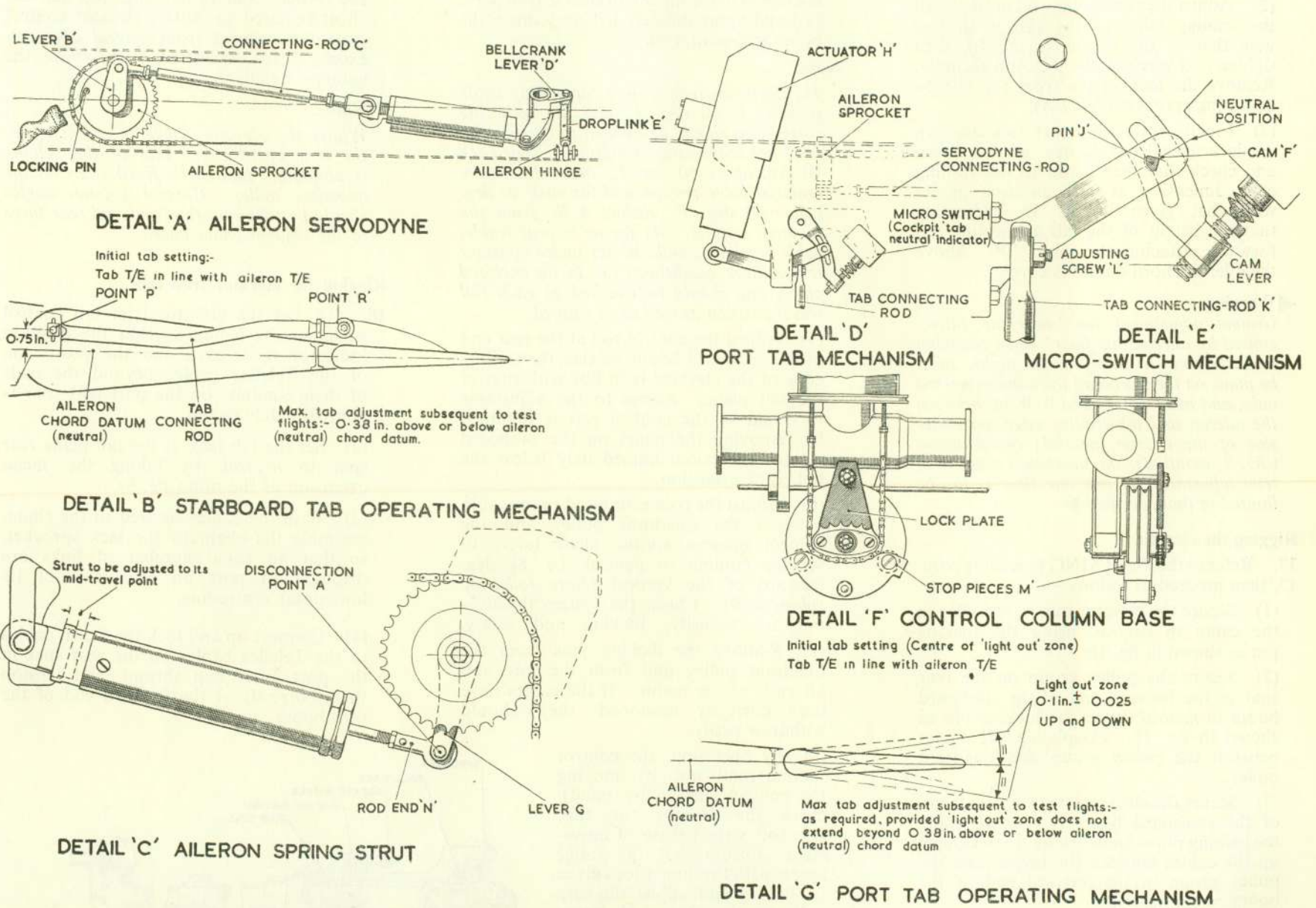


Fig. 7. Rigging diagram—powered ailerons and tabs

properly seated, the serrated lugs are not compressed.

(2) Adjust the connecting-rod at 'R,' until the trailing edge of the tab is in line with that of the aileron (detail B), then tighten and wirelock the lock-nut securely. Remove the locking pin from the aileron operating sprocket (detail A).

(3) Finally with power OFF (selector IN), displace the aileron 15 deg. up and down, and check that the aileron to tab trailing edge dimension at each position agrees with that given in fig. 18, indicating that the height of the tab connecting-rod forward attachment point 'P' above the aileron chord datum is correct.

Warning

Ground adjustment for 'nose up pitch,' caused by aileron 'up float' when changing from POWER to MANUAL in flight, must be made on the starboard tab connecting-rod only, and must not exceed 0.38 in. between the aileron and tab trailing edge, on either side of the aileron (neutral) chord datum (fig. 7, detail B); the maximum amount of trim adjustment at any one time is to be limited to that specified. ▶

Rigging the elevator

17. Refer to the WARNING preceding para. 13, then proceed as follows:—

(1) Secure the elevator quadrant pulley in the cabin in *neutral*, using the locking pin as shown in fig. 16.

(2) Secure the pulley group on the rear spar in the forward end of the starboard boom in *neutral*, using the locking pin as shown in fig. 16. Couple up the cables between the pulley group and quadrant pulley.

(3) Secure the elevator levers in the aft end of the starboard boom in *neutral*, using the locking pin as shown in fig. 16. Couple up the cables between the levers, and the pulley group in the forward end of the boom on the rear spar.

(4) Tension the control cables mentioned in sub-paras. (2) and (3) above simultaneously to 90 lb. \pm 0 lb., reading off —10 lb.

the 15 cwt. scale of a Mk. 4 tensiometer. The tensiometer should be applied to the cables in the inner flap shroud (sub-para. (2)) and approximately half way down the boom (sub-para. (3)).

Note. . .

The optimum temperature for setting cable tensions is 60 deg. F. and the following corrections should be applied to compensate for other temperature conditions. For each 10 deg. above 60 deg. F., add 4 lb. to the required cable tension and for each 10 deg. below 60 deg. F., deduct 4 lb. from the required tension. As far as is practicable, cable tensions should be set under constant temperature conditions, i.e. in an enclosed place, and should be checked at each full travel position as well as at *neutral*.

(5) Adjust the control rod at the rear end of the starboard boom, so that the trailing edge of the elevator is in line with that of the tail plane. Access to the adjustable fork end of the control rod is obtained by removing the panel on the outboard side of the boom immediately below the tail plane extension.

(6) Adjust the connecting-rod in the cabin between the quadrant pulley and the control column torque shaft lever, to set the column in *neutral*, i.e. 8½ deg. forward of the vertical (Note following sub-para. 9). Check the system through-out for security, locking and safety.

(7) Remove the locking pins from the quadrant pulley and from the fore and aft ends of the boom. If the cables have been correctly tensioned they should withdraw easily.

(8) By operating the control column (and not by moving the control surface by hand), check the elevator for full, free and correct sense of movement. Ensure that the range agrees with the dimensions given in fig. 18 and adjust the stop bolts in the starboard boom rear diaphragm as necessary to achieve those figures. Tighten and wirelock the stop bolt lock-nuts securely.

(9) Check that the range of movement of the control column is 22 deg. forward of the vertical, and 12 deg. aft, and that the effort required to initiate elevator control system movement from *neutral* does not exceed 5 lb., measured 7 in. above the column handle axis.

Note...

Whilst the elevator range is restricted by the rear boom stops, that of the column is ultimately limited by fixed stops on the quadrant pulley. Control column angles should be taken on the front and rear faces of the column chain guard.

