

Chapter 4A
FLYING CONTROLS
LIST OF CONTENTS

<i>Introduction</i>	Para.		Para.	
	1	SERVICING		REMOVAL AND ASSEMBLY
DESCRIPTION				
<i>Aileron control circuit</i>	2	<i>General</i>	3	<i>General</i>
		<i>Rudder control rigging</i>	4	5

LIST OF ILLUSTRATIONS

	Fig.		Fig.
<i>Lubrication - main flying controls</i>	1		
<i>Aileron control rigging (1)</i>	2	◀ <i>Elevator control rigging (1)</i> ...	4
<i>Aileron control rigging (2)</i>	3	<i>Elevator control rigging (2)</i> ...	5 ▶

Introduction

1. With the exception of the aileron flying control circuit aft of the rear spar, the rudder and minor alterations to the

rudder control circuit in the rear fuselage, the flying controls in Mk.1A aircraft are the same as those in Mk.1 aircraft. Reference should be made to Sect.3, Chap.3A for information concerning the rudder and

to this chapter for differences between the flying controls and the effects of those differences upon their operation, and to Chapter 4 of this Section for all other information.

AILERON CONTROL CIRCUIT

2. The aileron control circuit up to but not including the control rod preceding the torque shaft assembly at the rear spar, is the same as that of the Mk.1 aircraft described and illustrated in Chapter 4 of this Section. Aft of the

rear spar, the introduction of a modified torque shaft assembly at the junction of the rear spar and rib 63.5, and the interchange of the bell-crank lever preceding the power unit bell-crank assembly on the port side of the aircraft with that on the starboard side, resenses that section of the aileron control circuit as illustrated

in fig.1 and 2 of this chapter. Although the modification has altered the direction of movement of that section of the control run, the control circuit and control surface travels remain the same as those on Mk.1 aircraft. Reference should be made to fig.2 and fig.3 of this chapter for the rigging of the circuit.

General

3. The rigging of the aileron controls is given in the Key to fig.2 and 3 of this chapter. Information on the rigging of the rudder controls is given in para.4. Reference should be made to Chapter 4 of this section for all other servicing information. The neutral setting gauges

SERVICING

for aileron control rigging are the same as those used on Mk.1 aircraft.

linear travel to port and starboard from neutral is 15.5 ± 1 in. on NORMAL and 23.25 ± 1 in. on EMERGENCY. The difference in linear travel is due to the shortening of the rudder, which is basically a Mk.1 aircraft rudder reduced in size to clear the higher curvature of the rear fuselage of the Mk.1A aircraft.

4. The method of rigging the rudder controls is as described in fig.21 and 22 of chapter 4 of this section but with a linear travel of 30.0 $\begin{smallmatrix} +1.0 \\ -0 \end{smallmatrix}$ in. to port and starboard from neutral. The trim range





General

5. Reference should be made to Chapter 4 of this section for removal and assembly

REMOVAL AND ASSEMBLY

procedures. Although the surrounding structure is different and the rudder P.F.C. cooling and exhaust ducting has

been modified, the removal procedure for the rudder P.F.C. units is as described in Chapter 4.

