Chapter 5 ALIGHTING GEAR

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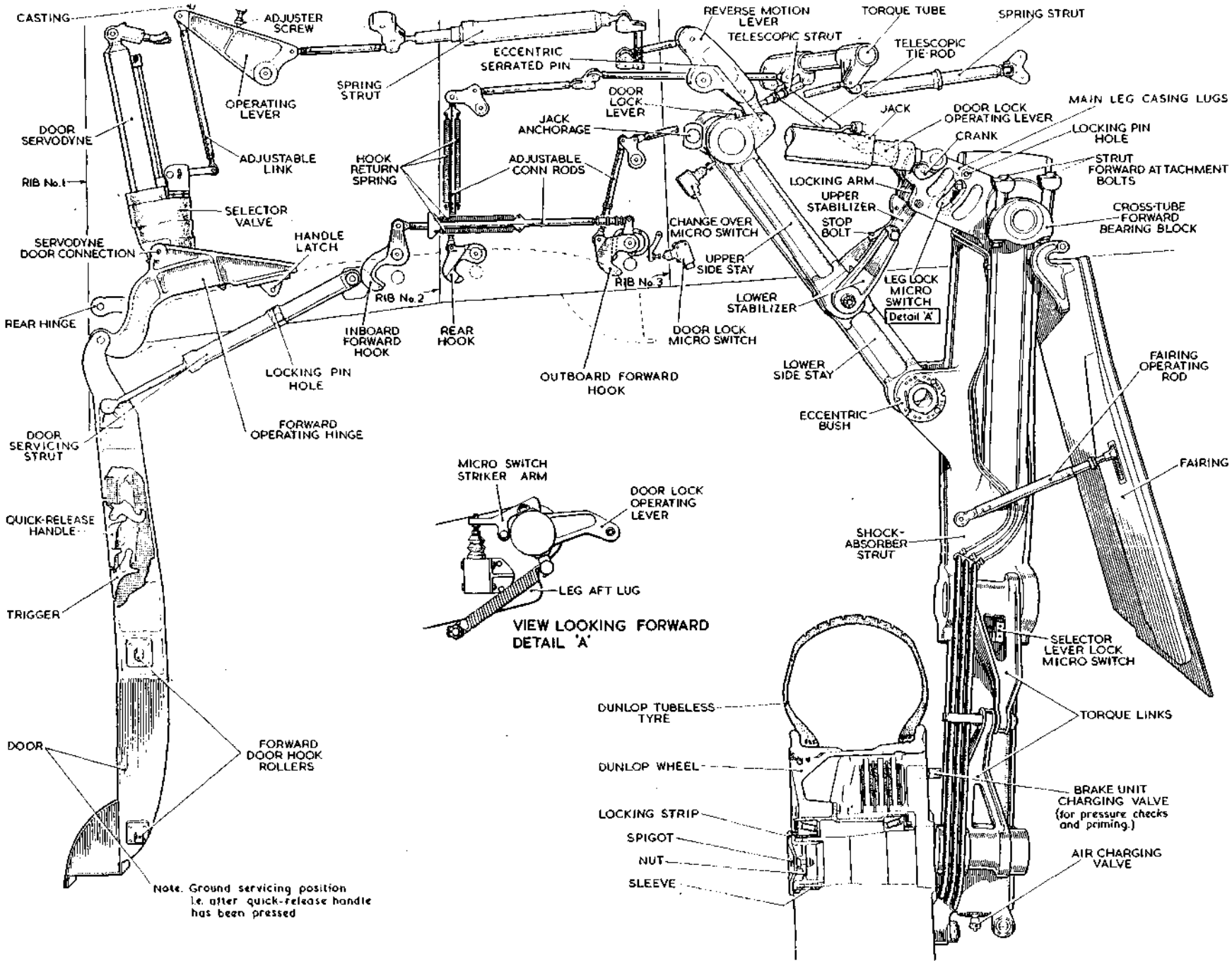


Fig. 1. Main undercarriage, port
(Door servodyne detail amended, detail 'A' added)

DESCRIPTION AND OPERATION

Introduction

1. This chapter describes the alighting gear, which consists of two main wheels, a single nose wheel, two tail skids and an arrester hook. Each wheel is mounted on a shock-absorber leg and is retracted and lowered by a single Lockheed jack. The main wheels are fitted with Dunlop hydraulic plate-type brakes and Maxaret anti-skid units. The nose wheel can be steered by a hydraulic mechanism which can be declutched to give 360 deg. castering action for ground handling. All three wheels are fitted with Dunlop tubeless tyres.

2. The part numbers of the wheels, tyres, brake units and Maxaret units are given in the Leading Particulars. Details of the nose steering mechanism, alighting gear and arrester hook hydraulic systems are given in Sect. 3, Chap. 6. The alighting gear components are described in the following publications:—

(1) Tail shock absorbers – A.P.1803C, Vol. 1.

(2) Undercarriage legs – A.P.1803P, Vol. 1.

(3) Maxaret units – A.P.1803S, Vol. 1, Book 2.

(4) Wheels – A.P.2337, Vol. 1, Book 1.

(5) Tyres and brake units – A.P.2337, Vol. 1, Book 2.

Main undercarriage

3. Each main wheel is carried on a stub axle at the bottom of an oleo shock-absorber leg, which is retracted inboard and slightly forward by a hydraulic jack. The leg is braced in the *down* position by an upper and a lower side-stay and is locked in both *up* and *down* positions by an upper and a lower stabilizer. When *up*, each main undercarriage is enclosed in its well by a door and a fairing.

4. As each main undercarriage (including the door and the fairing) is similar, apart from the positions of the torque links (*para.* 6) and handed differences, only the port is described here. Fig. 1 shows the various components of the undercarriage, while fig. 2 and 3 show, diagrammatically, the operation of the mechanisms involved.

Main undercarriage oleo leg

5. The leg, which is pivoted on a cross-tube between two main undercarriage pick-ups at the outboard end of the wheel well, consists of a plunger tube sliding in the main leg casing, a pair of torque links and a stub axle. The plunger tube, which is charged with compressed air, slides in fluid contained in the main leg casing. When the plunger tube moves up, the fluid is forced through a spring-loaded orifice control valve in the top of the plunger tube and pushes a separator piston down the tube against the air pressure. The air is thus compressed and cushions the downward movement of the separator piston. Eventually, the air is so compressed that it will force the piston back up the tube and the oil back into the main leg casing. The returning fluid closes two ports in the orifice control valve, thus restricting the fluid flow and preventing any tendency to bounce.

6. The stub axle, which carries the wheel, is attached to the bottom of the plunger tube and is prevented from rotating by the two torque links. One link is pivoted in lugs on the stub axle casting and the other in lugs at the bottom of the main leg casing; they are pinned together by a knuckle pin forward of the leg. On the port side the lower link is bushed at the pin; the upper link is not bushed and is bolted to the pin. On the starboard side the positions are reversed.

Main undercarriage jack

7. The inboard end of the jack is carried in a bracket on rib No. 3 and its outboard end is attached to a crank, which is carried on the forward end of a crankshaft running through two lugs at the top of the main leg casing. The jack extends to retract the undercarriage and retracts to lower it.

Side-stays and stabilizers

8. One end of the upper side-stay pivots between brackets on rib No. 3, and one end of the lower side-stay pivots between lugs on the leg casting; their other ends are connected by a hollow pin. A bolt passing through the hollow pin connects the lower stabilizer to the centre side-stay joint. The upper stabilizer is attached to the leg casing lugs which carry the crankshaft. The two stabilizers are joined by a pivot bolt. The lower side-stay has spherical bearings of beryllium copper when Mod. 1162 is embodied.

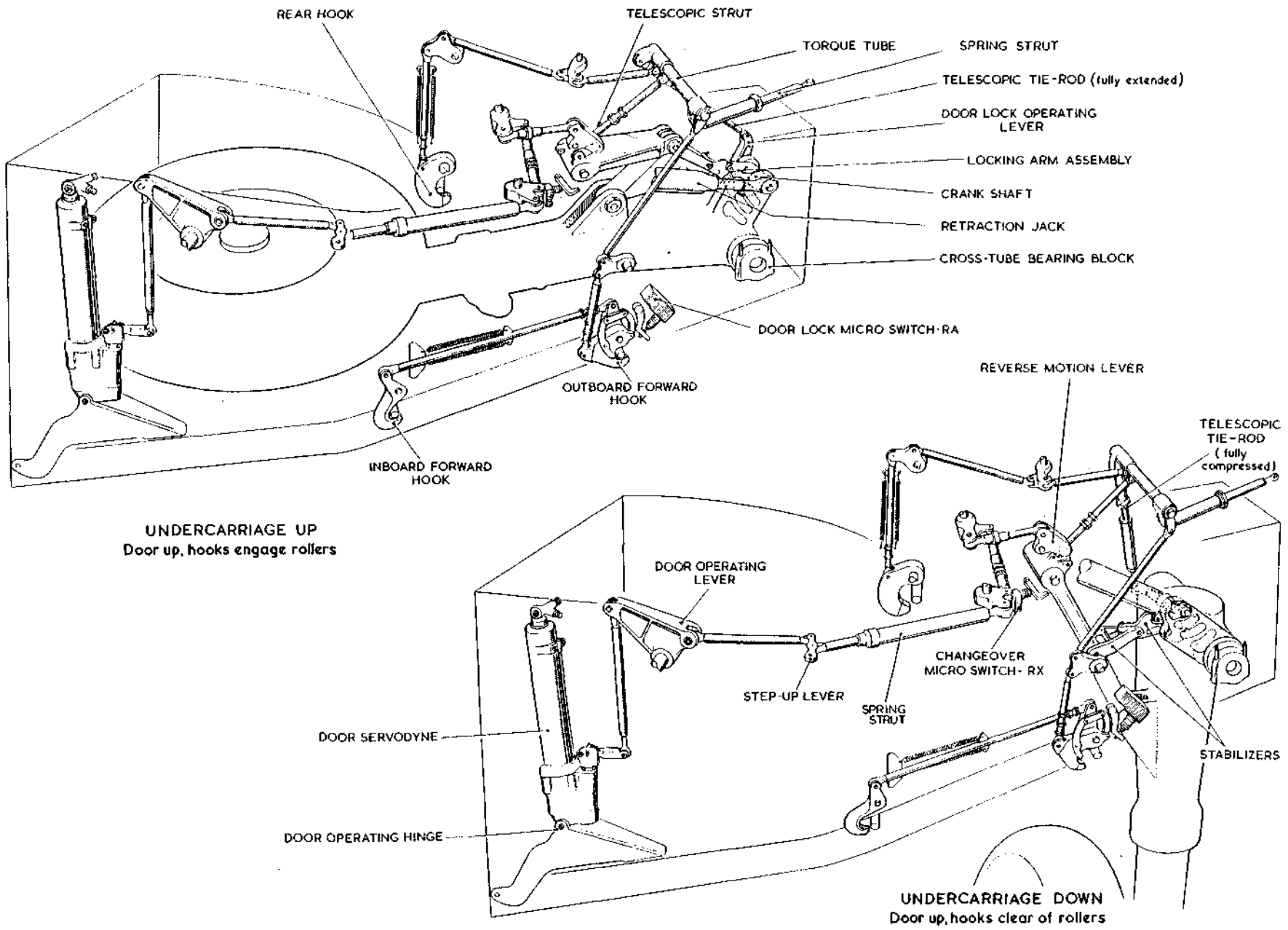


Fig. 2. Main undercarriage diagram (1)

《Annotation Amended》

When the undercarriage is *down*, the side-stays are fully extended with their centres in a straight line and the stabilizers are also fully extended but just over centre. In this position a stop bolt on the upper stabilizer butts against a stop on the lower one and prevents any further movement out of a straight line, so locking the undercarriage in position. When the undercarriage is *up*, the side-stays are folded but the stabilizers are again in their locked position.

9. Between the main leg casing lugs a crankshaft carries a locking arm assembly which comprises two arms at right-angles, each carrying a roller. In the undercarriage locked up or down positions, the roller in the unlocking arm is clear of a cam track on the top face of the upper stabilizer, and the roller in the locking arm is touching the cam track but is just clear of the face of the locking cam on the upper stabilizer. Two coil springs, attached to the aft end of the crankshaft and the leg, tend to hold the locking arm assembly in the locked position. In the locked down position, a hole in the unlocking arm of the locking arm assembly aligns with holes in the main leg casing lugs, thus allowing the main undercarriage ground locking pin (*Item G2, Sect. 2, Chap. 4*) to be fitted.

Main undercarriage door and fairing

10. The door is hinged at two points on the inboard edge of the wheel well. The forward hinge is in two parts, both pivoting about the hinge pin; one part is attached directly to the door, the other, which is the door-operating hinge, is attached at its top to a door servodyne and on its lower side to the door, by a latch which engages with a quick-release handle in the outer skin of the door. The handle is held in position by a spring-loaded trigger.