Rigging the elevator trim tab

18. (1) Set the elevator trim tab control wheel in the cabin, so that the position indicator reads *zero* and the protrusion of the Teleflex cables beyond the ends of their conduits on the port rear spar is approximately equal.

(2) Set the tab jack at the tail plane rear spar in *neutral*, by taking the mean extension of the ram (fig. 8).

(3) With the cables secured to the chain, assemble the chain to the jack sprocket, so that an equal number of links are disposed to port on each side of its horizontal centre-line.

(4) Connect up and lock the 5 cwt. cables to the Teleflex cables on the rear spar in the port inner flap shroud, and tension them correctly at the forward end of the port boom.

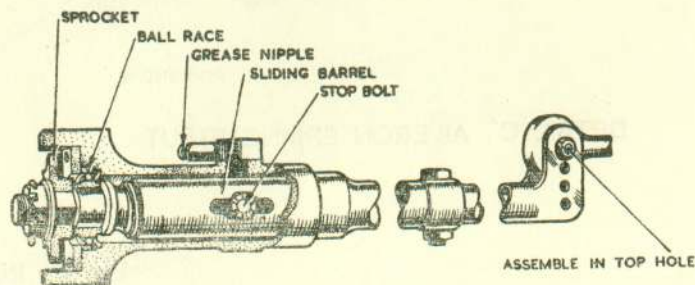


Fig. 8. Elevator trim tab jack

- (5) Secure the elevator in *neutral* and couple up the tab connecting-rod to the correct hole in the jack fork end as shown in fig. 8. Adjust the rod to bring the trailing edge of the tab in line with that of the elevator. Check the system throughout for security, locking and safety.

Note . . .

Play at tab trailing edge must not exceed 0.020 in.

- (6) Operate the handwheel in the cabin and check the tab for full free and correct sense of movement. Ensure that the range agrees with the dimensions given in fig. 18. When the handwheel is rotated clockwise, the tab should move upwards and the indicator towards NOSE DOWN, and vice versa. Minor corrections to the position of the indicator, may be effected by adjusting its operating cable conduit at the control box (fig. 9). Ensure also that the effort required to initiate rotation of the control handwheel, does not exceed 12 lb. measured 3.5 in. from the handwheel axis.

Rigging the elevator spring tab (fig. 10)

19. The elevator spring tab operating mechanism is correctly set on initial assembly and will not need re-rigging unless subsequently dismantled, when the following procedure should be adhered to:—

- (1) Lock the elevator levers in the rear of the starboard boom in *neutral*, using the locking pin as shown in fig. 16 and secure the elevator in *neutral* also.
- (2) Check that the forward end of the tab connecting-rod is correctly assembled to the tab actuating lever and the tab actuating lever to the elevator mounting bracket.

Note . . .

If the adjustment of the tab connecting-rod has been disturbed, it should be set to a nominal length of 9.45 in. before re-assembly.

- (3) Insert the spring unit into the elevator and assemble its eye end to the rear mounting bracket with the special bolt, washer and nut.

- (4) With the link eye-bolt loosely screwed into the spring unit link fork end, assemble the eye-bolt to the elevator torque tube lever with the special bolt, washer and nut.

- (5) With the trailing edge of the tab in line with that of the elevator, adjust the link fork end, until the attachment holes in the fork are in line with those in the actuating lever, then tighten the lock-nut securely.

- (6) Assemble the link fork end and the exposed end of the spring unit plunger to the actuating lever, with the special bolt, washer and nut and check throughout for security, locking and safety.

- (7) Assemble the spring unit fairing to the elevator, remove the elevator and elevator lever locking devices and operating the control column, check that the range of spring tab movement agrees with the dimensions given in fig. 18.

Rigging the rudders

20. Refer to the WARNING preceding para. 13, then proceed as follows:—

- (1) Secure the rudder pedals in *neutral*.
- (2) Secure the pulley group on the rear spar in the forward end of each boom in *neutral*, using the locking pins as shown in fig. 16. Couple up the cables between the rudder pedals and the pulley groups.

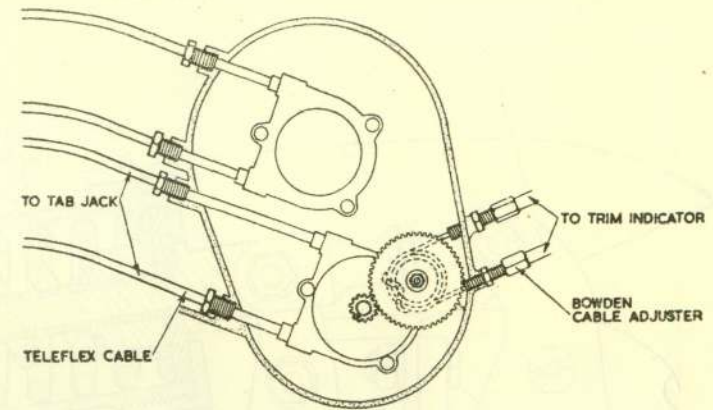


Fig. 9. Elevator trim control box

- (3) Secure the rudder levers in the aft end of each boom in *neutral*, using the locking pins as shown in fig. 16. Couple up the cables between the levers and the pulley groups in the forward end of the booms on the rear spars.

- (4) Tension the control cables mentioned in sub-para. (2) and (3) above simultaneously to $65 \pm 0 \text{ lb.}$ reading off the 15 cwt. scale of a Mk. 4 tensiometer. The tensiometer should be applied to the cables in the inner flap shrouds (sub-para. (2)) and approximately half way down the booms (sub-para. (3)).

Note . . .

The optimum temperature for setting cable tensions is 60 deg. F. and the following corrections should be applied to compensate for other temperature conditions. For each 10 deg. above 60 deg. F., add 4 lb. to the required cable tension and for each 10 deg. below 60 deg. F., deduct 4 lb. from the required tension. As far as is practicable cable tensions should be set under constant temperature conditions, i.e. in an enclosed place, and should be checked at each full travel position as well as at neutral.