-  GUN LUBRICATION GREASE XG-295
-  PRE-PACKED BEARING
-  OIL (GEARBOX)
-  PRE-PACKED 3 ROLLER BEARING

NOTE - * LUBRICATION OF COCKPIT CONTROLS. FIG. 2, CHAP 4
 ⊙ LUBRICATION OF ARTIFICIAL FEEL UNIT. FIG. 6, CHAP 4

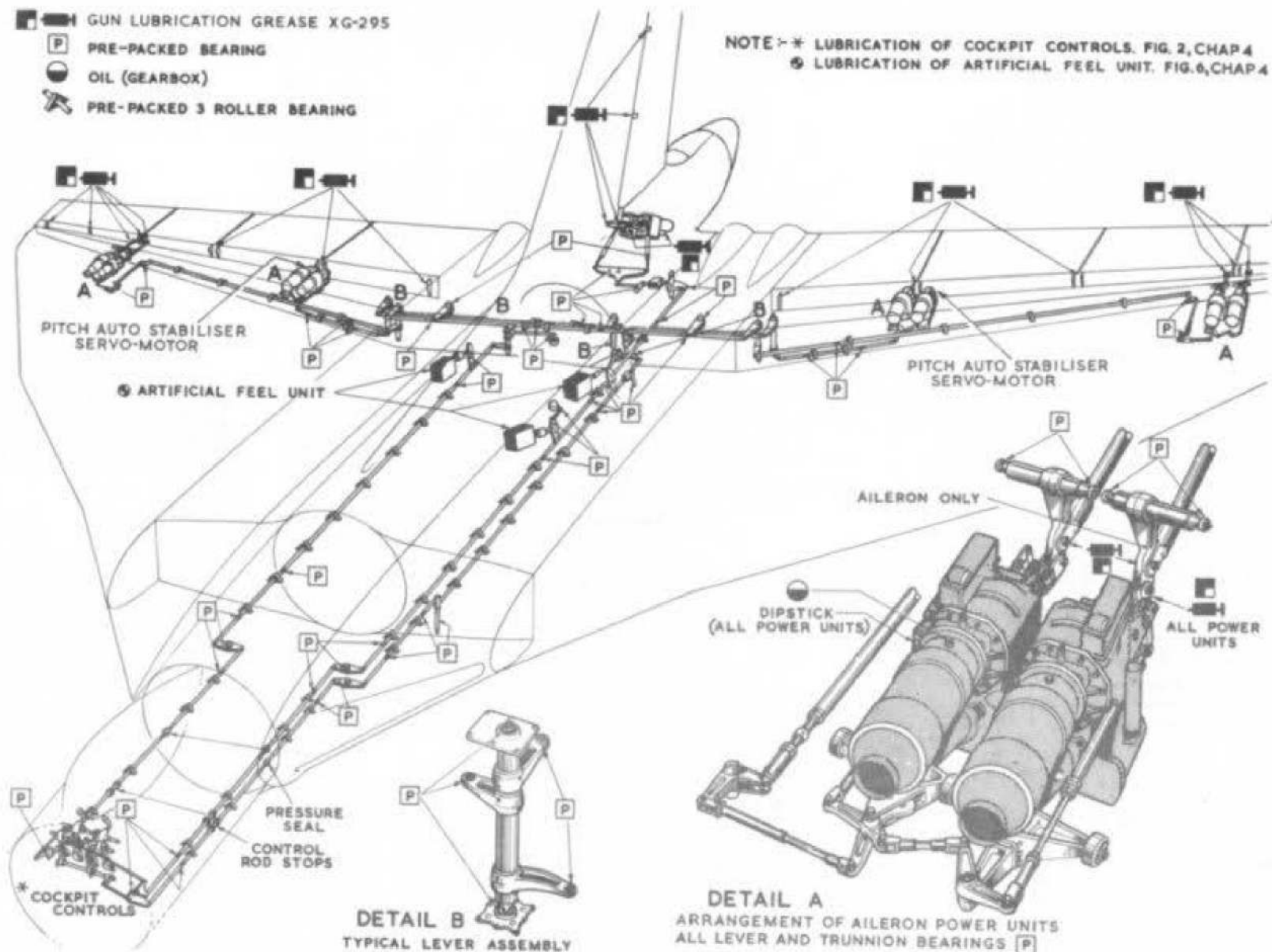


Fig. 1. Lubrication — main flying controls
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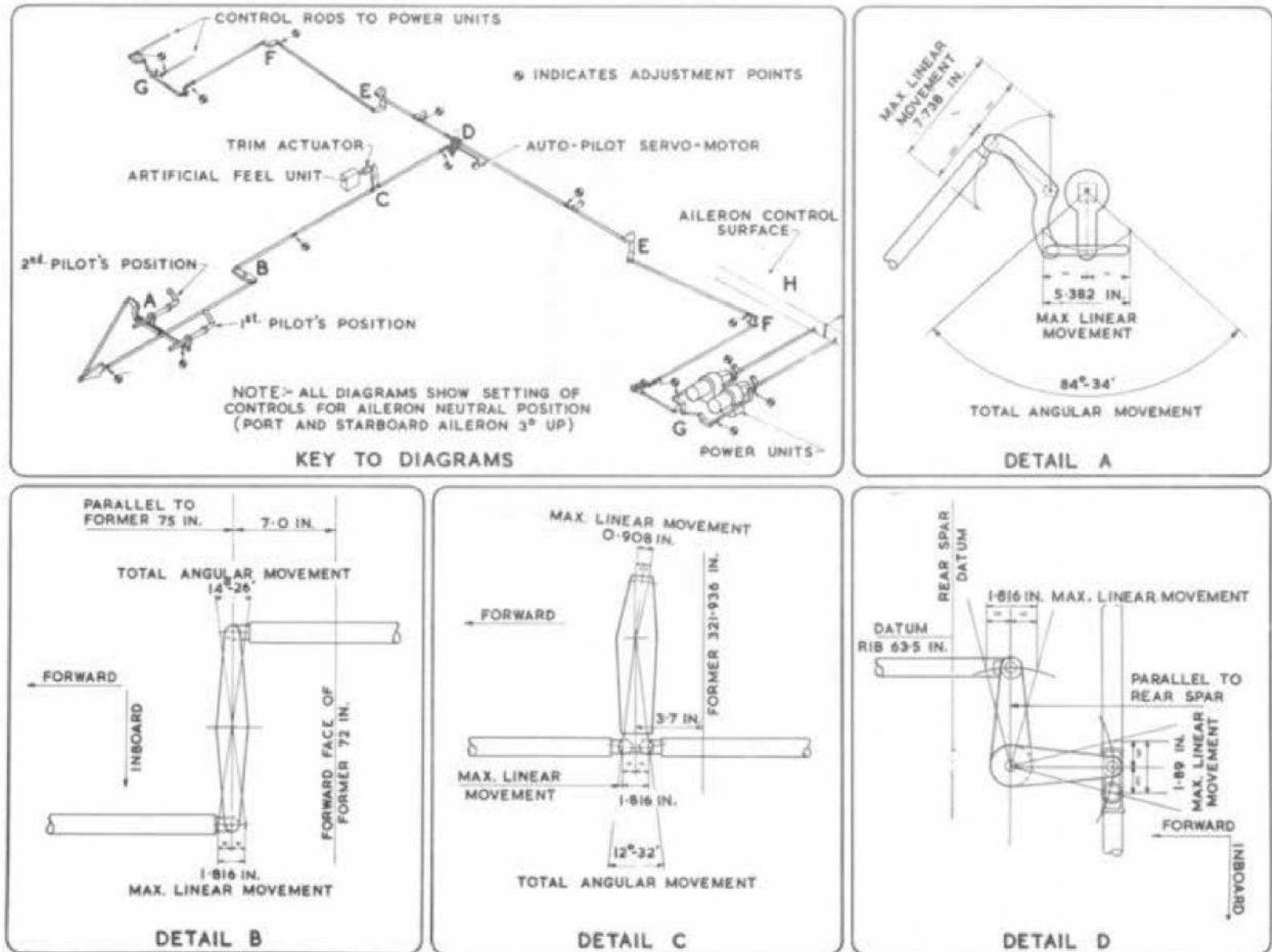