11. When the undercarriage is lowered or retracted, the door is operated by the servodyne, which is attached at its top to the inboard end of the main undercarriage door mechanism support beam. When the undercarriage is *down*, the door can be lowered and raised by hand after releasing the quick-release handle. The door is held down for servicing by a telescopic strut, which runs from a bracket on the leading edge of the door to a bracket on the forward wheel well wall and can be locked in its extended length by a locking pin (*Item G23, Sect. 2, Chap. 4*).

12. The fairing is hinged at two points on the outboard end of the wheel well and is attached by a rod to the main leg casing, with which it opens and closes. The door and fairing meet along the centre-line of the stub boom and are both shaped to the boom profile.

Main undercarriage door operating mechanism

13. A lug on the top of the upper side-stay is connected by a short link to the lower arm of a reverse motion lever, which is pivoted in a bracket on rib No. 3 above the side-stay brackets. As the undercarriage retracts, the upper side-stay swings up and pushes up the lower arm of the reverse motion lever until the link and the side-stay lugs are in a straight line. As the side-stay continues to revolve, it pulls the lever in the reverse direction. When the undercarriage is lowered a similar sequence takes place.

14. The upper arm of the reverse motion lever is connected by a link, which passes through rib No. 3, to one arm of a lever on the inboard face of that rib. The lower arm of this lever is connected by a rod, which runs forward parallel to and inboard of rib No. 3 to one arm of another lever bracketed to that rib just aft of the main spar. The inner arm of this lever is connected by a spring strut, which runs inboard along the aft face of the main spar and through rib No. 2, to a step-up lever, carried on the outboard end of the main undercarriage door mechanism support beam. This lever consists of a single arm pivoted about a pin in the beam structure and pointing aft. A connecting-rod is also attached to this lever aft of the spring strut and runs from the lever inboard to the outboard end of a door-operating lever, which is triangular in shape and is in effect a bell-crank lever. It is pivoted about mid-way along the bottom of the support beam and imparts vertical movement to an adjustable link, which operates the door servodyne in a normal 'follow-up' fashion.

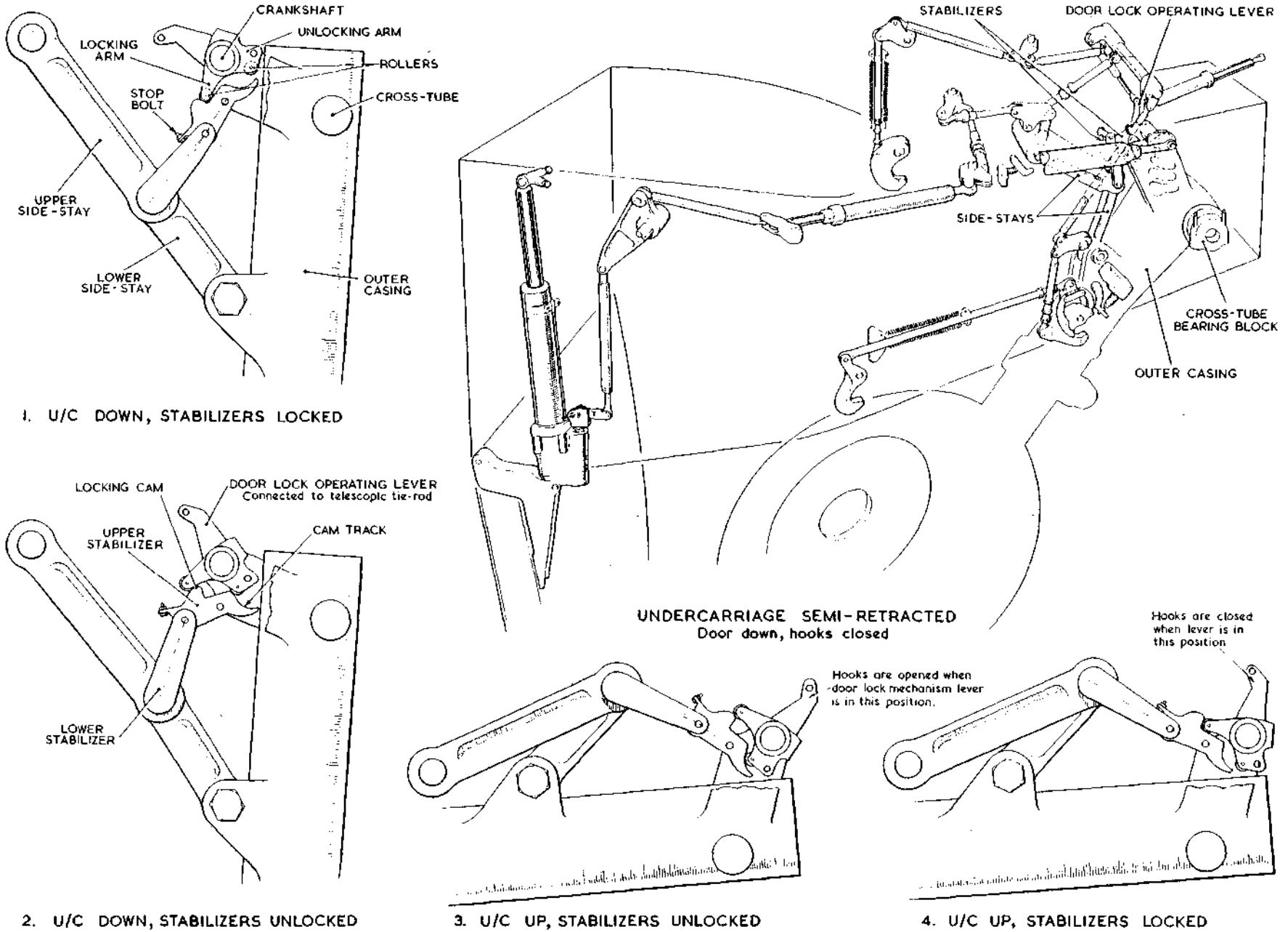


Fig. 3. Main undercarriage diagram (2)

◀Annotation amended▶

Main undercarriage door locking mechanism (fig. 2)

15. When the undercarriage is up, the door is locked by three hooks which engage rollers on the door. Two hooks engage the forward edge and one hook engages the aft edge of the door.

16. The hooks are operated by the movement of the undercarriage via a door lock operating lever on the aft end of the crankshaft, the upper side-stay, and a torque tube mounted above and almost parallel to the cross-tube. The torque tube carries five levers as follows:—

(1) The forward lever operates the outboard forward hook by the action of a fixed length and an adjustable connecting rod via a lever pivoted inboard of rib No. 3, and also operates the inboard forward hook through an adjustable rod which connects the two hooks. Two springs attached to the latter rod act as return springs for both hooks.

(2) The second lever is attached to an adjustable spring strut which is attached to rib No. 4.

(3) The third lever is connected to the upper side-stay by a telescopic strut, which is compressed when the undercarriage is down.

(4) The fourth lever operates the rear hook via two fixed-length rods and one adjustable rod and two levers. The adjustable rod has two return springs attached to it, and to a bracket on the rear wall of the wheel well.

(5) The fifth lever is connected to the door lock operating lever, on the aft end of the crankshaft, by a telescopic tie-rod.

17. The spring strut and coil springs at the rear and inboard forward hooks tend to keep the hooks in the closed position, but when the undercarriage is down, the hooks are held open by the telescopic strut against the pressure these springs.

Main undercarriage operation (fig. 2 and 3)

18. When undercarriage UP is selected the jack extends, rotating the crank and the locking arm assembly in the main leg casing lugs. The roller in the locking arm moves clear of the locking cam on the upper stabilizer and the roller in the unlocking arm bears against the cam track, turning the upper stabilizer and breaking the lock between that and the lower stabilizer.

19. The jack now pivots the leg about its cross-tube, the stabilizers fold upward and inboard and the side-stays fold upward and outboard. As the upper side-stay folds, it pushes up the lower arm of the door-operating mechanism reverse motion lever thus opening the door. At the same time, the telescopic strut is drawn inboard by the upper side-stay, allowing the hooks to close when the door is clear.

20. When the leg has reached approximately its mid-travel position, the lower arm of the reverse motion lever is in its extreme upwards position. As the leg continues to rise, the lever moves in the opposite direction and the door closes.

21. During the final stages of retraction, the door lock operating lever on the aft end of the crankshaft reaches a position sufficiently far outboard to have extended the telescopic tie-rod to its greatest length; further movement of the lever pulls the tie-rod and opens the hooks to allow the door to close.

22. When the leg is up and the door closed, the between-centres line of the jack is such that the crank is

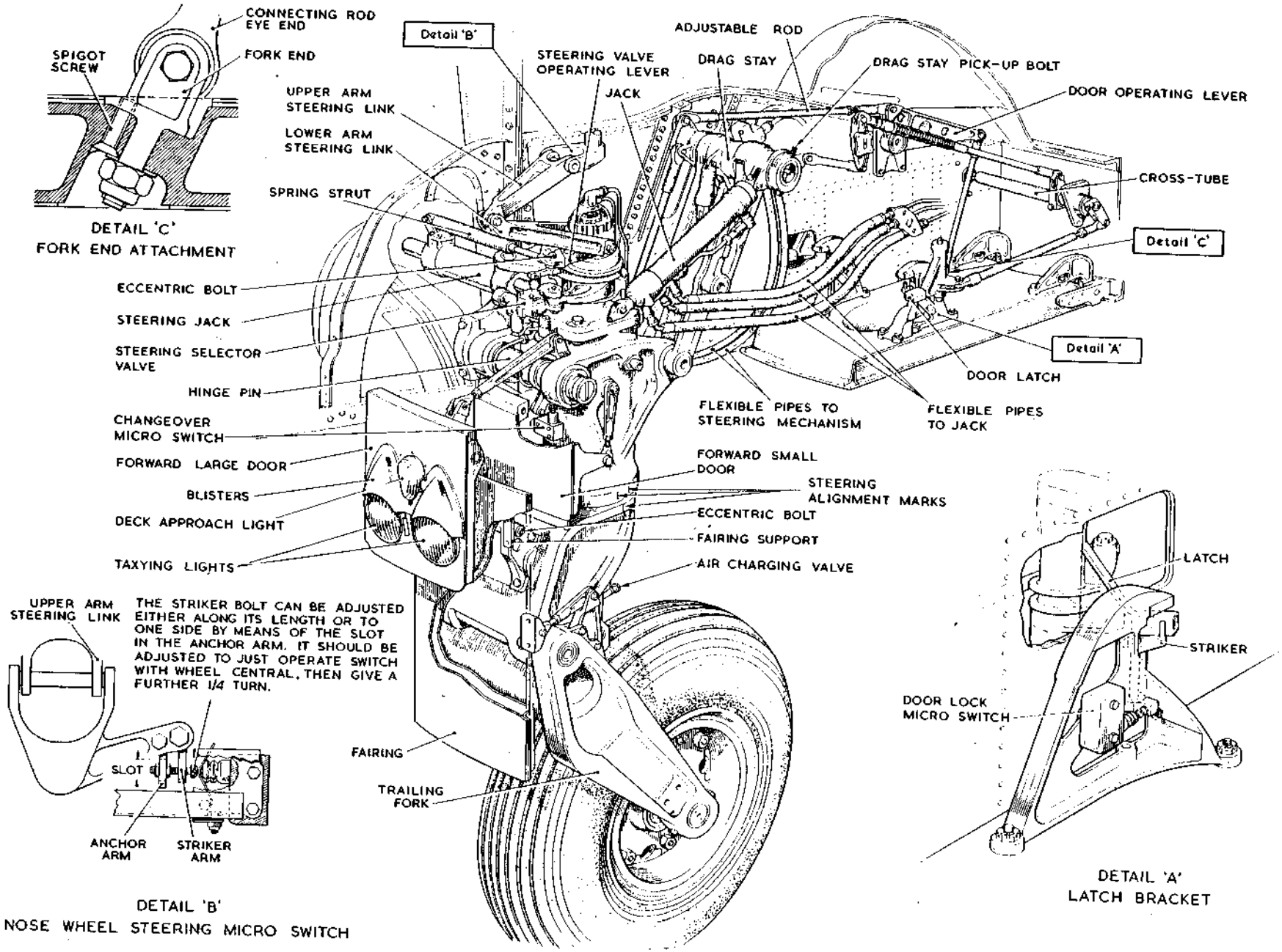
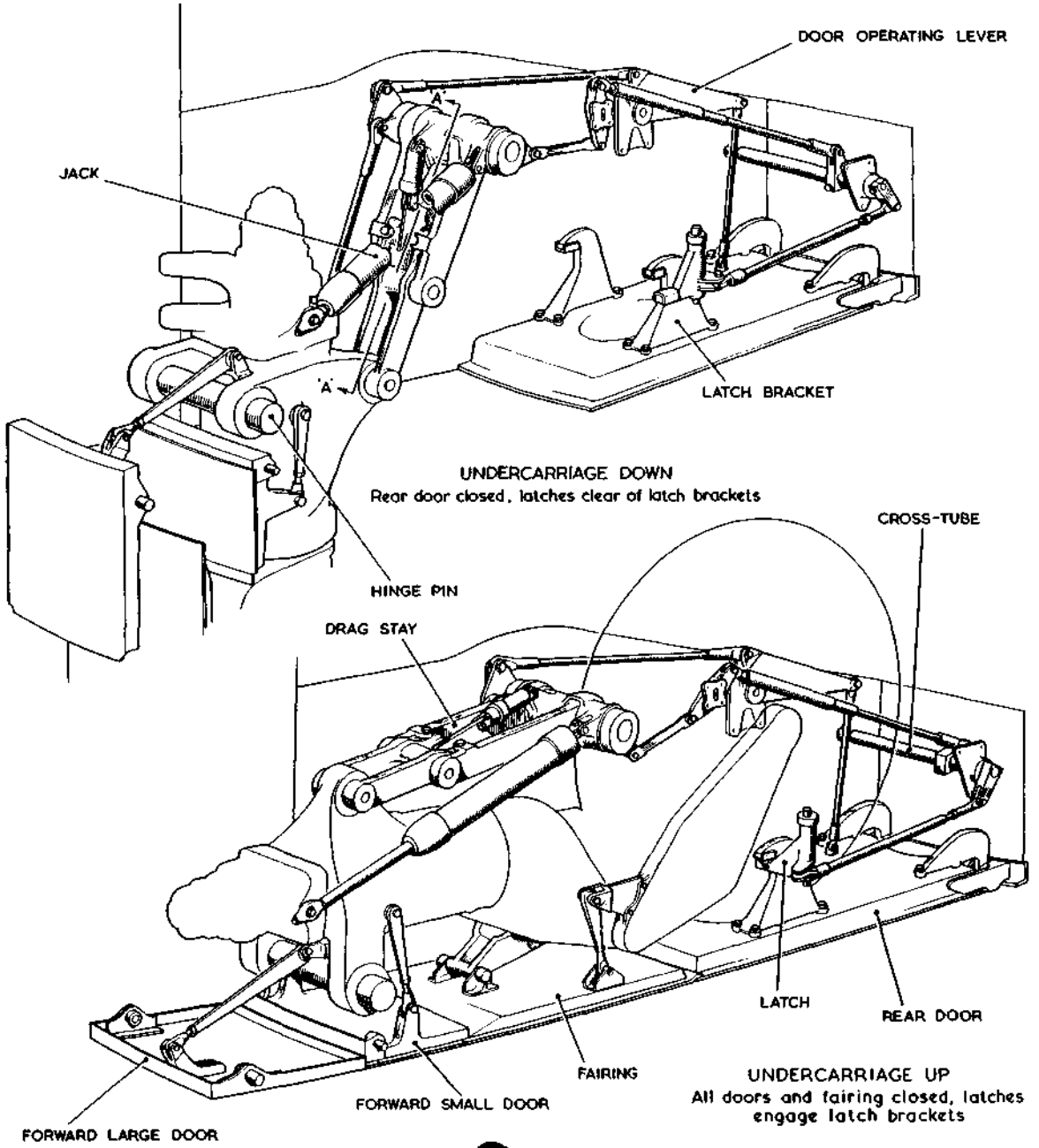