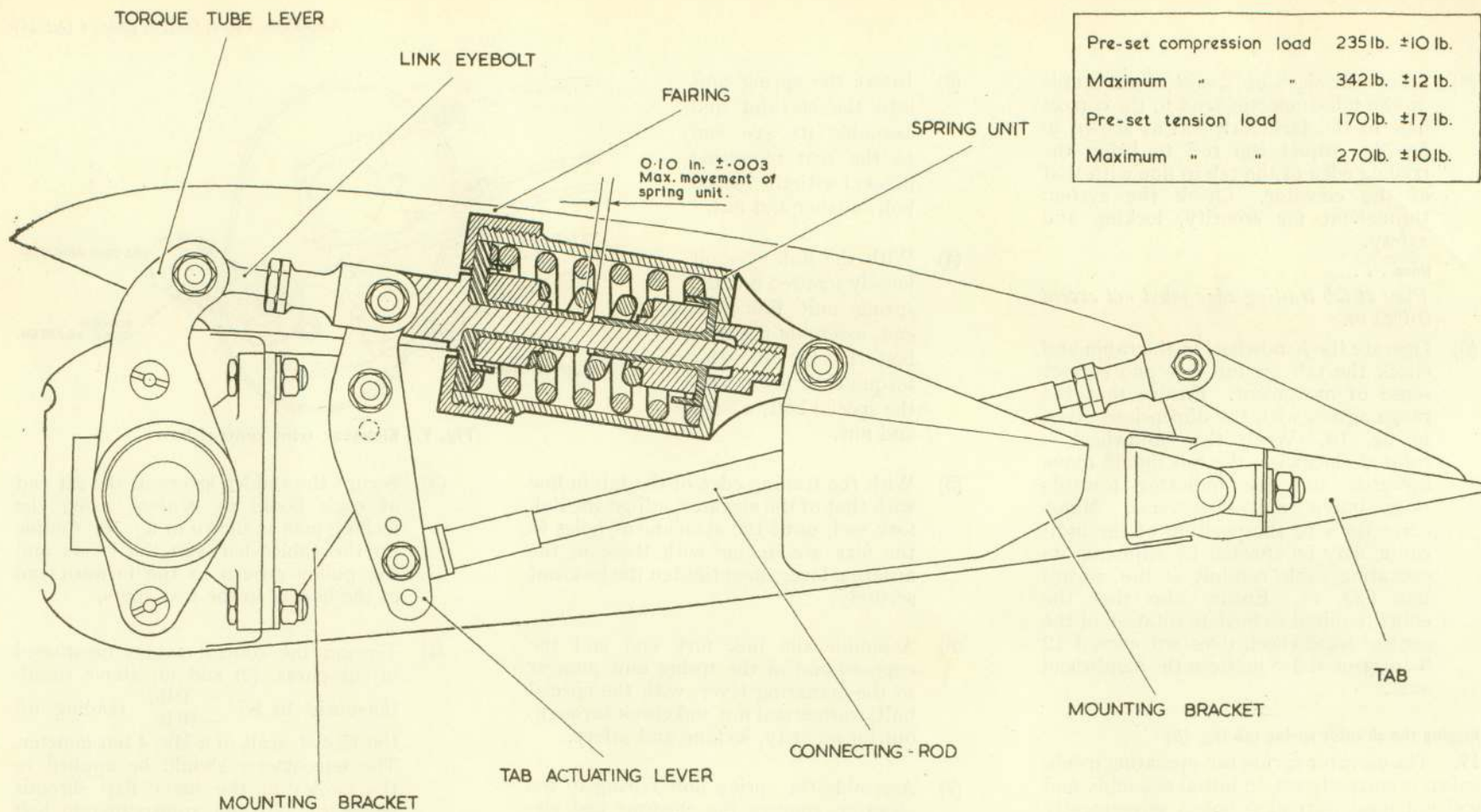


Fig. 10. Elevator spring tab operating mechanism.

- (5) Adjust the control rod at the rear end of each boom until the rudders are *central*. Access to the adjustable fork ends of the control rods is obtained by removing the boom rear fairings. Check the system throughout for security, locking and safety.
- (6) Remove the locking devices from the rudder pedals and from the fore and aft ends of the booms. If the cables have been correctly tensioned they should withdraw easily.

- (7) By operating the rudder pedals (and not by moving the control surfaces by hand), check the rudders for full, free and correct sense of movement. Ensure that their range agrees with the dimensions given in fig. 18 and adjust the stop bolts in the boom rear diaphragm as necessary to achieve those figures. Tighten and wirelock the stop bolt lock-nuts securely. Ensure also, that the effort required to initiate rudder control system movement does not exceed 6 lb. measured at the trailing edge of either control surface.

Rigging the rudder trim tabs

21. Ground adjustment of the rudder tabs is effected by slackening the bolt at the base of each tab and off-setting both tabs equally. The bolts must then be tightened and wire-locked securely with 20 s.w.g. locking wire.

Rigging the flaps

22. (1) Adjust each jack ram fork end, so that when the flap is fully retracted, the trailing edge of the outer section of the surface just makes firm contact with the buffer strip on the flap shroud. Re-lock the fork end.

RESTRICTED

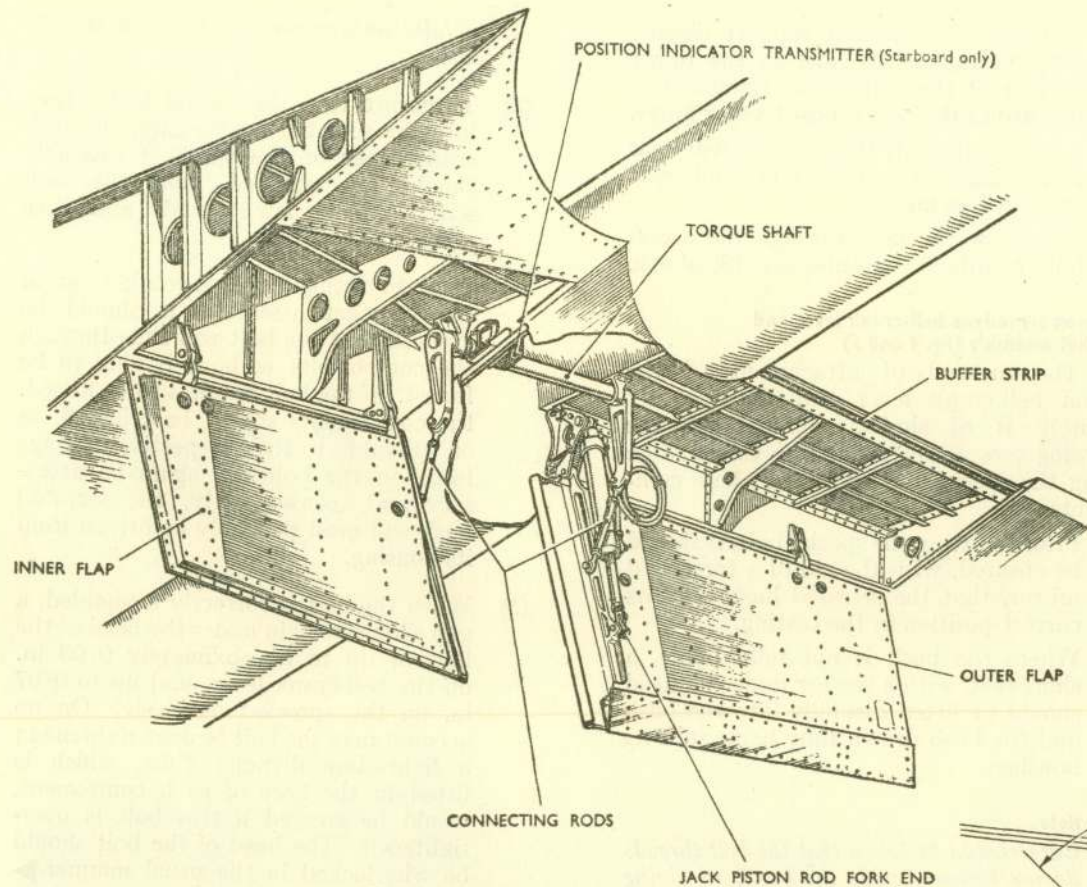


Fig. 11. Flap (starboard)

- (2) With the outer section of the flap fully retracted, check that the trailing edge of the inner section also just makes firm contact with the buffer strip on the flap shroud. Adjust both torque shaft connecting-rods as necessary to achieve this requirement. Re-lock the torque shaft connecting-rod eye ends.
- (3) Lower the flaps fully and check that their range agrees with the dimension given in fig. 18, measuring above the flap jack centre-line.

Note . . .

The range of movement of the flaps is limited by the extended length of the jacks and is not adjustable.

Rigging the flap position indicator (fig. 12)

23. (1) With the flaps up, check that the position indicator reads zero. Adjust the length of the transmitter link as necessary to achieve this reading.
- (2) Lower the flaps until the trailing edge of each is 12.40 in. from the main plane trailing edge, measuring above the flap jack

centre-line, then check that the indicator reads 30 deg. If the reading is less than this figure, decrease the effective length of the transmitter operating lever, and if more, increase the effective lever length. Lock the points of adjustment securely.

Rigging the dive brakes

24. (1) Adjust each jack ram fork end, so that, when the dive brake is closed, its leading edge just makes firm contact with the underside of the main plane.
- (2) Open the dive brakes fully and check that their range agrees with the dimensions given in fig. 18, measuring at the extreme inboard end of the trailing edge.