Fig.2. Aileron control rigging (I)
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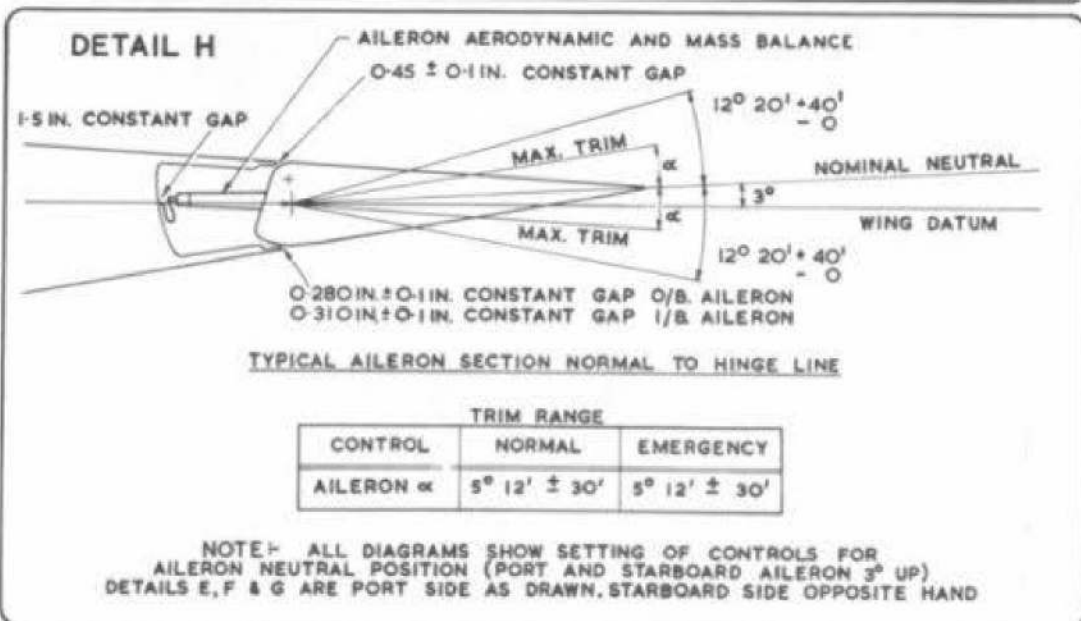
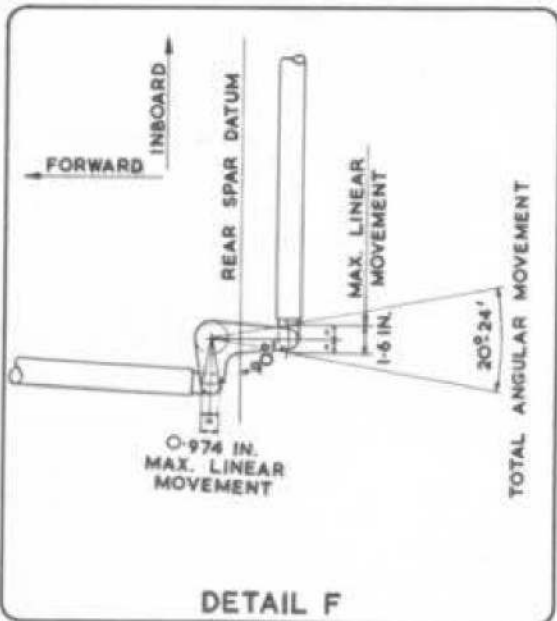
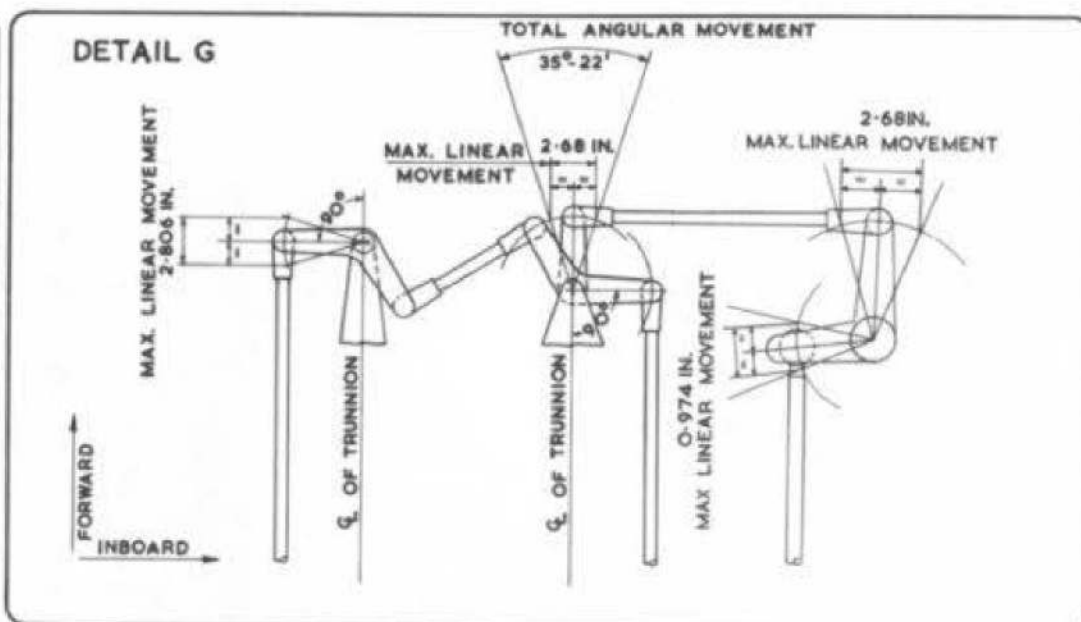
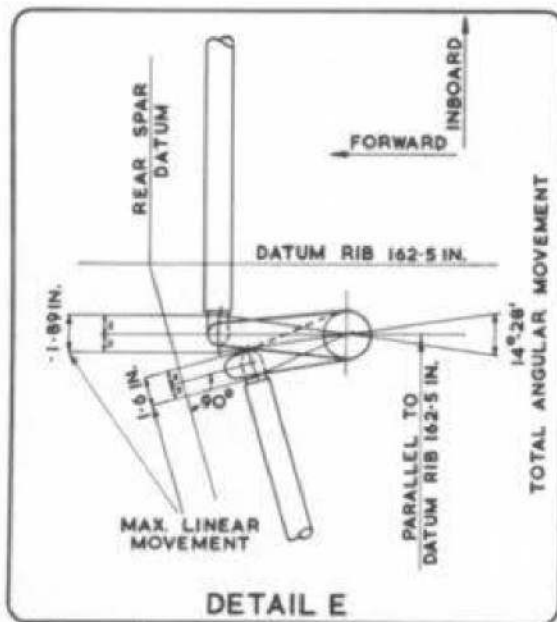