Fig. 4. Nose undercarriage



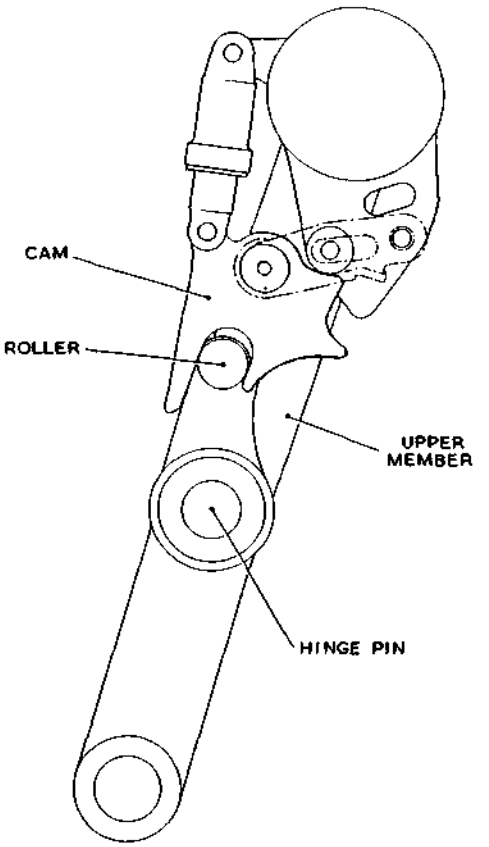
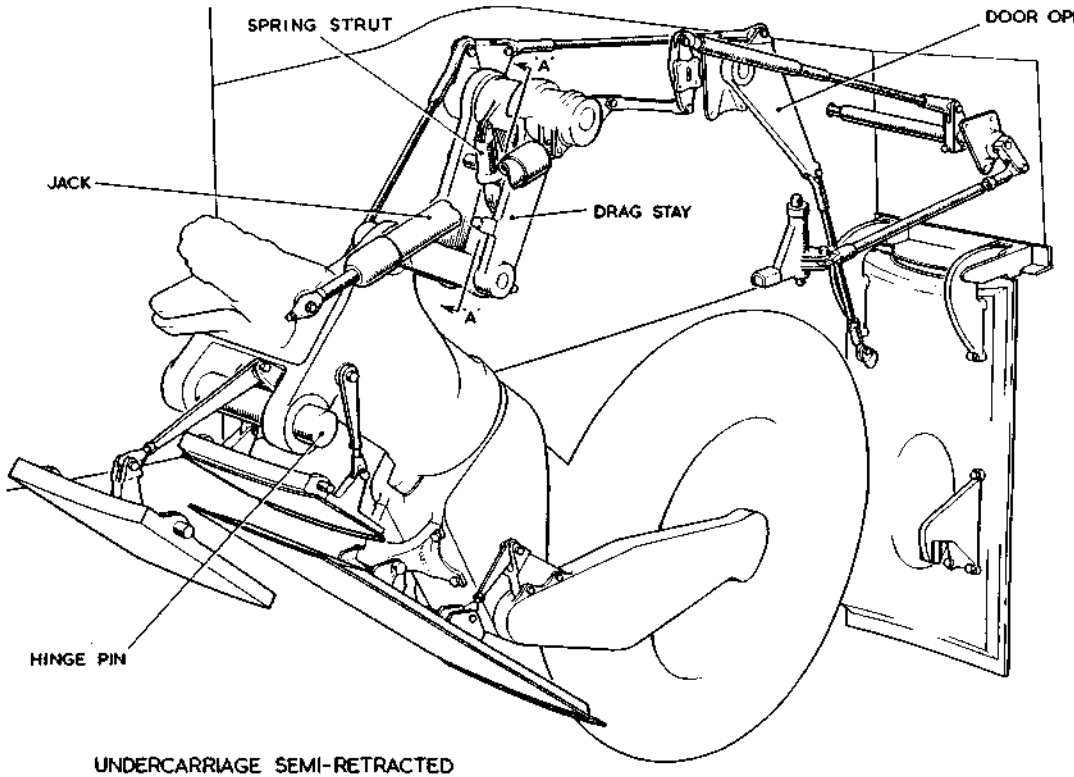
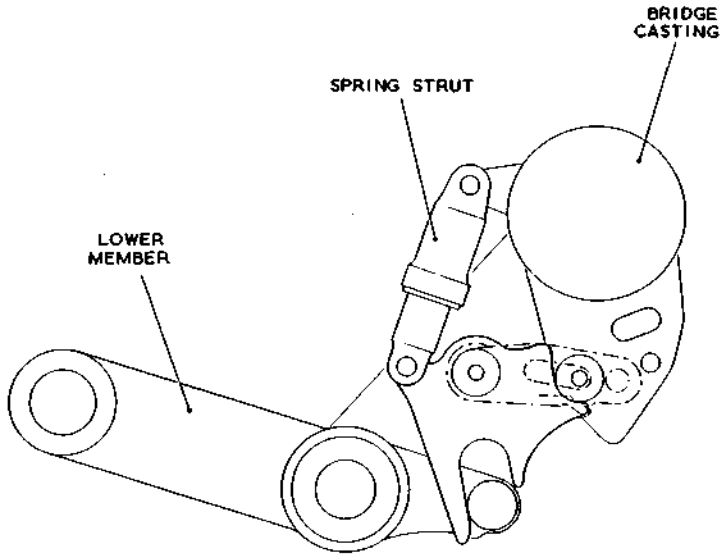


Fig.6 Nose undercarriage diagram



UNDERCARRIAGE SEMI-RETRACTED
Rear door open



SECTION 'A'-'A'
DRAG STAY UNLOCKED
Undercarriage up or down

Fig.7 Nose undercarriage diagram

turned in the reverse direction relative to the lugs and the locking arm pushes the stabilizers into the locked position. At the same time, the door lock mechanism lever moves inboard, releasing the pull on the telescopic tie-rod so that the hooks close.

23. When the undercarriage is lowered the sequence is the reverse of retraction, the initial pull of the jack unlocking the stabilizers and opening the hooks. The final pull of the jack locks the stabilizers but leaves the hooks open.

Nose undercarriage

24. The nose wheel is carried in a trailing fork at the bottom of an oleo leg, which is retracted to the rear by a hydraulic jack and is braced and locked in both *up* and *down* positions by a drag stay. When *up*, the undercarriage is enclosed in its well by three doors and a fairing. When *down*, the nose wheel can be steered from the pilot's cockpit through a hydraulic steering mechanism, which is mounted on top of the leg.

25. The nose undercarriage, doors and fairing are shown, as they are installed in the aircraft, in fig. 4, and their operation is shown diagrammatically in fig. 6. The drag stay and its component parts are shown in fig. 5.

Nose undercarriage oleo leg

26. The leg is pivoted about a hinge-pin carried in pick ups at the forward end of the wheel well, and consists of an inner and an outer casing, a sliding plunger and a trailing fork, which is connected to the plunger by a link. The plunger slides within the inner casing and is charged with compressed air, the inner casing being charged with fluid. When the plunger slides up, the fluid is forced through a spring-loaded orifice valve in the top of the plunger and pushes down a separator piston, which slides within the plunger. The air is thus further compressed and acts as a spring to return the plunger to its original position. The trailing fork is pivoted on lugs at the bottom of the inner casing, which is free to revolve in the outer casing and is connected to the steering mechanism by a splined torque shaft. A full description of the leg is given in A.P. 1803P.

Drag stay *(fig. 5)*

27. The drag stay has two upper members and a lower member; the two upper members are pivoted about a cross-tube carried in pick-ups at the top of the nose-wheel well at station No. 95. The lower member is pivoted on a lug projecting to the rear from the leg outer casing. The other ends of all three members are pinned together, the two upper ones enclosing the lower one. In either locked position, the members are fully extended but just over centre.

28. Also on the drag stay cross-tube is a bridge casting which partly encloses the top of the port member. Two lugs on the casting lie between the upper members and carry a roller, which bears against a cam pivoted on a bolt between the two members. A lug on the forward end of the cam is connected by a spring strut to a lug on the front of the bridge casting. Two arms at the bottom of the cam engage a roller carried on an extension of the lower drag stay member, which also butts against stop bolts in the two upper members. On either side of the cam, and carried on the cam bolt, is a slotted lock link; another bolt, which holds the roller in the bridge casting lugs, protrudes either side of the lugs to engage the slots in these links. The two upper members are maintained at their correct distance apart by a spacer bolt which is held in lugs on the aft faces of the members and passes through slots in the bridge casting lugs to limit the movement of the casting relative to the upper members of the drag stay.

Nose undercarriage jack

29. The jack is attached to the port side of the leg at a point aft of and just above the hinge pin. The other end of the jack is carried in two lugs on the port end of the bridge casting.