Note . . .

The range of movement of the dive brakes is limited by the extended length of the jacks and is not adjustable.

Lubrication

25. The components requiring periodic lubrication and the location of the points are shown in Fig. 20. For details of control surface hinge lubrication, refer to Chapters 2 and 3 of this Section.

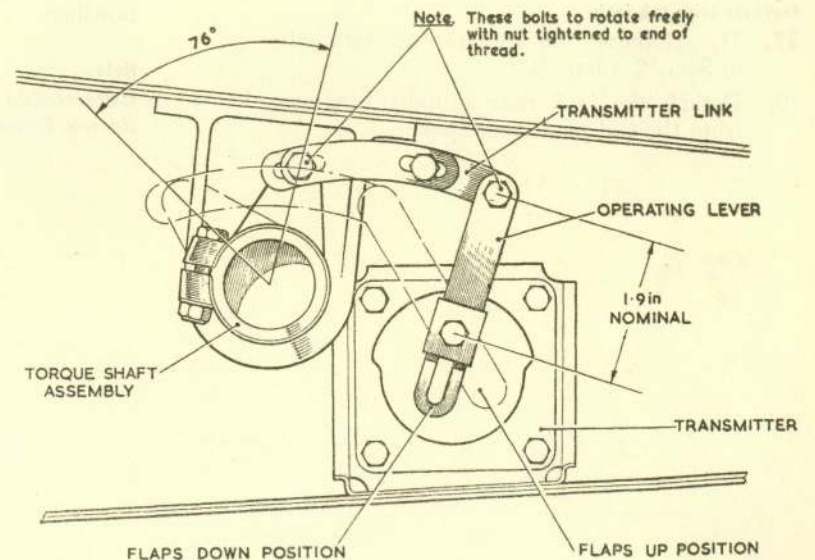


Fig. 12. Flap position indicator transmitter

REMOVAL AND ASSEMBLY

General

26. Instructions for the removal and assembly of the control surfaces are given in Chapters 2 and 3 of this Section. The procedure for removing the majority of the pulleys, control levers etc., will, in the main, be readily apparent when viewed in position and no instructions are therefore supplied. As the operations for removing the elevator trim jack assembly in the tail plane may not be so obvious, the recommended sequence is given below. The re-assembly of this component is a reversal of the removal procedure.

Note . . .

- (1) *All pulleys should be re-fitted with the ball race caulking on their underside; thus, in the event of caulking failure, the possibility of separation of the pulley and its race will be obviated by the pulley shoulder.*
- (2) *After removal of the aileron servodyne, reference should be made to A.P.4602A, Vol. 1, Sect. 2, Chap. 2 for the pre-installation checks before installing the new unit.*

Elevator trim tab jack

- 27.** (1) Remove the elevator as detailed in Sect. 2, Chap. 3.
- (2) Detach the jack rear support bearing from the tail plane rear spar.

- (3) Detach the jack front support bearing cap via the access hole in the upper surface of the tail plane, immediately inboard of the port inner elevator hinge.
- (4) Push the jack aft through the rear spar and remove the fork end and rear support bearing.
- (5) Withdraw the jack through the access hole mentioned in sub-para. (3) above.

◀Aileron servodyne bell-crank lever and sprocket assembly (fig. 4 and 5)

28. The method of attachment of the aileron bell-crank lever and the sprocket assembly is of similar design, and the following precautions should be taken when fitting the special bolts securing these components:—

- (1) Prior to fitting the special bolt, it should be ensured, with the aid of a torch and mirror, that the serrated bush is in its correct position in the casting.
- (2) Where the bush is not fully home, a short bolt, with a washer under its head should be fitted carefully into the bush and the bush drawn fully home into its housing.

Note . . .

Care should be taken that the bolt threads do not bottom inside the bush, so giving

a false impression that the bush is fully home.

- (3) To ensure that the special bolt screws into the serrated bush easily, the bell-crank lever or the sprocket assembly should be removed, and the bolt screwed in a few threads and then removed.
- (4) Prior to fitting the bell-crank lever or the sprocket assembly, it should be ensured that the bolt will slide through the components without having to be forced. If the bolt requires to be forced, the components should be rejected, as on assembly to their respective castings force on the bolt will again be necessary and, consequently, the serrated bush will most probably be driven from its housing.
- (5) When the bolt is correctly assembled, a gap should remain under the head of the bolt of up to approximately 0.03 in. on the bell-crank lever, and up to 0.07 in. on the sprocket assembly. On no account may the bolt be over-tightened; a light-alloy distance tube, which is fitted in the bore of each component, would be swaged if this bolt is over-tightened. The head of the bolt should be wire-locked in the usual manner.▶