Fig. 3. Aileron control rigging (2)

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KEY TO FIG.2 AND 3 AILERON CONTROLS RIGGING

1. Jack the aircraft laterally and longitudinally level (Sect.2, Chap.4).
2. Disconnect the trim actuator from the vertical lever, and the spring control rods from the input levers of the power units.
3. Check both control column square shafts for backlash. Adjust, if necessary, to eliminate all backlash, on the adjustable guide rollers fitted at the forward end of the bearing tube of the aileron lever assembly. Lock the eccentric bolts by tag washers.
4. Set the control handle at the second pilot's position in the neutral position, i.e., vertical, and secure (detail A).
5. Adjust, if necessary, the rod (Part No.127/R3577) connecting the two control handle shafts so that the first pilot's handle is vertical.
6. Set the centrally-pivoted lever at former 75F in its mid-travel position (detail B). Adjust the forward control tube, if necessary, and connect.
7. Set the upright lever at the feel unit position in its mid-travel position (detail C). Adjust the forward control tube, if necessary, and connect.
8. Check the torque tube assembly at the rear spar and rib 63.5. Adjust, if necessary, the forward control tube so that the levers of the assembly are in the mid-travel position (detail D).
9. On the starboard side, check the torque tube assembly at rib 162.5. Adjust, if necessary, the control tubes inboard of this point so that the levers of the assembly are in the mid-travel position (detail F).
10. Check the outer bell-crank lever. Adjust, if necessary, the inboard control tube so that the lever is in its mid-travel position (detail F).
11. Check the bell-crank lever assembly

at the power unit position. Adjust, if necessary, the control tube so that the levers are in the mid-travel position (detail G).

12. Repeat items 9, 10 and 11 on the port side of the aircraft.

NOTE...

At this point it may be convenient to check the static friction (Chap.4, para.46).

13. Release the pilots' control handles and rotate them clockwise through 42 deg. 17 min. (detail A). Check that, at this position the forward stop sleeve on the control rod contacts the limit stop at former 288F. Adjust the sleeve as necessary.
14. Rotate the control handles anti-clockwise through the normal full range, i.e., to a position 42 deg. 17 min. to port. Check that the rear stop sleeve contacts the limit stop. Adjust the sleeve, if necessary, and lock the pilots' control handles in the central position.
15. Open the bleed screws on the main pressure relief valves of the power control units. Remove the 2 B.A. bleed screw, together with its bonded seal, from the top surface of the tail piece of each aileron power control unit. Move in turn the appropriate control surface upward, by hand, to the limit of power unit jack movement. Ensure damage is not caused to the shrouds and sealing fabric. Measure the control surface angle which must be 12 deg. 20 min. $\begin{matrix} +40 \\ -0 \end{matrix}$ min. above neutral as determined by the appropriate setting gauge.
16. Move the control surface downward, by hand, to the limit of power unit jack movement. Measure the control surface angle which must be 12 deg. 20 min. $\begin{matrix} +40 \\ -0 \end{matrix}$ min. below aileron neutral.
17. If the angles above and below aileron neutral do not conform to the

dimensions above, adjust on the power unit ram adjustable fork end (refer to A.P. 4603C for method of adjustment). When adjustment is complete, lock the adjuster.