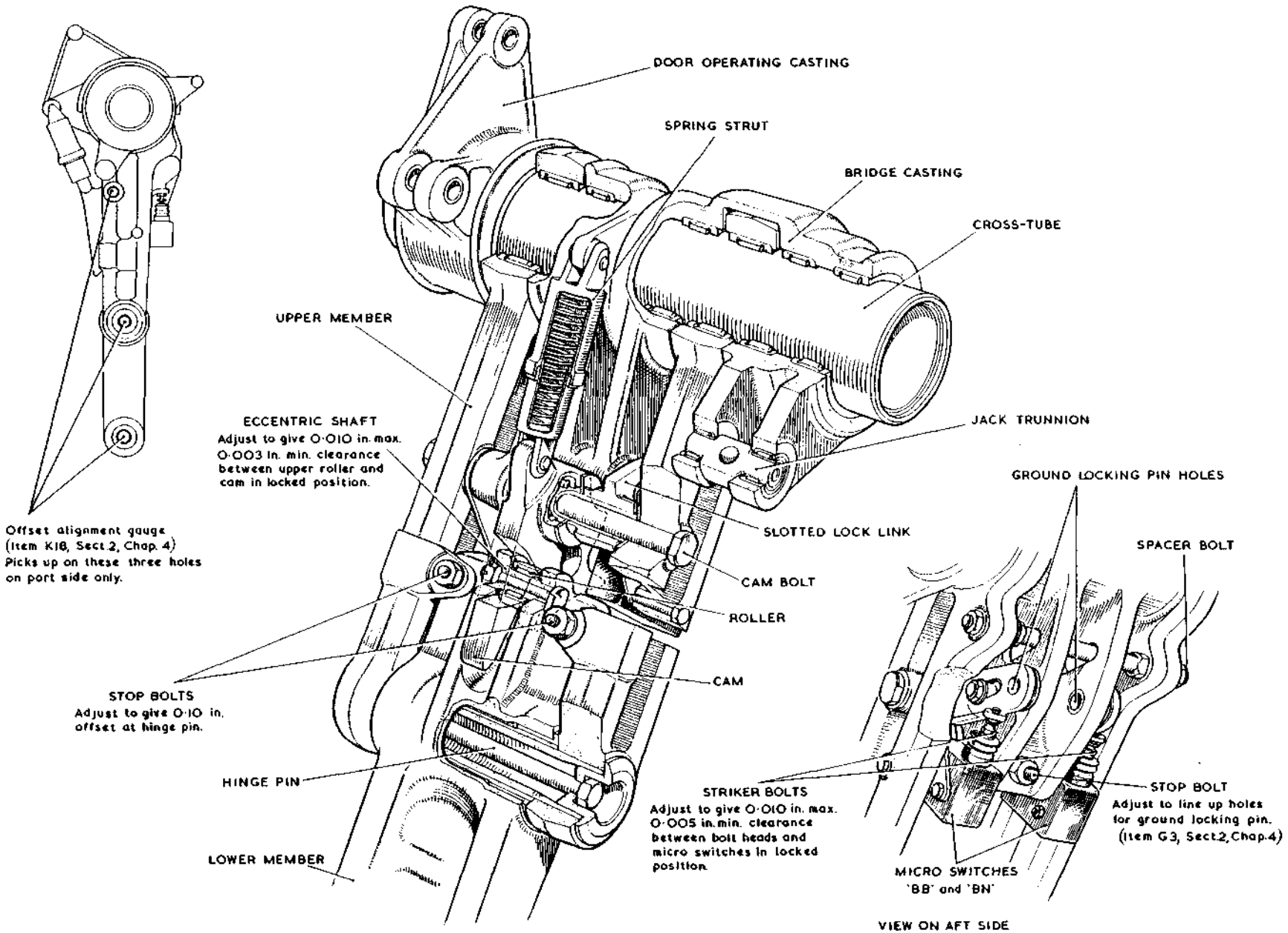
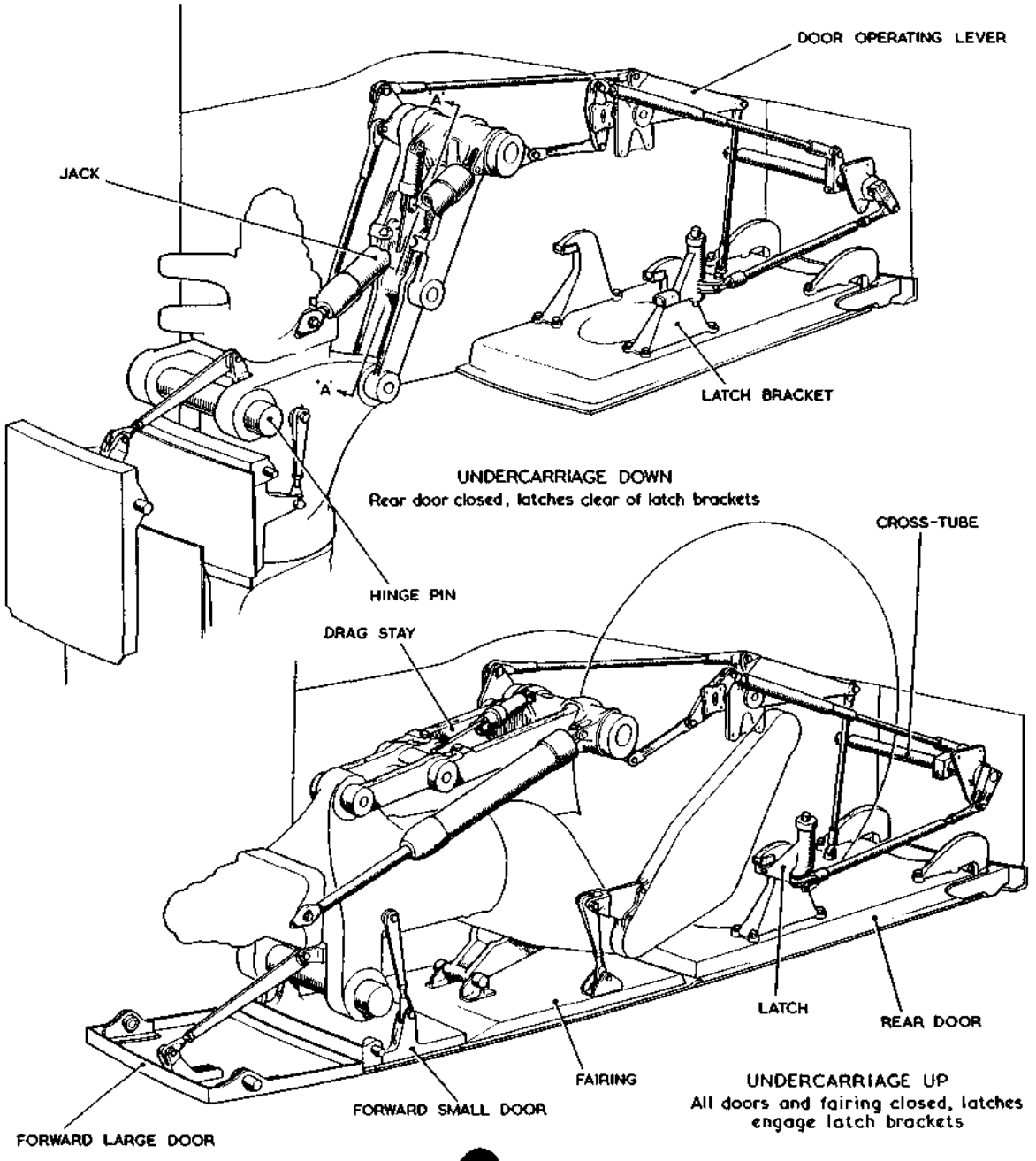


Fig. 5 Drag stay



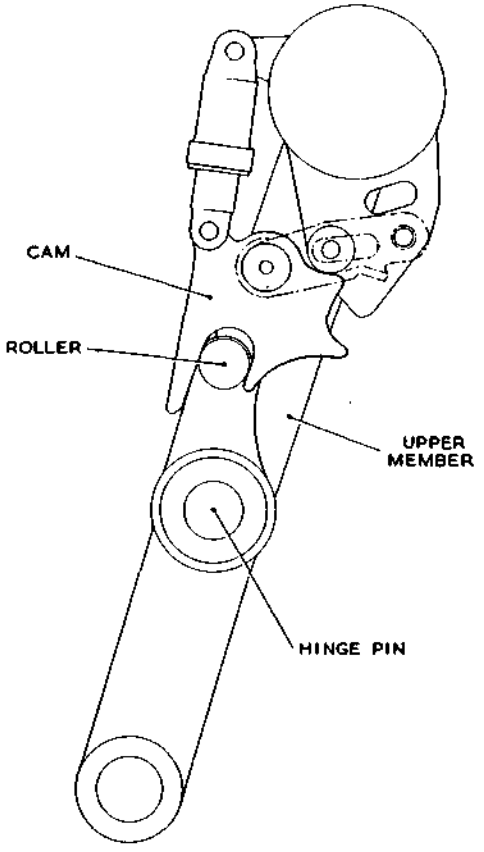
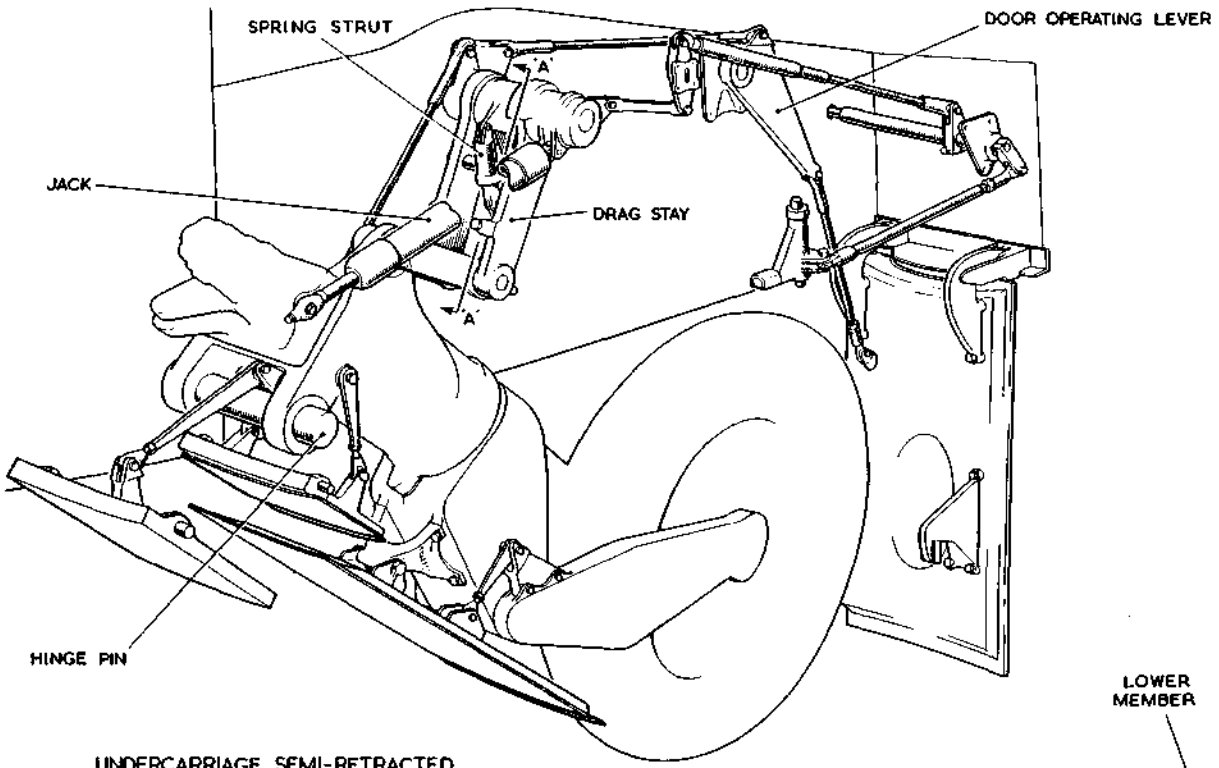
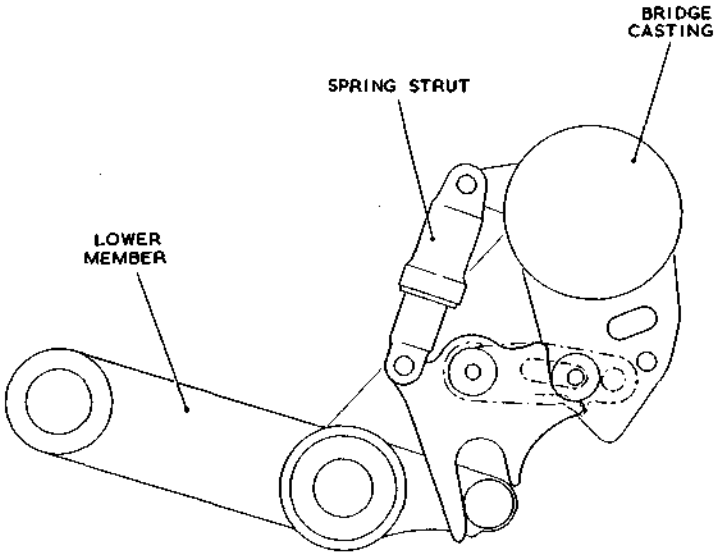


Fig.6 Nose undercarriage diagram



UNDERCARRIAGE SEMI-RETRACTED
Rear door open



SECTION 'A'-'A'
DRAG STAY UNLOCKED
Undercarriage up or down

Fig.7 Nose undercarriage diagram

When the undercarriage is *down*, the jack is not quite bottomed on its internal stops.

Nose undercarriage doors and fairing

30. When the undercarriage is *up* it is enclosed in its well by three doors and a fairing. The two forward doors are both hinged to the sides of the well and are connected by links directly to the leg, with which they open and close. The fairing is attached to the forward face of the leg. The rear door is hinged at two points at the rear of the well; it is closed when the undercarriage is fully *up* or *down*, and opens during the lowering and retraction operations. The foremost door carries two taxying lights and a deck approach warning light, which are fully described in ◀Book 2, Cover 1, Sect. 5, Chap. 1, Groups G6 and G1, respectively.▶

Nose undercarriage door mechanism

31. On the starboard end of the drag stay cross-tube is a door-operating casting which has two arms at approximately 45 deg. to each other. The lower arm, which faces forward, is connected to the leg by a connecting-rod which has an eccentric ball in the end attached to the leg. The other (almost vertical) arm of the casting ◀is attached to a connecting-rod (adjustable post Mod. 831) which▶ runs aft to the top of a door-operating lever, pivoted on a bracket at the aft end of the starboard wall. This lever is triangular in shape and is in effect a bell-crank, which transmits vertical movement to a short connecting-rod attached to the door.