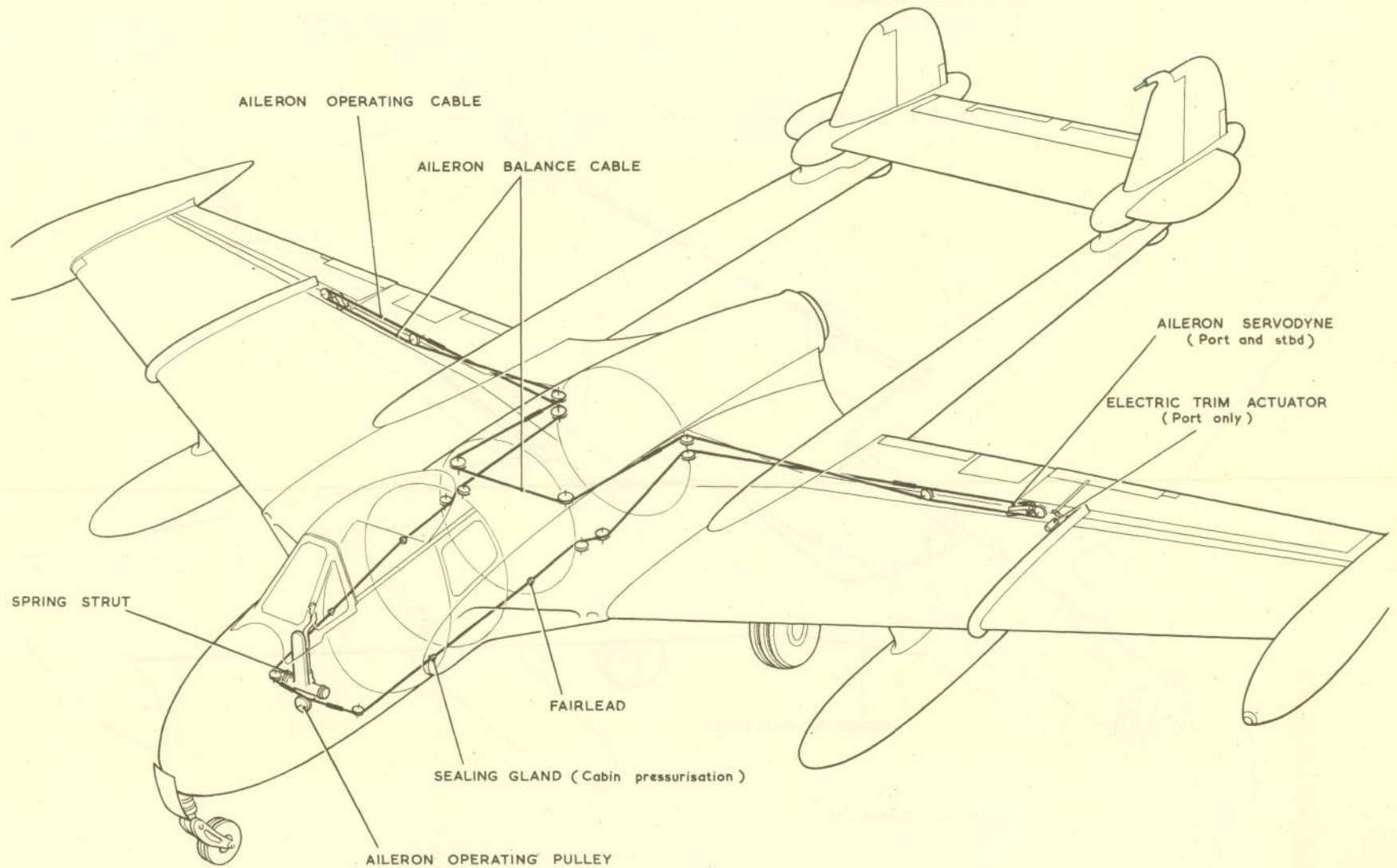


Fig. 13 Aileron controls

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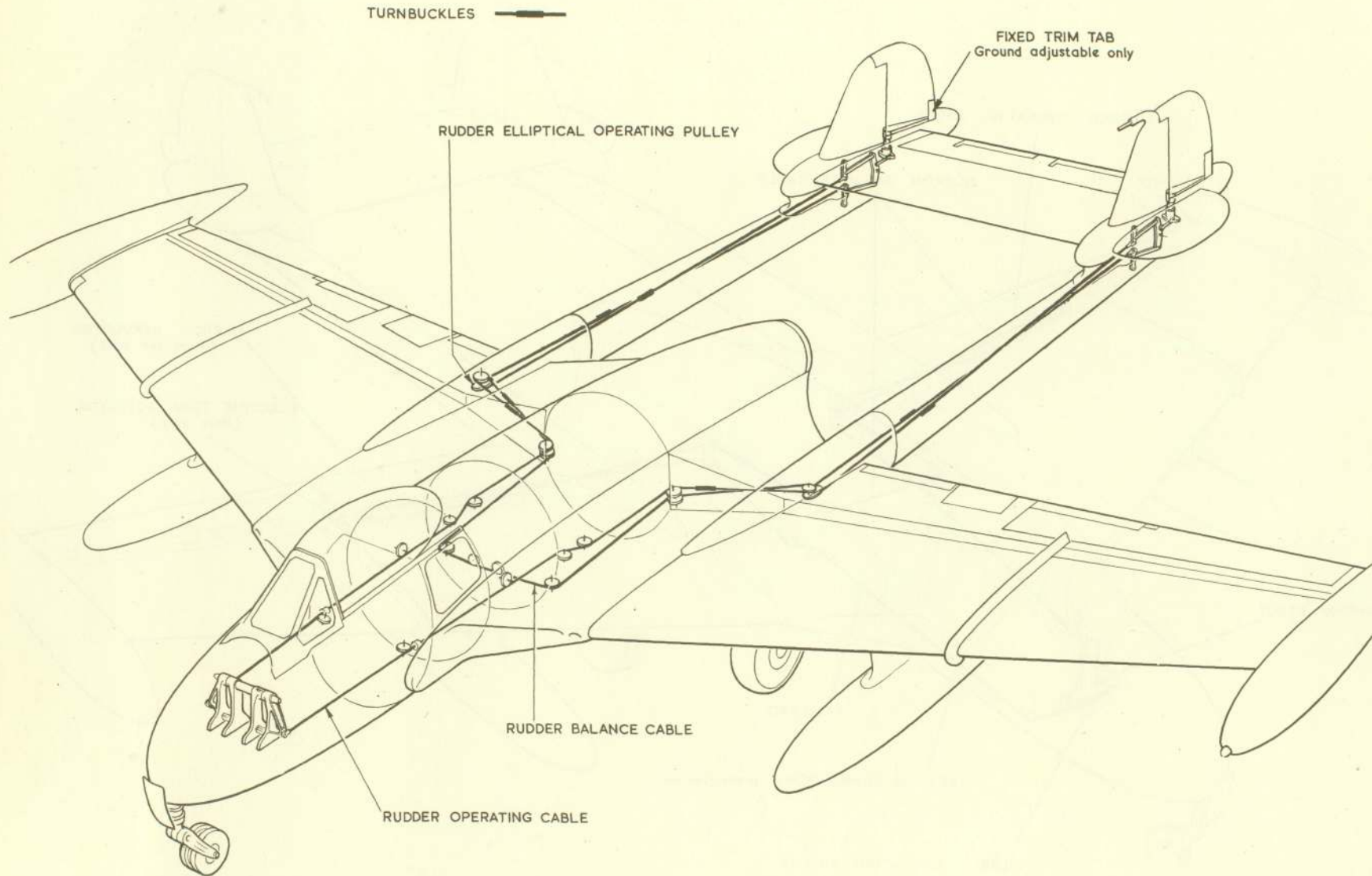


Fig. 14 Rudder controls

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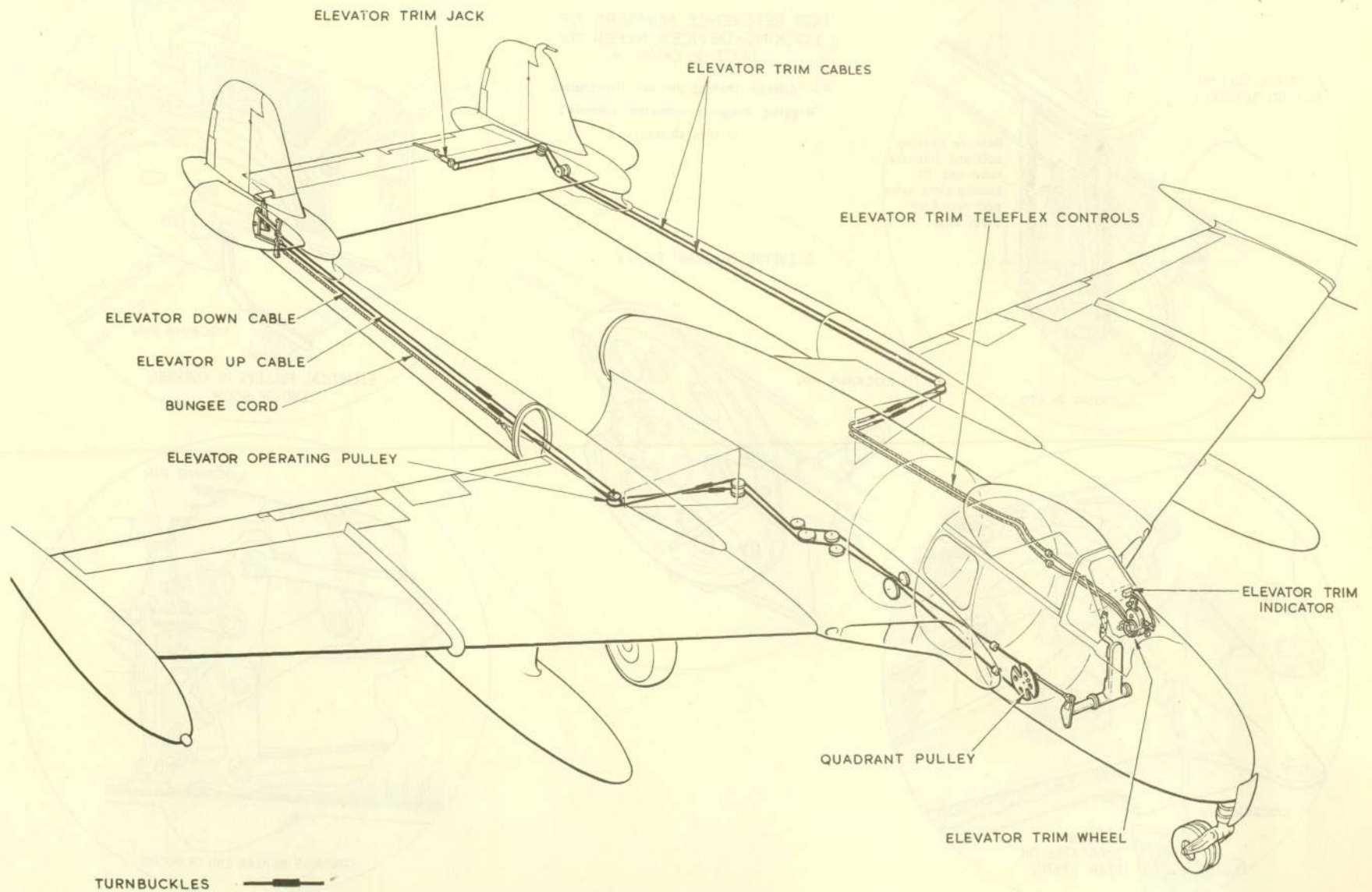
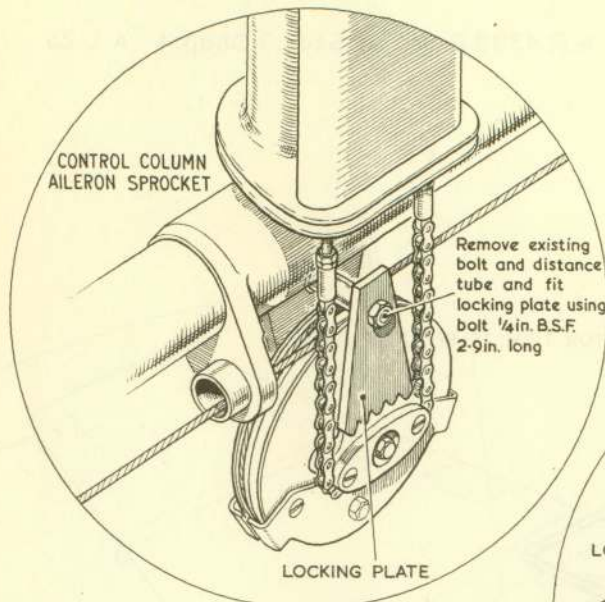