18. Move the control surface to the neutral position, 3 deg. above wing datum, using the appropriate setting gauge (Ref. No. 26DC/95165 for inner and 26DC/95166 for outer aileron). Press the neutral setting plunger on the power unit and move the unit input lever until the plunger registers with the indentation in the carrier assembly.

19. Adjust the spring control rods to fit and connect them in position.

20. Close the bleed screws on the main pressure relief valves on the power control units. Fit the 2 B.A. bleed screw complete with its bonded seal in the top surface of the tail piece of each power control unit, wire lock the bleed screw. Fill and bleed the units in accordance with the instructions in A.P.4603C.

21. Set the trim actuator (Chap.4, fig.8) and connect between the feel unit and the lever in the control run.

22. Release the pilots' control handles and, with a ground electrical supply connected to the aircraft and the aileron power units engaged, check the ailerons for full and free travel. Full travel of the ailerons is 12 deg. 20 min. $\begin{matrix} +40 \\ -0 \end{matrix}$ min. up and down from neutral with 42 deg. 17 min. movement of the control handle in each direction.

23. Check that the stops on the control rod contact the limit stops at former 288F, with full movement of the control, and that the rollers of the triple roller bearings are working freely.

24. Check that all adjustment and connection points are in safety and lock them as necessary.

25. Finally, check the fluid level in the power units and replenish if necessary.

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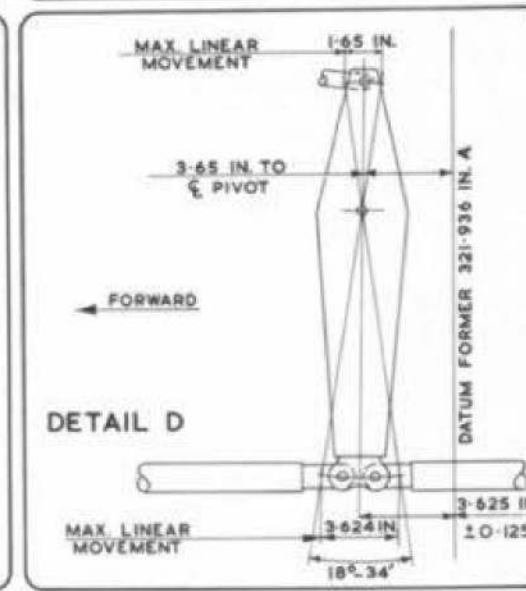
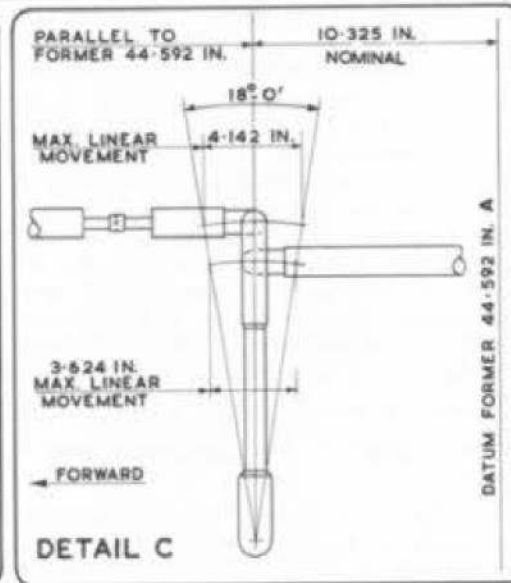
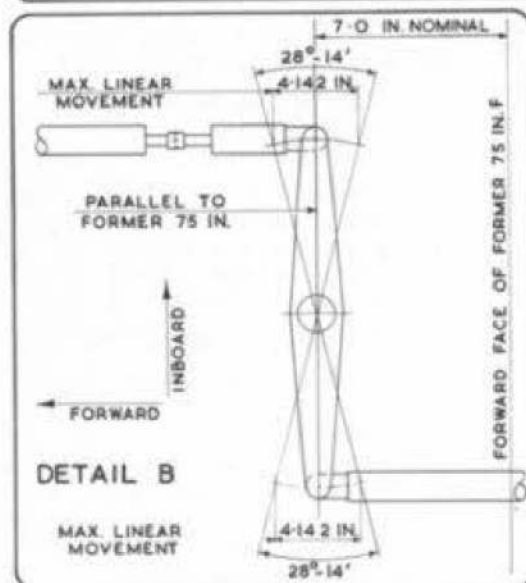
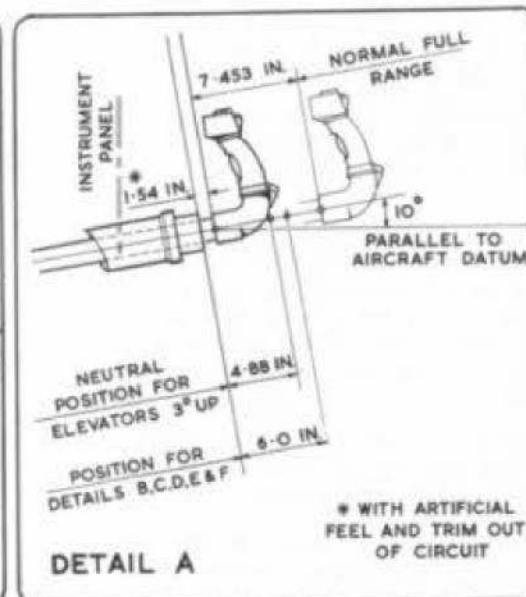
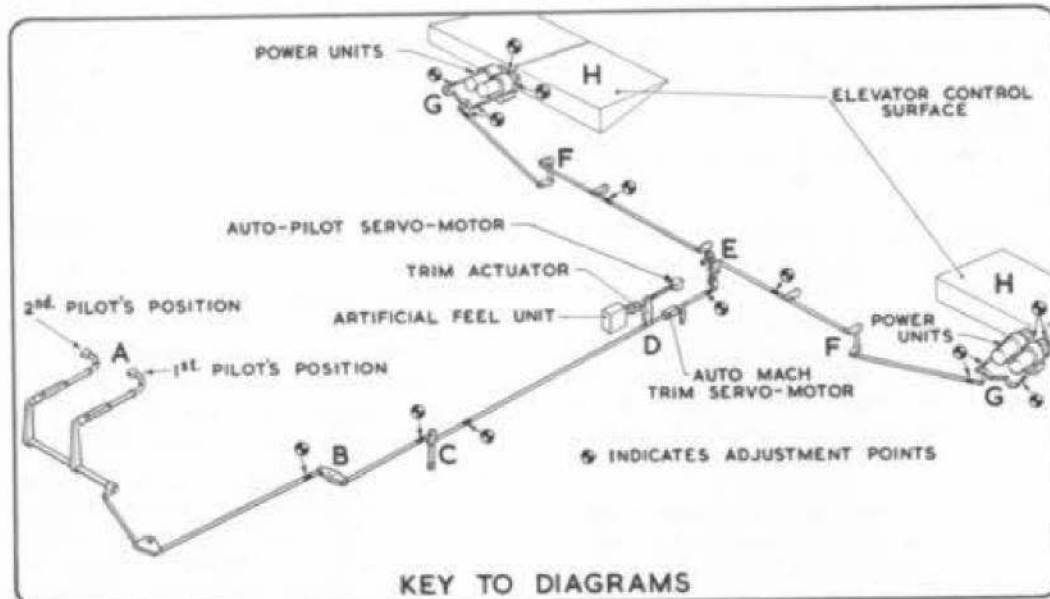