Nose undercarriage door locking mechanism

32. When the undercarriage is *up*, the rear door is locked by two latches which are pivoted in brackets on the outboard sides of the wheel well walls and engage latch brackets, mounted on the door, through holes in the walls.

33. A lug projecting aft from the drag stay bridge casting is connected by a link to the lower arm of a lever, pivoted on a bracket on the port wall of the wheel well aft of the drag stay pick-ups. The upper arm of this lever is connected by a spring connecting-rod to a lever on top of a cross-tube, which is mounted in brackets at the aft end of each side wall of the wheel well. The cross-tube protrudes through each of the side walls and carries a lever on serrations at each of its ends. These levers are connected to the latches by connecting-rods which run forward outboard of the walls.

Nose undercarriage operation (fig. 6 and 7)

◀**34.** When undercarriage UP is selected, the jack extends and pivots the drag stay bridge casting counter-clockwise (from port side). The locking roller in the bridge casting lugs is moved along the cam to the point where the cam profile becomes part of a circle centred at the cam pivot point. The can is now free to pivot under the action of the spring strut, and presses on the drag stay roller to break the lock between the drag stay members.

35. The leg now pivots about the hinge pin, and the drag stay upper member is moved with the bridge casting to fold the drag stay and retract the leg. The initial movement of the leg moves the eccentric ball connection towards the door-operating casting, and the door linkage opens the door. When the leg is in its mid-travel position the eccentric ball is at its nearest position to the door-operating casting and the door is fully open.

36. When the leg passes the mid-travel position, the drag stay is extended, the drag stay roller engages in the cam slot and the spring strut is compressed. Simultaneously, the eccentric ball moves away from the door-operating casting and the door closes.

37. During the final stages of retraction, the bridge casting is turned clockwise by the jack, the locking roller moves against the cam into the locked position, and the link of the door locking mechanism is pulled forward to lock the door.▶

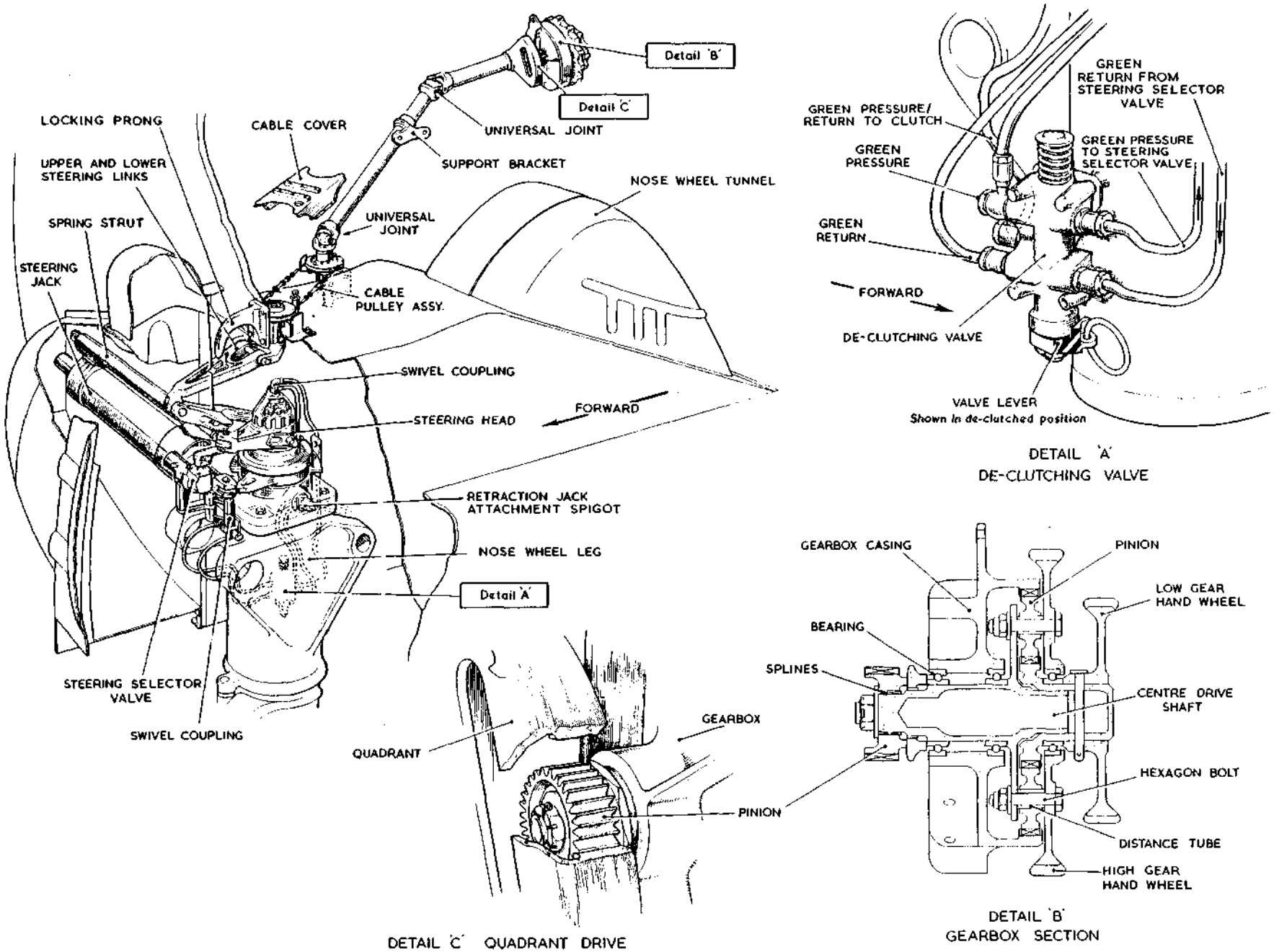


Fig. 8. Nose wheel steering mechanism

◀Declutching valve pipelines – Mod. 1321▶

38. When the undercarriage is being lowered the sequence is the reverse of retraction. The initial movement of the jack breaks the lock of the drag stay and unlocks the door; the final movement of the jack locks the drag stay but leaves the door unlocked.

Nose wheel steering mechanism

39. The nose wheel may be steered up to 45 deg. either side of central by a steering mechanism mounted on the top of the non-rotating portion of the nose-wheel leg. The installation is shown on fig. 8 to 10, and this text must be read in conjunction with these illustrations.

40. The steering selector valve is attached to the front of the nose wheel head, and is operated by a two-speed gearbox mounted on a panel on the pilot's starboard side. The gearbox has two handwheels, the smaller giving fine and the larger coarse control respectively. The gearbox is linked to the selector valve on the steering head by torque tubes, and a cable and pulley run (*fig.* 8).

41. The *steering head* is a general term used to describe all the steering mechanism at the top of the nose wheel leg. The oleo leg passes through the leg casing into the clutch mechanism in the head, and is connected via splines and the clutch to the operating jack on the outside of the leg casing. Extension and retraction of the jack, which is fixed to the outer casing, causes the oleo leg and its attached wheel to rotate, full travel being 45 deg. port or starboard of the centre line. A spring centring strut is fixed to the outboard end of the steering jack and to the fixed portion of the nose wheel casing and makes the leg self-centring when the handwheel is released.

42. Operation of either of the control wheels in the cabin moves the steering selector valve port or starboard, and the nose wheel is rotated in the same direction in which the valve is moved. The selector valve ports are sealed off in a normal follow-up action and the nose wheel is hydraulically locked in the selected position. When the leg is retracted, the steering mechanism is locked in the central position by a locking prong engaging the upper steering link.

Nose-wheel de-clutching valve

43. The de-clutching valve (*fig.* 8) is mounted on the starboard lower portion of the nose-wheel leg. The valve releases hydraulic pressure from the clutch pressure chamber (*fig.* 10) in the steering head, permitting free 360 deg. castering of the nose-wheel leg for ground handling and towing. The valve can only be operated on the ground and when the lever is moved to the de-clutch position the reverse face, which is painted RED (or RED/YELLOW stripes, post Mod. 1321), is visible.

WARNING . . .

Although a microswitch prevents the alighting gear from being retracted unless the nose wheel is central, it is essential that the lever should be returned to the clutch position, i.e. flush with the leg and pointing aft, after towing or ground servicing.

Nose wheel steering head operation (fig. 10)

44. The steering head is bolted to the top flange of the nose-wheel leg outer casing, and externally provides the mounting for the selector valve operating lever, and internally houses the hydraulically-operated clutch and the anti-shimmy damping arrangement.

45. The pipes and swivel coupling mounted on the pressure head retaining nut, connect the de-clutching valve on the leg to the clutch pressure chamber within the head. With the system charged and the lever (*detail A, fig.* 8) in the clutch position, hydraulic fluid will be admitted to the chamber, the resultant pressure holding the clutch dogs C and D in engagement against the clutch spring. When the lever is moved to the de-clutch position the plunger in the valve is rotated, thus relieving the hydraulic pressure on clutch dog C and allowing the clutch spring to force the two clutch dogs (C and D) out of engagement. The clutch pressure chamber and the moving clutch dogs are shown on the illustration which also shows the splines on the oleo leg on which the moving clutch dog slides. The