Fig.15 Elevator and elevator trim tab controls

(A.L.25, Aug. 55)

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FOR REFERENCE NUMBERS OF
LOCKING DEVICES REFER TO
SECT. 2, CHAP. 4.

For aileron locking pin see illustration
'Rigging diagram - powered ailerons',
in this chapter.

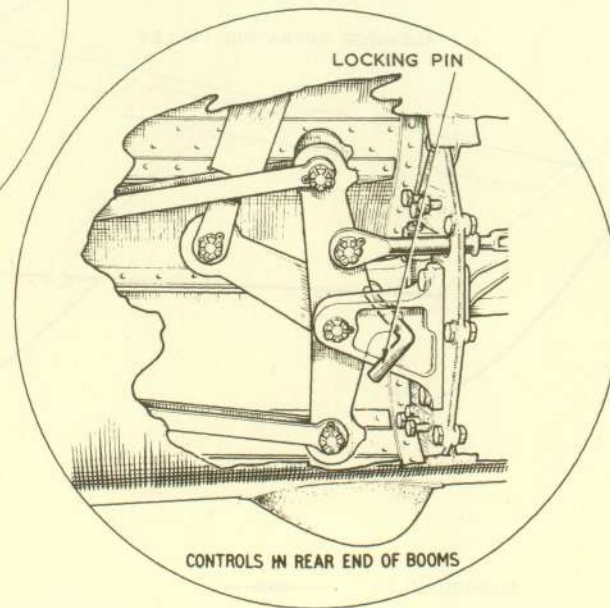
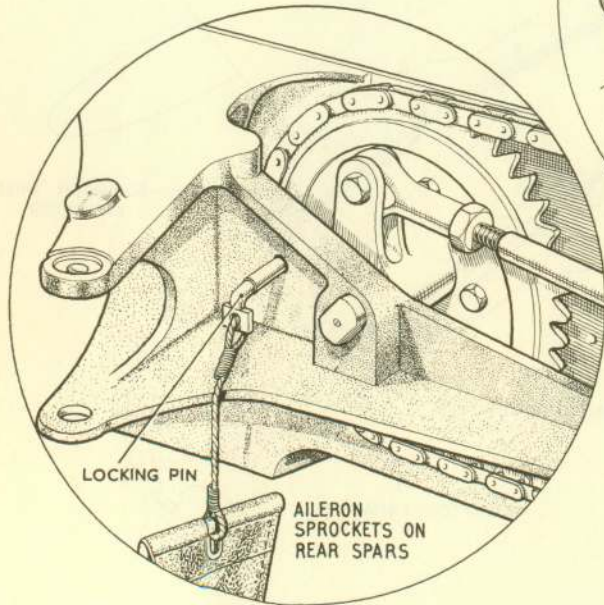
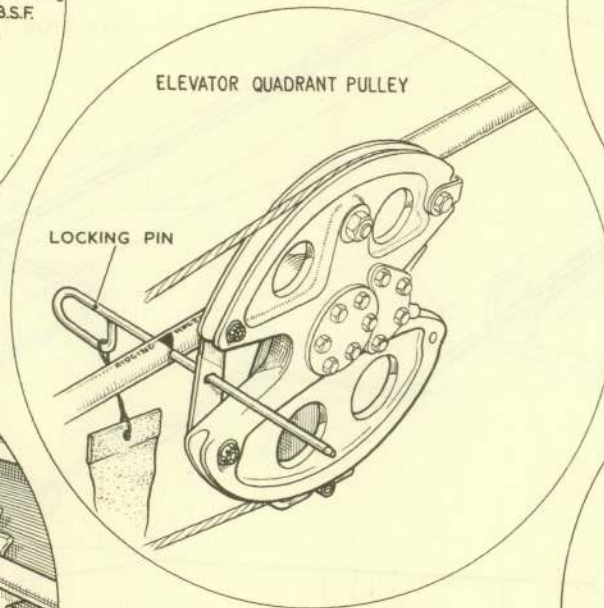
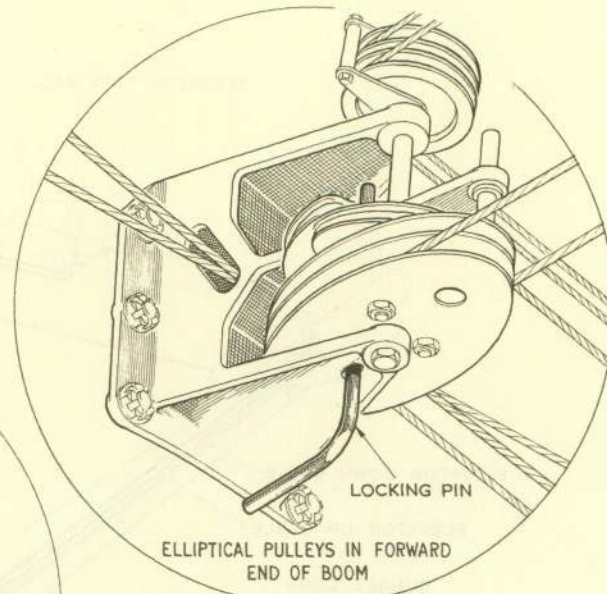