Fig. 4. Elevator control rigging (1)

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KEY TO FIG.4 AND 5
ELEVATOR CONTROL RIGGING

NOTE...

It is advisable to check all dimensions before carrying out any adjustments to the circuitry. The auto-mach trim servo motor must be in the retracted attitude and the bomb doors closed before any checks are made.

1. Jack the aircraft laterally and longitudinally level (Sect.2, Chap.4).
2. Disconnect the spring control rods from the input levers of the power control units.
3. Disconnect the trim actuator from the vertical lever at the feel unit position.
4. Set the pilot's control handle 6 in. back from the fully forward butting position (detail A). Secure the handle in this position.
5. Check the centrally pivoted lever at former 75F position. Adjust, if necessary, the control rod forward of this position so that the centre line of the lever is parallel to, and approximately 7 in. from former 75F (detail B).
6. Check the lever between formers 21-717A and 44-592A. Adjust, if necessary, the control rod forward from this point so that the centre line of the lever is parallel to former 44-592A and approximately 10-3 in. from it (detail C).
7. Check the lever at the feel unit position. Adjust, if necessary, the control rod forward of this point so that a line midway between the rod attachment points is 3-625 in. forward of former 321-963A (detail D).
8. Check that the lever attached to the auto mach trim servo-motor eye-end is vertical. Adjust, if necessary, on the servo motor eye-end.
9. Adjust, if necessary, the micro switch striker pin on the auto-mach trim servo motor so that the micro switch is just operated with the servo motor in the fully retracted position.
10. Check the torque tube assembly at the rear spar and rib 63-5 in. Adjust, if necessary, the control rod forward of this point so that the centre line of the lowest lever of the assembly is parallel to the datum face of the rear spar and 2 in. approximately from it (detail E).
11. Check the torque tube assembly at rib 162-5 in. (both sides of the aircraft). Adjust, if necessary, the control rods inboard of this point so that the centre line of the lower lever is 9-35 in. approximately from the datum face of rib 162-5 in. (detail F).
12. Remove the bolt from the stop lever (both sides of the aircraft) (detail G).
13. Open the bleed screws on the main pressure relief valves of the power control units and remove the 2 B.A. bleed screw together with the bonded seal from the top surface of the tail piece of each power control unit. Move the appropriate control surface upward, by hand, to the limit of power unit jack movement. Care must be exercised to avoid damage to the shrouds and sealing fabric. Measure the control surface angle which must be 16 deg. $+0$ - 30 min. above nominal neutral.
14. Move the control surfaces downwards, by hand, to the limit of power jack movement. Measure the control surface angle which must be 13 deg. $+0$ - 1 deg. below rigging neutral.
15. If the angle above and below neutral do not conform to those quoted, adjust on the power unit adjustable fork-end (A.P.4603D). Lock the adjuster when adjustment is complete.