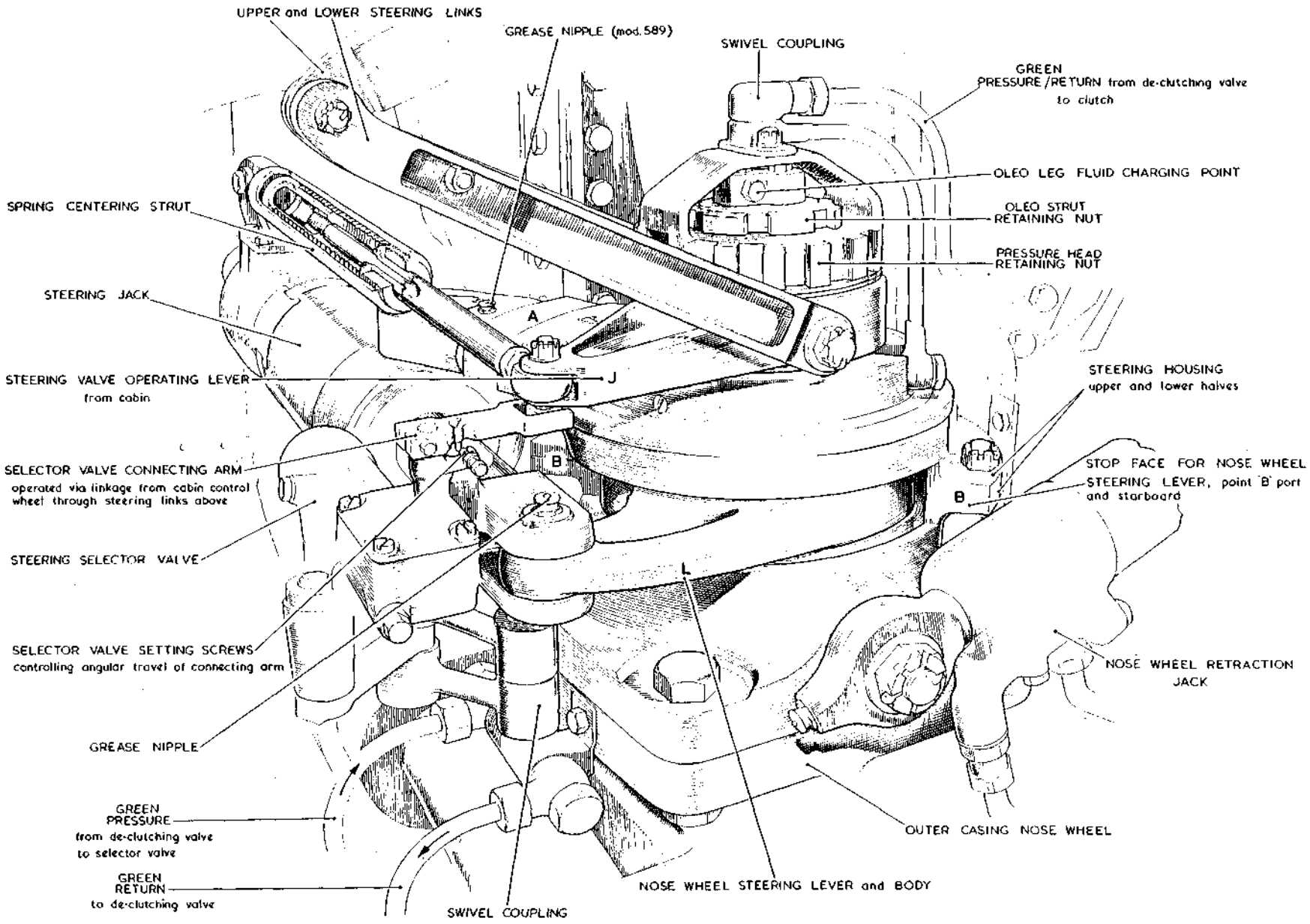


Fig. 9. Nosewheel steering head

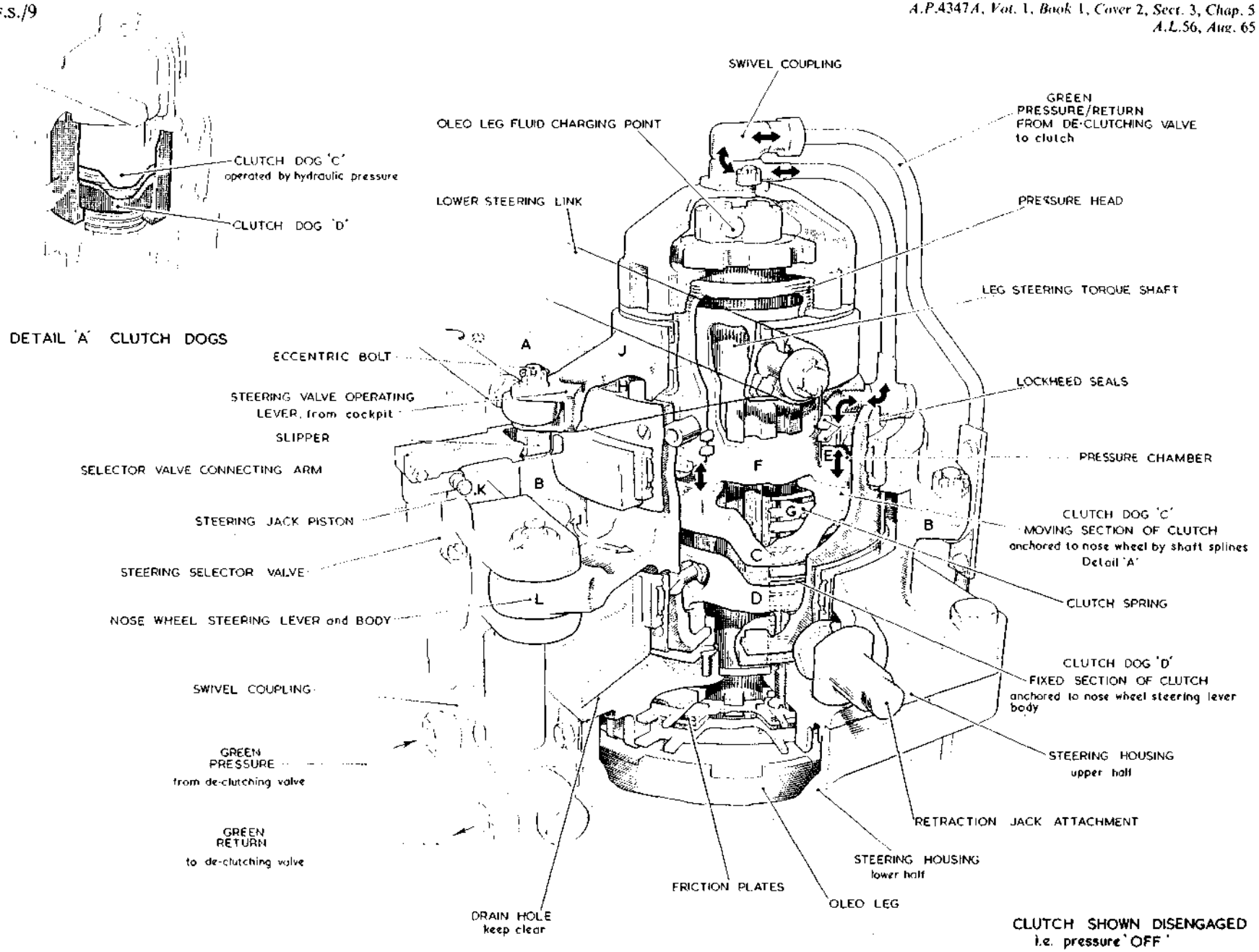


Fig. 10. Nose wheel steering head, sectioned

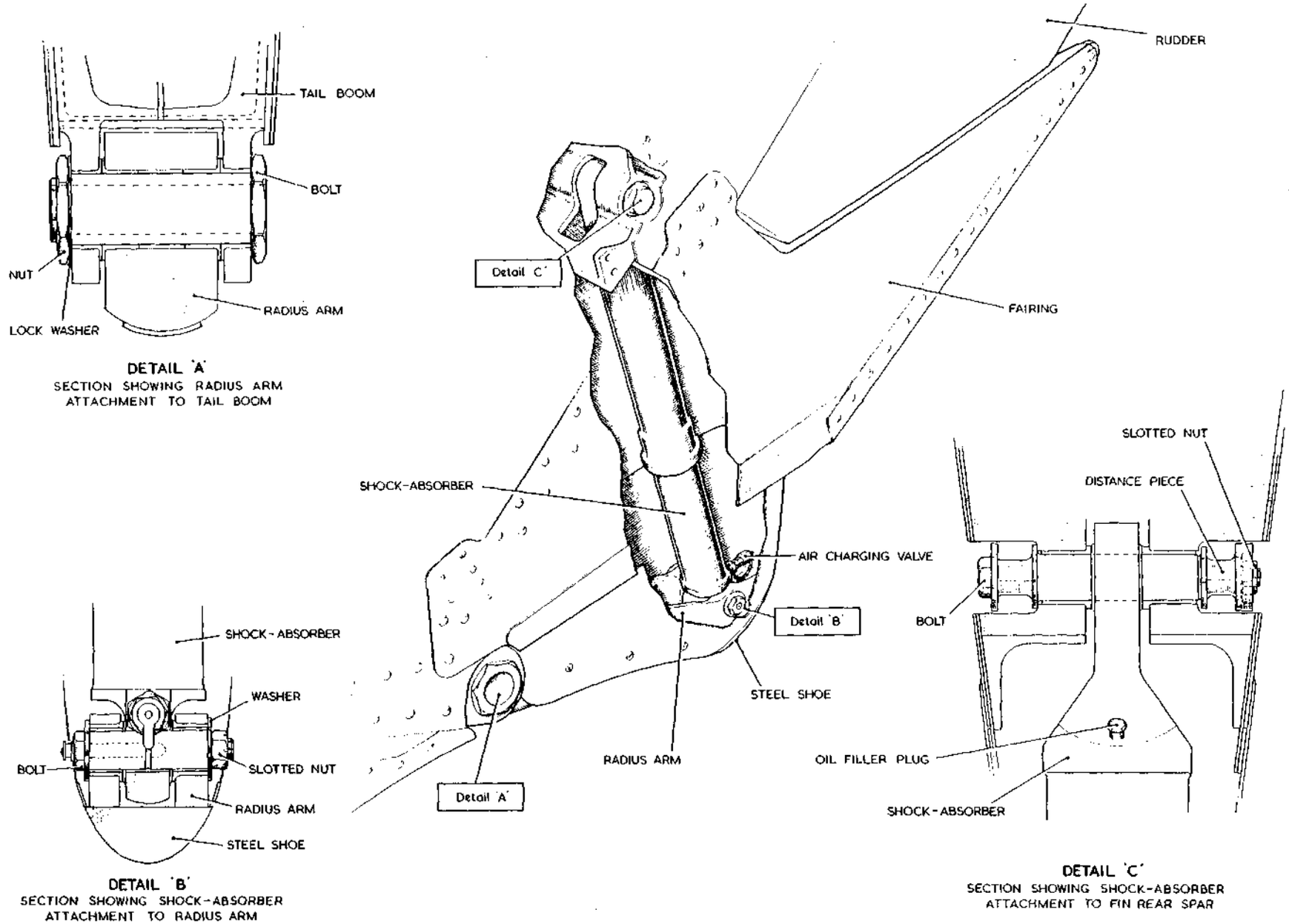


Fig. 11. Tail unit skid, port

◀Grease nipple – Mod. 1182▶

steering valve operating lever J is a free rotating fit on the steering head, and can move within the limits of the slot at point H. This free movement is sufficient to allow the lever J to open the ports on the steering valve when either of the cabin control wheels is operated. The steering jack piston rod K then extends or retracts according to the direction of selection.

46. The drive from the jack is transmitted to the nose wheel steering lever body L, to which the clutch dog D is splined, then to the clutch dog C, which is splined to the top of the rotating oleo leg.

47. At the bottom of the steering head is an anti-shimmy friction-damping assembly, consisting of Ferodo friction rings and steel plates splined alternately to the steering head and the oleo leg. The friction rings must be free of oil or grease on assembly. A small drain hole at the base of the steering head is provided to drain away any internal seepage of hydraulic fluid. This drain hole must always be kept clear. Within the steering jack is a pressure relief valve to limit the maximum side loads on the oleo leg and aircraft structure.

Undercarriage selection

48. The undercarriage (i.e. both main wheels and the nose wheel) is selected UP or DOWN by a lever on the port side of the pilot's cockpit. The jacks are normally operated by Green hydraulic system pressure, but should this system fail, the undercarriage may be lowered by selecting EMERGENCY DOWN, when Red system pressure will be used. EMERGENCY DOWN is selected by pulling the lever knob out, turning it clockwise and pushing it in. The lever is then moved to the EMERGENCY position. The lever must be returned to normal DOWN before the knob is turned anti-clockwise after movement to the emergency position.

49. A solenoid, operated by a microswitch on the port leg, prevents undercarriage UP selection while the undercarriage is on the ground but, if Green system pressure is available, this solenoid may be overridden by selecting EMERGENCY UP.

Note . . .

EMERGENCY UP should only be used in a true emergency, and NOT to raise the undercarriage if normal UP selection has failed.

Undercarriage indicator lamps and microswitches

50. The indicator lamps associated with the undercarriage are grouped on the alighting gear position indicator which is adjacent to the undercarriage selector lever and is fully described in Sect. 5, Chap. 1, Group C5.

51. The main undercarriage microswitches are as follows: --

(1) Leg lock switch (port and starboard): This is fitted to the aft lug of the main leg casing and is operated through a striker by a cam on ◀the door lock operating lever.▶ When the undercarriage is locked down, a green indicator lamp in the cockpit is on. When the lock is broken, the green lamp goes out and a red lamp comes on.

(2) Change-over switch (port and starboard): This is fitted to the wheel well wall outboard of rib No. 3 and is operated through a striker by the upper side-stay, so that the green indicator lamp is on when the undercarriage is locked down but is off at all times when the undercarriage is NOT locked down.

(3) Door lock switch (port and starboard) : This is fitted on the outboard forward hook bracket and is operated when the hook engages the roller on the door, so that the red lamp in the cockpit goes out when the door is locked.

(4) Selector lever lock switch (port only): This is fitted on the leg upper torque link and is operated by the extension of the oleo leg when the undercarriage leaves the ground. Operation of the switch withdraws the solenoid latch on the cockpit selector lever, and allows undercarriage UP selection to be made.

(5) Fatigue meter microswitch (starboard only): This is fitted and operated in exactly the same way as