Fig. 16 Control locking devices
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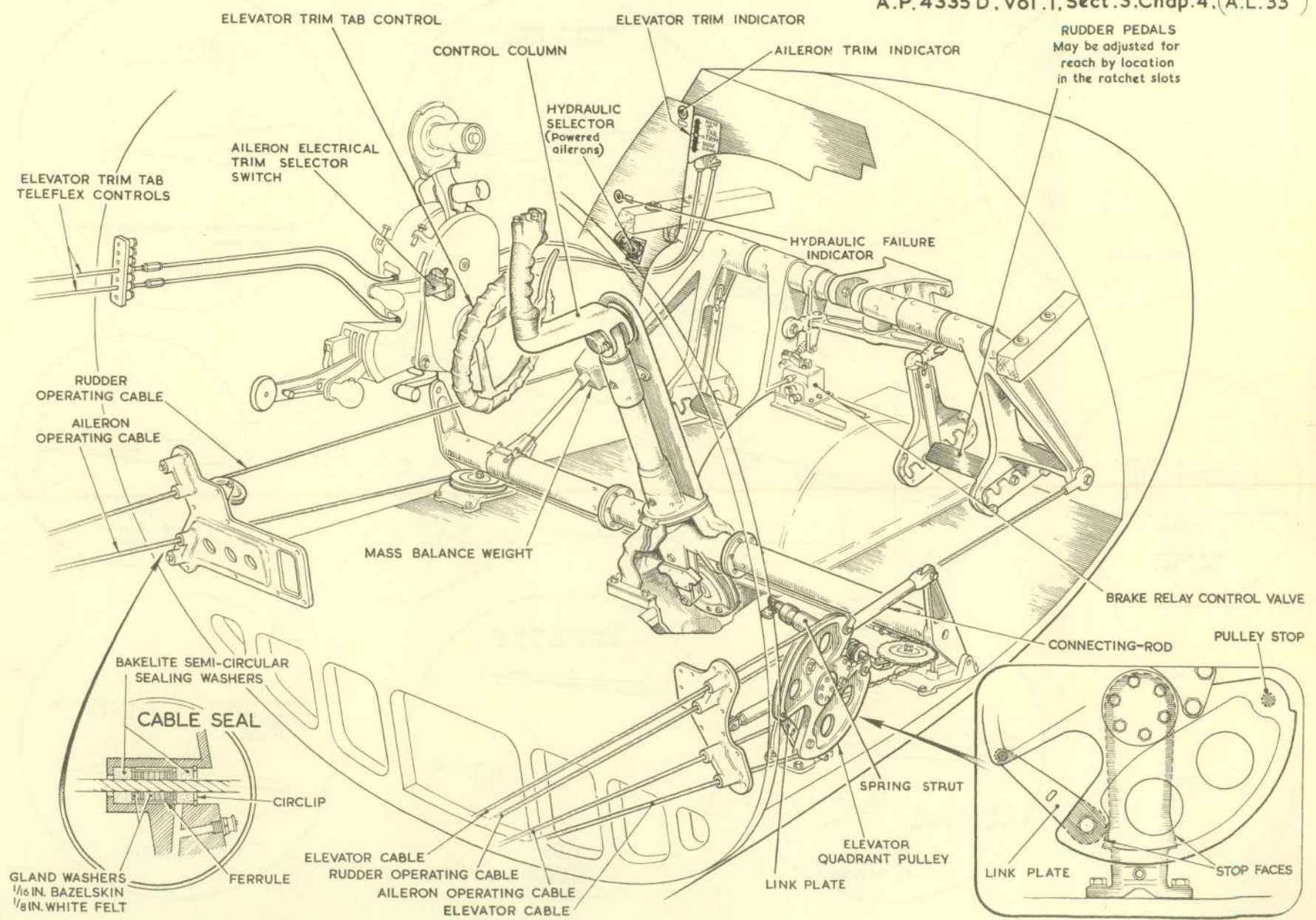


Fig. 17 Controls in cabin

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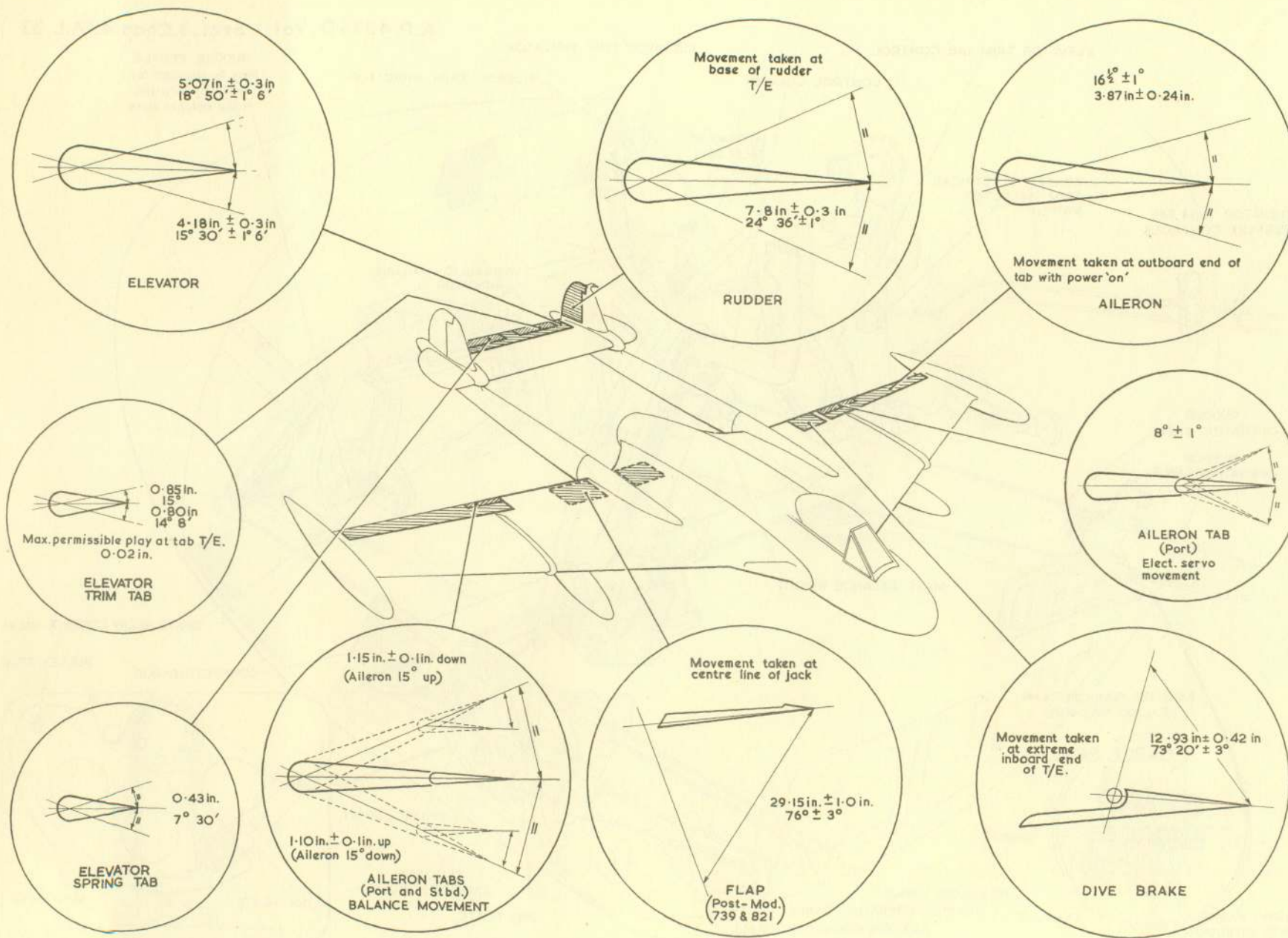