NOTE...

After establishing the above angles by adjustment of the P.F.C. unit, no further adjustment on the unit must be made.

16. Close the bleed screws on the main pressure relief valves of the power control units and replace the 2 B.A. bleed screw on the top surface of the tail piece of each power control unit. Ensure that the bonded seal is fitted to each 2 B.A. bleed screw and wire lock the bleed screws. Fill and bleed the units in accordance with the instructions in A.P.4603D.

17. Set the spring rods to the following dimensions:-

Inboard 2 ft. 2-75 in.
Outboard 2 ft. 4-6 in.

18. Switch on the elevator group of power units.
19. Move the control surface to the neutral position, 3 deg. above the wing chord using setting gauges, Ref.No.26DC/95163 and 26DC/95164. Press the neutral setting plungers on both P.F.C. units at the same time and switch off the elevator group of power units, holding the neutral setting plungers in and maintaining the rigging neutral until the units have run down.

NOTE...

With the elevators in neutral, the distance between the centre of the hole in the ram attachment fitting on the elevator to the centre of the hole in the tail cone attachment trunnion must be 26-06 in. (A.P.4603D, Vol.1, Sect.1, Chap.2).

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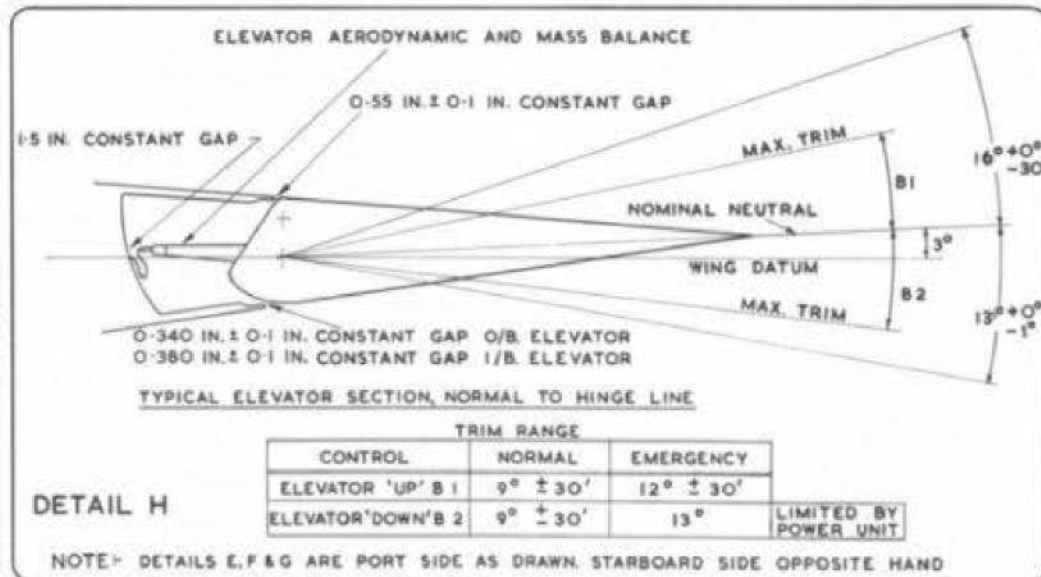
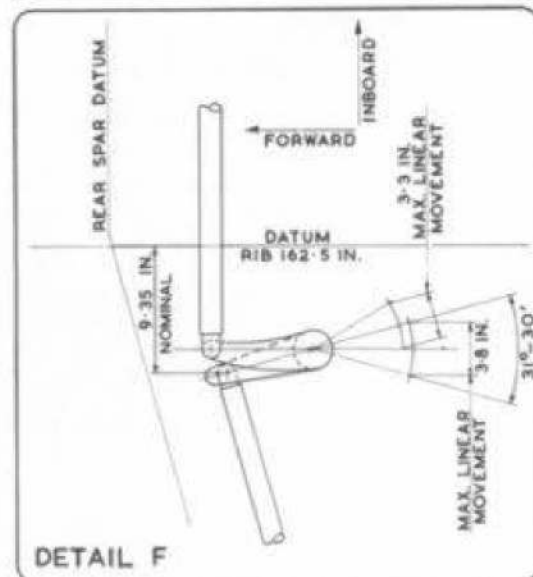
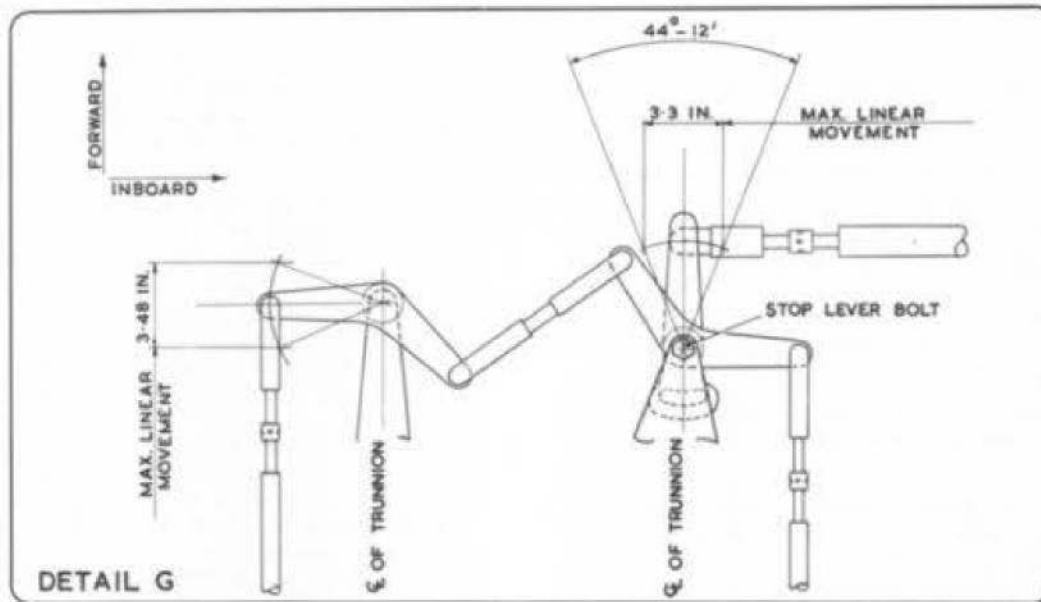
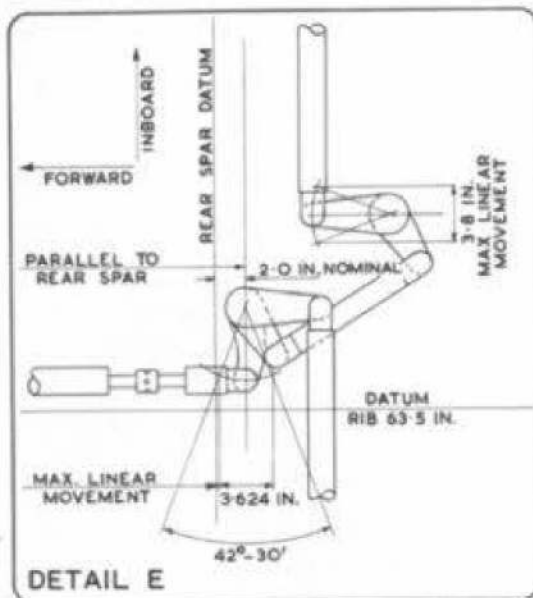