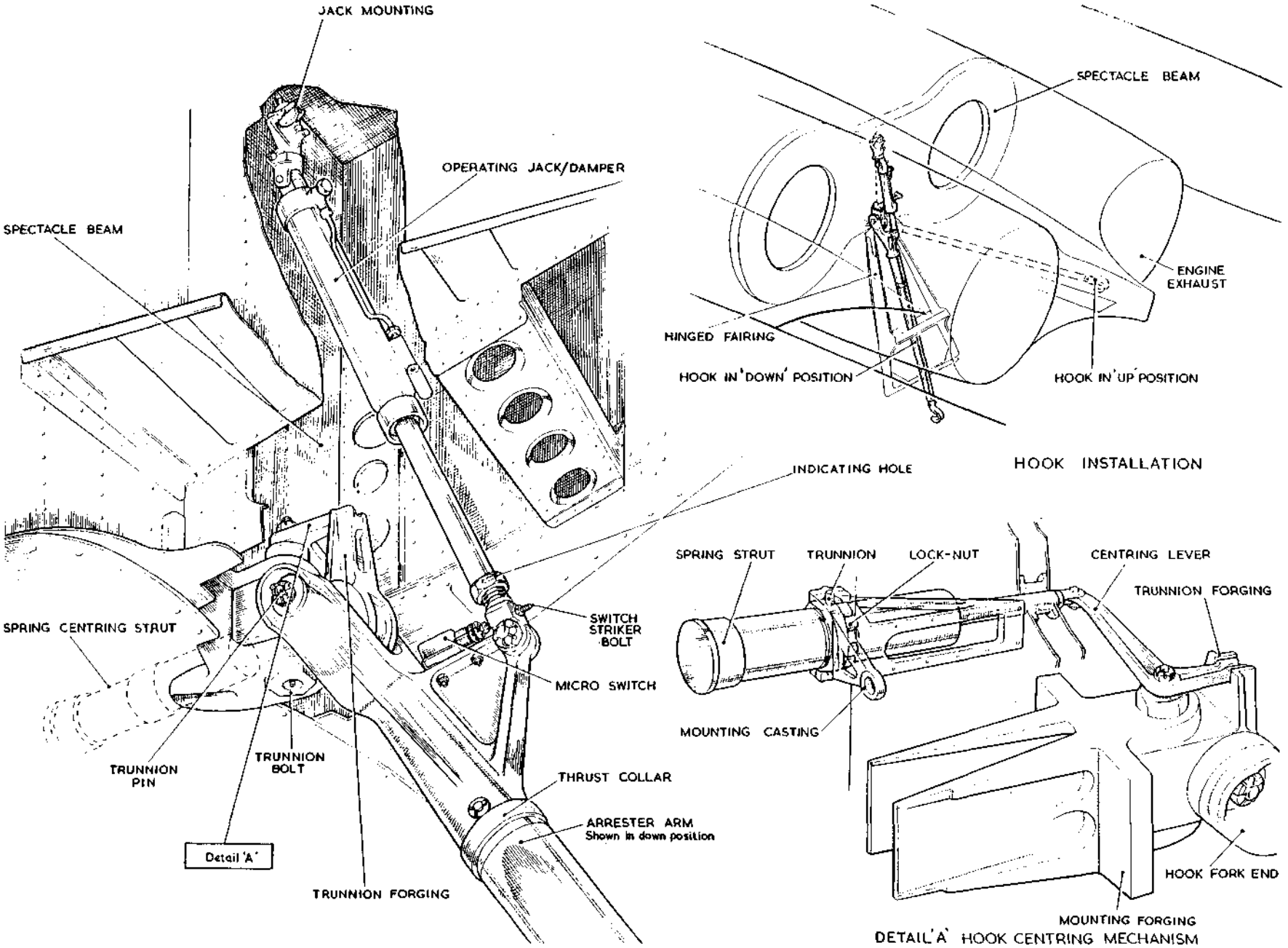


Fig 12. Arrester hook installation

◀Annotation amended▶

the selector lever lock switch, but on the starboard leg. It operates a fatigue meter in the fuselage (Sect. 5, Chap. 2, Group F5) when airborne, and isolates the deck approach light and flasher when the aircraft is on the ground (Sect. 5, Chap. 2, Group G1).

52. The nose undercarriage microswitches are as follows, the indications in the cockpit being the same as for the equivalent main undercarriage switches :-

(1) Leg lock switches : Fitted to the upper member of the drag stay and operated by contact with the slotted lock links.

(2) Change-over switch : Fitted to the forward side of the main leg casing just below the hinge pin and operated through a striker by a cam on the pin.

(3) Door lock switch : Fitted to the port latch bracket on the door and operated through a striker by contact with the latch.

(4) Nose steering microswitch : Fitted directly above the nose wheel leg and operated by the steering input mechanism. It acts in conjunction with the selector lever lock switch (para. 51, (4)) so that the undercarriage UP selection can only be made with the nose wheel fore-and-aft.

Tail unit skids (Fig. 11)

53. A skid is fitted to the aft end of each boom to protect the boom structure in the event of a tail down attitude during landing or take-off. Each skid comprises a radius arm pivoted at its forward end to the boom structure and supported at its aft end by a Lockheed shock-absorber which is anchored to the fin rear spar. The shock-absorber is an oleo unit, similar in principle to the undercarriage legs and consists of a cylinder charged with fluid and a piston tube charged with compressed air. The shock-absorber is described in A.P.1803C, Vol. 1. A steel shoe, which comes in contact with the ground, is bolted to the bottom of the radius arm.

Arrester hook (Fig. 12 and 16)

54. The arrester hook consists of a single arm, pivoted at the rear of the spectacle beam, and operated by a Lockheed jack; the arc of movement is shown in Fig. 16. A microswitch, mounted on the arrester hook arm, is operated when the hook is down to give an indication in the cockpit and also functions, in conjunction with the alighting gear circuit, to operate the deck approach warning light in the nose wheel forward large door. To assist in the disengagement of the hook from the arrester wire after landing, the arrester hook can pivot laterally 15 deg. (14 in. at the end) either side of centre and is returned to the centre position by a spring strut.

SERVICING

General

55. Before any servicing, other than wheel changing, is commenced it must be ensured that the aircraft is jacked and trestled correctly (Sect. 2, Chap. 4), and that hydraulic pressure is released from the relevant accumulator (Sect. 3, Chap. 6).

Oleo legs

56. Full details of adjustments, charging and inflating of both main and nose undercarriage legs are given in A.P.1803P, Vol. 1. The fluid specification is given in Leading Particulars, and the inflation pressures and strut inflation diagrams for checking the air pressures, with the wheels on the ground, are shown in Sect. 2, Chap. 2.

Brake and Maxaret units

57. The brake units are self-adjusting for brake pad wear. Pre mod. 671 Maxaret units are adjusted for wear by shimming under the mounting bracket to give a contact flat of 0·75 in. to 1·0 in. Post mod. 671 aircraft have Maxaret units with spring-loaded mountings which maintain a contact flat of 0.5 in., and do not require adjustment for wear. Both the brake pads and Maxaret tyres must be checked periodically for wear as detailed in Vol. 5. The brake unit servicing is described in A.P.2337, Vol. 1, Book 2 and the Maxaret servicing in A.P.1803S, Vol. 1, Book 2.

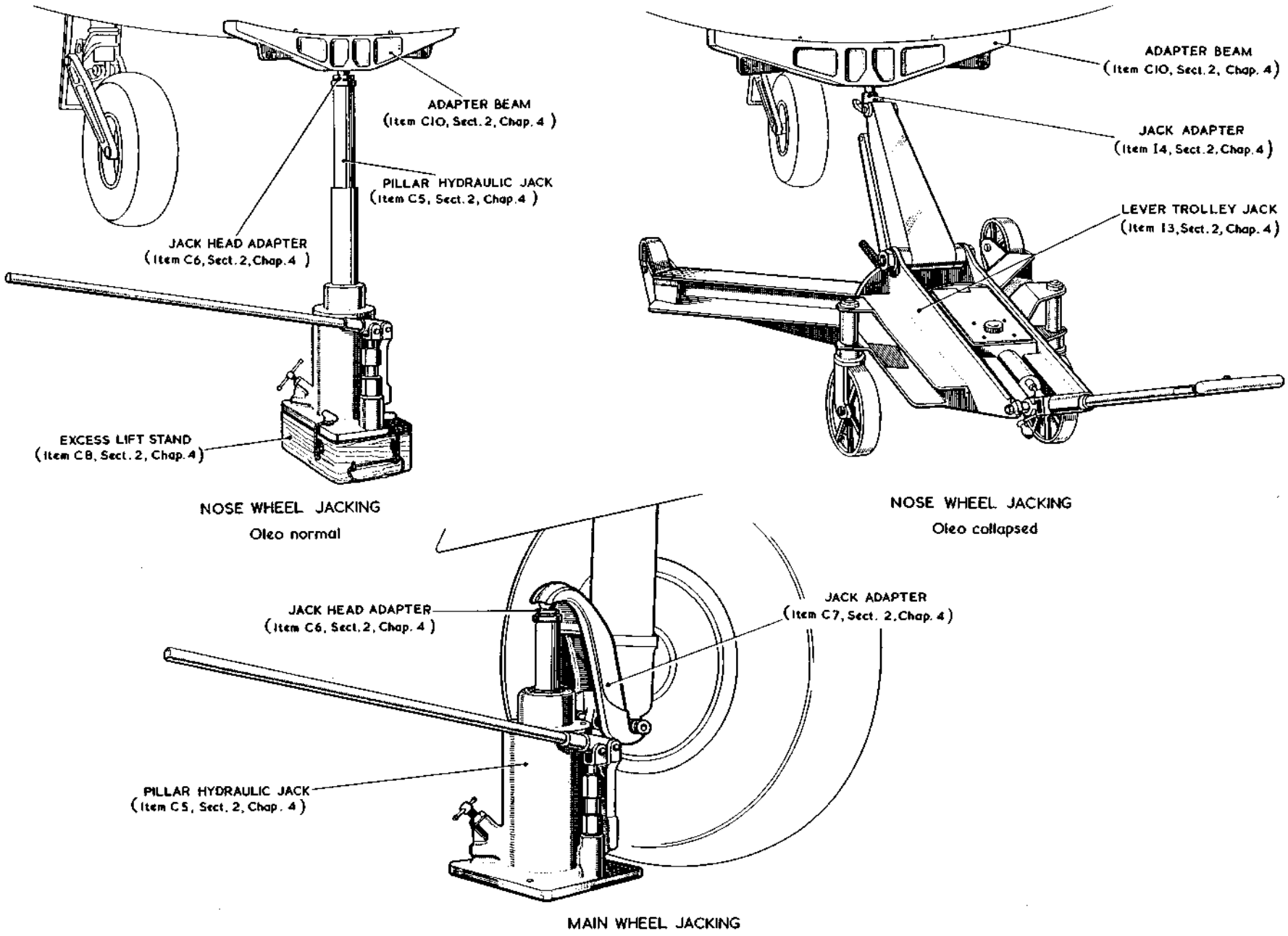


Fig. 13 Wheel changing

MAIN UNDERCARRIAGE ADJUSTMENTS

58. Before checks are made on any of the main undercarriage components the door must be lowered by releasing the quick-release handle, the fairing disconnected from the peg on the undercarriage unit which is being adjusted and a check made to ensure that the ground-locking pin is inserted in the unit not being adjusted. It should then be ensured that the leg has been filled with fluid and that the air chamber has been inflated to its normal operating pressure. The wheel and tyre or an equivalent weight must be secured to the axle.

Side-stays and stabilizers

59. The side-stays and stabilizers are adjusted as follows:—

(1) Check that, with the undercarriage locked down:—

(a) There is a clearance of 0·005 to 0·018 in. between the roller in the locking arm and the locking cam of the upper stabilizer (*detail 'F', fig.* 14).

(b) The stabilizer centre pivot is ◀ 'over-centre' by 0·08 to 0·20 in. ▶ (*detail 'F', fig.* 14).

(c) The ground locking pin can be easily inserted. If necessary, adjust the shims under the head of the stop bolt in the upper stabilizer.

(2) Remove the ground-locking pin and connect the jack to a hydraulic hand pump. Retract the leg slowly checking that the stabilizers unlock correctly, that the motion of the leg is smooth and without any evidence of fouling and that the stabilizers lock positively when the leg is up.

(3) With the leg up, check that the outer casing is 0·2 in. to 0·3 in. clear of the bottom boom of rib No. 3. If necessary, lower the leg and adjust the eccentric bush (*fig.* 14), using a special spanner (*Item K*11, *Sect.* 2, *Chap.* 4) to lower the side-stay joint. Check that the jack ram is not bottoming on its internal stops in the retracted position.

◀Note . . .

If the eccentric bush is adjusted, check the over centre measurement (sub-para. (1) (b)).▶

(4) Lower the leg slowly, checking that the stabilizers unlock correctly and that the clearance between the path of the tyre and rib No. 1 is not less than 2·90 in. (*fig.* 14). Check that the stabilizers lock positively when the leg is down and that it is still possible to insert the ground-locking pin without difficulty. Recheck the gap between the locking roller and the locking cam.

Door Mechanism

60. It should not be necessary to alter clearances on an existing door, unless there has been removal or replacement of any parts. Where required, checks may be made in accordance with fig. 14 and, when a new door has to be fitted, the instructions given in para. 82 must be carried out. During servicing, and if it is intended to leave the undercarriage door lowered, reference should be made to Sect. 2, Chap. 1.

WARNING . . .

If the main undercarriage door quick-release handle is not pre-loaded into the locked position, air flow may operate the quick-release handle trigger when the undercarriage door is opened in flight and cause the loss of the door. Adjust the quick-release handle as follows:—

(1) Release all hydraulic pressure in the door Servodyne pressure line.

(2) Pull down against the spring strut the vertical adjustable link connected to the Servodyne input lever and, at the same time, pull down the door Servodyne pick-up bracket.

(3) Connect up the door quick-release catch to the door Servodyne pick-up bracket and check that the door hangs below the lower wing skin.

(4) Check that the pre-loading of the quick-release handle commences approximately 25 deg. from the fully closed position, where this is not adjusted correctly, Attwell laminated shim, (Pt. No. 10.20 U.871) must be reduced between the door Servodyne pick-up bracket (Pt. No. 10.20 U.869A) and the latch bracket (Pt. No. 10.20 U.875A) attached to the Servodyne pick-up bracket.