Fig.18 Control surface movements

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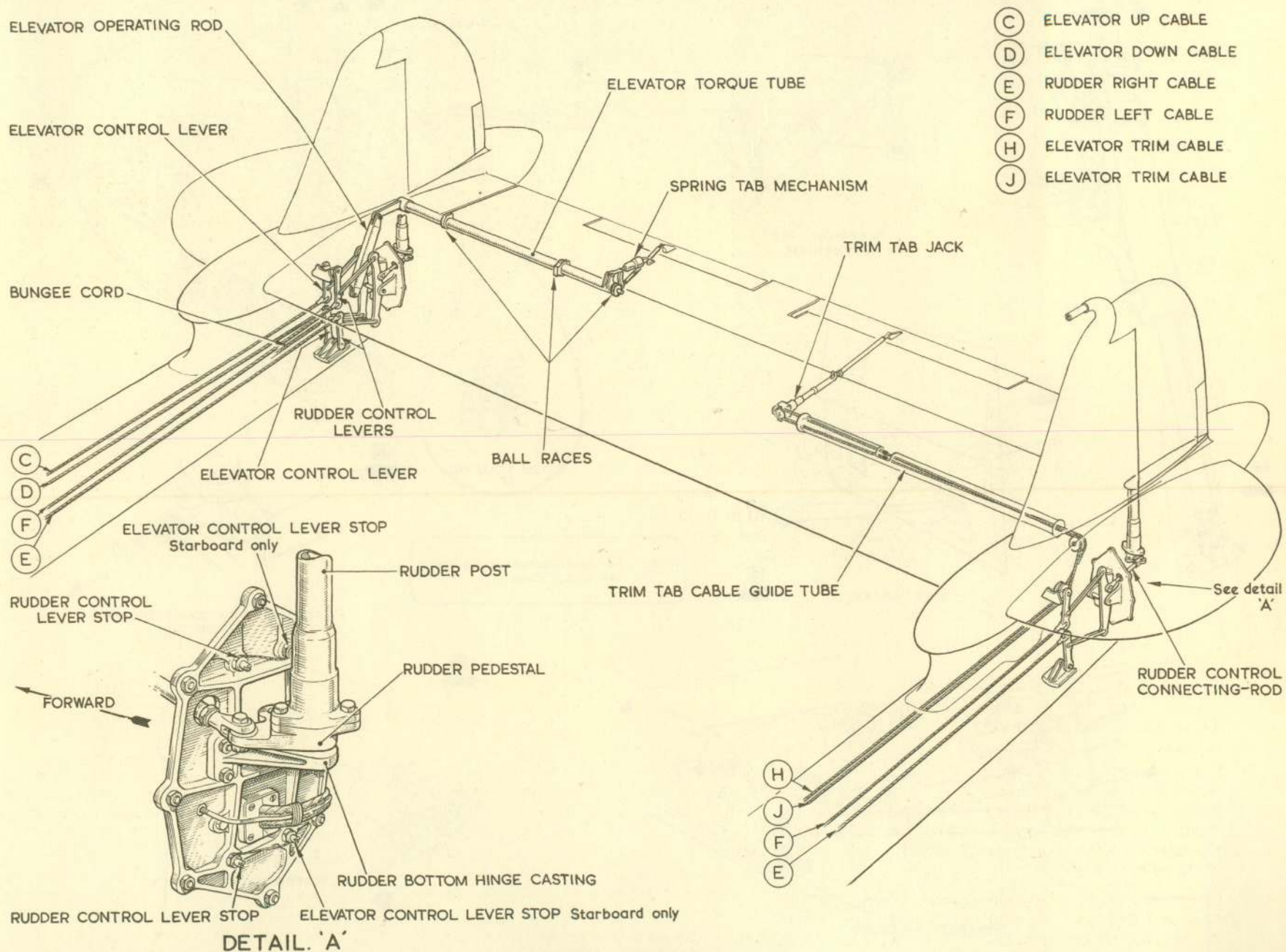


Fig.19 Controls in tail unit

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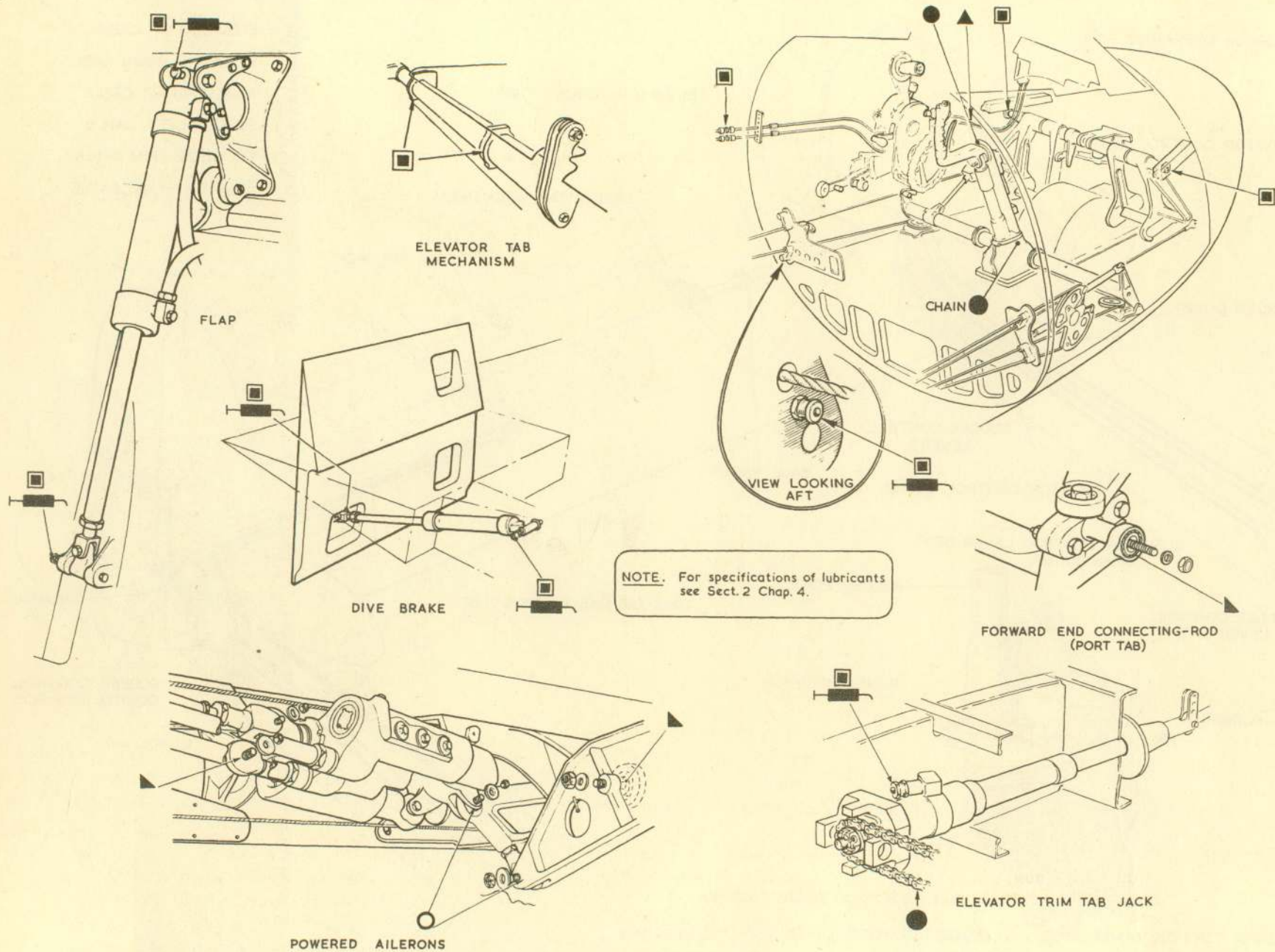


Fig. 20 Lubrication details

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