Fig. 5. Elevator control rigging 2

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KEY TO FIG.4 AND 5

ELEVATOR CONTROL RIGGING (continued)

20. With the elevator still in neutral, couple up the spring rods.
21. Switch on the elevator group of power units and move the control surface to the up position. Measure the surface angle which must be 16 deg. $\begin{matrix} +0 \\ -30 \end{matrix}$ min.
22. Move the control surface to the down position and measure the surface angle which must be 13 deg. $\begin{matrix} +0 \\ -1 \end{matrix}$ deg.

NOTE...

Should new levers 9 and 10/R3515 have been fitted prior to rigging check, the ends of the kidney slots may be carefully filed to enable the correct movement to be obtained. A minimum wall thickness of 5/16 in. must be maintained. After filing, all burrs are to be removed and the levers treated with selenious acid to Spec.D.T.D.911.

23. With all P.F.C. units set up to the above sequence, set the pilots control column to the 1.59 in. position (detail A) and with the artificial feel and trim still out of circuit, refit the bolt to the stop lever (detail G) on both sides of the aircraft. With the elevators still in the down position (item 22), slight adjustment of the adjuster may be necessary to marry up the controls.

NOTES...

(1) Check that the stop on the power unit trunnion lever is positive with elevators down and circuitry connected. At this point it may be convenient to check for fouls and static friction load (para.46, Chap.4).

(2) Detail G is for reference purposes only and the position of the levers is not relevant to any part of the sequence.

24. Set the pilots control column to 4.88 in. back from the butting stop and marry up the artificial feel and trim.

NOTE...

The 1.54 in. dimension will move forward to a new dimension of 1.2 to 1.4 in.

25. Carry out a full range check of the elevators and neutral settings (detail H).
26. With the elevators 16 deg. $\begin{matrix} +0 \\ -30 \end{matrix}$ min. above neutral, adjust the rear stop sleeve on the control rod until it contacts the limit stop at former 288F.
27. Check that, with the elevators 13 deg. $\begin{matrix} +0 \\ -1 \end{matrix}$ deg. below neutral, movement is limited by the secondary

stop at the power unit trunnion lever, and that there is a gap of 0.6 in. approximately between the forward stop sleeve and the limit stop at former 288F.

NOTE...

When the servo actuator in the auto mach trim system is fully extended, up movement is governed by the primary stop at former 288F and the secondary stop on the power unit trunnion. To accommodate the increase in the overall length of the circuitry with the mach trim fully extended and make it possible to obtain the full down range the control column will move forward against its butting stop and take up the 0.6 in. gap between the forward stop sleeve and the limit stop at former 288F.

28. After wirelocking all adjustment points and checking the safety of all rods, set the controls to the dimensions shown on details A, B, C, D and E and measure the stick position and record on aircraft history card.

NOTE...

This is a check on the standardisation of the setting of control geometry. Check that the rollers of the triple roller bearings work freely.

29. Finally check the fluid level in the power units and replenish if necessary.

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