Fairing

61. The fairing should be adjusted as follows:—

(1) Lower the door by hand, con-

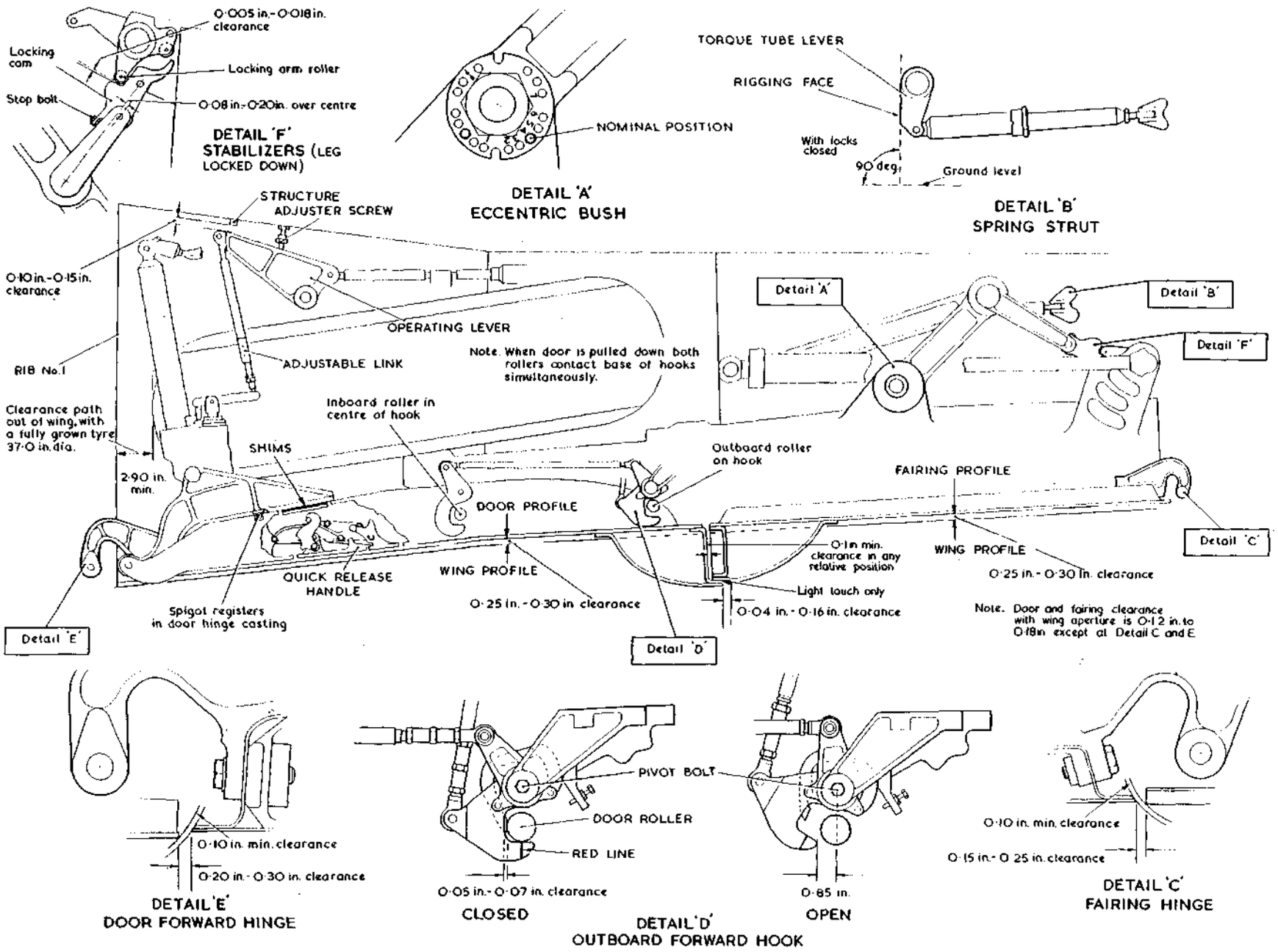


Fig. 14. Main undercarriage adjustments

(OVER-CENTRE MEASUREMENT - DETAIL 'F')

nect the fairing operating rod to the leg and retract the leg. Check that the inboard edge of the fairing is 0·25 in. to 0·30 in. inside the wing profile at both ends to match the door; adjust the operating rod if necessary. Ensure that a clearance of 0·10 in. will be maintained between the door and the fairing in any relative position.

(2) Lower the leg and reconnect the door. Slowly retract the leg and check by the cockpit lights that the leg and door are fully locked up, and that the fairing is just touching but not overstraining the door.

Note...
To check the leg locked up (port side), the flaps must be retracted with the tailplane tab in the neutral position.

62. When all the above adjustments have been completed, checks should be made to ensure that all bolts and adjustment points have been locked correctly, that the clearance between the wing aperture and the front and rear edges of the door and fairing are 0·12 in. to 0·18 in., that the clearance along the hinged edge of the door is 0·20 in. to 0·30 in. and that the clearance along the hinged edge of the fairing is 0·15 in. to 0·25 in.; components may be trimmed if necessary. The jack should then be disconnected from the hand pump and connected to the aircraft hydraulic system.

Microswitches

63. The operation of the microswitches described in para.51 should be checked after the following adjustments have been made :-

(1) Leg lock switch (pre mod.1145)

(a) With the leg locked down, screw out the striker lever adjusting bolt until the switch is made, then screw in one turn and tighten the locknut.

(b) Select undercarriage UP and, using a hand pump rig, operate the pump until the leg is unlocked.

(c) Select undercarriage DOWN and pumping slowly check that when the green light comes on, the gap between the roller and the back of the hook is not more than 0·2 in.

Note...
This check must be made when the undercarriage is moving from UP to DOWN to ensure that the red light comes on before the roller has moved 0.4 in. from the back of the hook when the leg is being retracted

(2) Leg lock switch (post mod. 1145)

(a) With the leg locked down, screw out the striker bolt until it just operates the microswitch and a green light shows on the indicator. Screw out one half turn, tighten the locknut and wire-lock.

(b) Check the operation of the microswitch as detailed in (b) and (c) of sub-para.(1).

(3) Change-over switch : With the leg locked down, check that the switch is operated and the green light is on.

(4) Door lock switch : Retract the leg to the locked up position and screw the striker bolt towards the switch until the red light in the cockpit goes off. Screw the bolt towards the switch a further two and a quarter turns and wire-lock.

(5) Selector lever lock switch and fatigue meter switch : Screw the striker bolt towards the switch until the switch operates, then screw towards the switch a further four turns and wire-lock.

NOSE UNDERCARRIAGE ADJUSTMENTS

64. Before checks are commenced, it must be ensured that the leg is filled with fluid and that the air chamber is inflated to its normal operating pressure (Sect.2, Chap.2); the wheel and tyre or an equivalent weight must be secured to the axle.

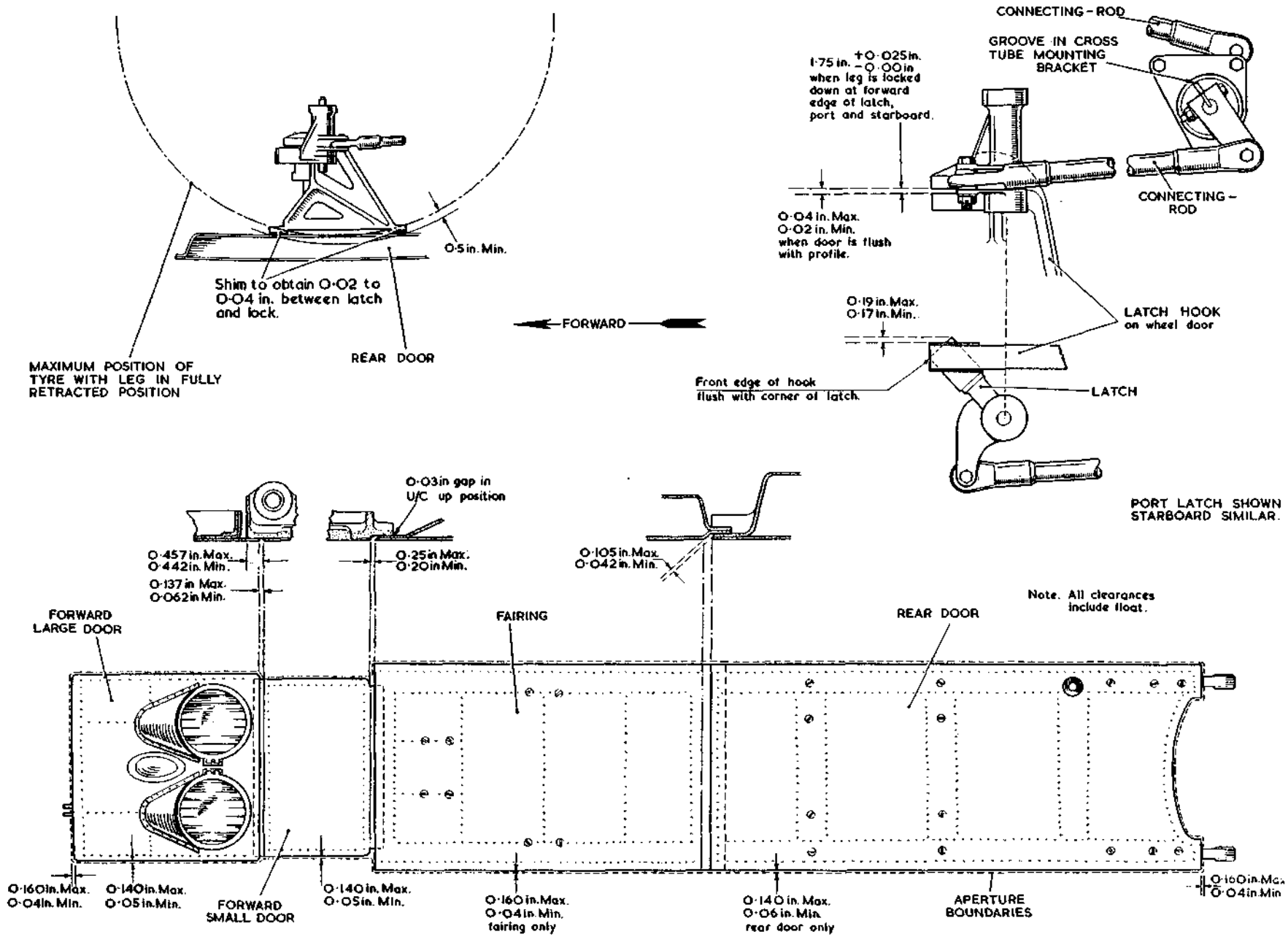


Fig. 15 Nose undercarriage adjustments.

Drag stay

65. The drag stay adjustments (Fig. 5) can only be carried out after the drag stay has been removed from the aircraft.

Retracting mechanism

66. The procedure for testing is as follows:—

(1) Open the radome and disconnect the connecting rod from the rear door. Connect the jack to a hydraulic hand pump.

(2) Remove the ground-locking pin from the drag stay and operate the hand pump until the drag stay unlocks; check that this action is positive. Continue pumping to raise the leg slowly, checking that the movement is smooth and that there is no fouling; when the leg is fully up, check that the drag stay locks positively and that the locking pin may be inserted easily.

(3) Remove the locking pin and lower the leg, checking that the drag stay unlocks correctly and, when the leg is fully down, that it locks positively and that the locking pin can be easily re-inserted.

Steering mechanism

67. It is very important that no attempt is made to steer the nose wheel during lowering or retraction. Adjustment to the steering mechanism should be carried out as follows:—

(1) Line up the white mark on the steering hand wheel with the centre line on the quadrant. (The two outer lines are the limits allowing for backlash.)

(2) Lock the nose wheel central with the anti-caster pin (*Item G4 Sect. 2, Chap. 4*).

(3) Adjust the turnbarrels to take up the slack in the steering cables (No. 36 and 37), and then tighten each turnbarrel one and a half turns.

(4) Check that the hand wheel is still lined-up.

(5) With hydraulic power connected to the steering jack and the clutch, adjust the length of the spring strut so that the nose wheel is directly fore-and-aft; this may be checked by inserting the steering rigging pin (*Item F5, Sect. 2, Chap. 4*). ◀ Lock the spring strut by tightening locknut and wire-locking the eye end to the plunger using a figure of eight locking. ▶

(6) Remove the rigging pin and turn the cockpit steering hand wheel in both directions. Check that the nose wheel turns 45 deg. both ways and returns to the fore-and-aft position when the hand wheel is released.

(7) Check that, with the nose wheel locked down, there is 0·10 in. clearance between the upper steering link and the locking prong above it.

(8) Raise the leg slowly by the hand pump and check that, during its travel and when the leg is locked up, the prong is clear of the slot in the link and that there is no tendency for the leg to steer. This may be checked by inserting and removing the rigging pin several times during the operation.

(9) If the steering is affected, adjustment may be made by lining up the steering valve operating lever with the nose wheel steering lever, and adjusting the eccentric bolt in the steering valve operating lever to bring the lower steering link studs on that lever to 90 deg. of the fore-and-aft line of the aircraft.

Note . . .

After adjustments have been made, insert the nose wheel anti-caster pin (Item G4, Sect. 2, Chap. 4) in the holes used for the steering rigging pin. This obviates the risk of the clutch being engaged with the wheel off the fore-and-aft line if hydraulic pressure to the clutch is released and subsequently reconnected. The anti-caster pin should only be removed if the wheel is required to caster (e.g. for towing) and before flight.

Doors and fairing (fig. 15)

68. Adjust the doors, fairing and door mechanism as follows:—

(1) Check that the connecting rod to the rear door is in the same position when the undercarriage is locked up and down. This may be checked by inserting a pencil

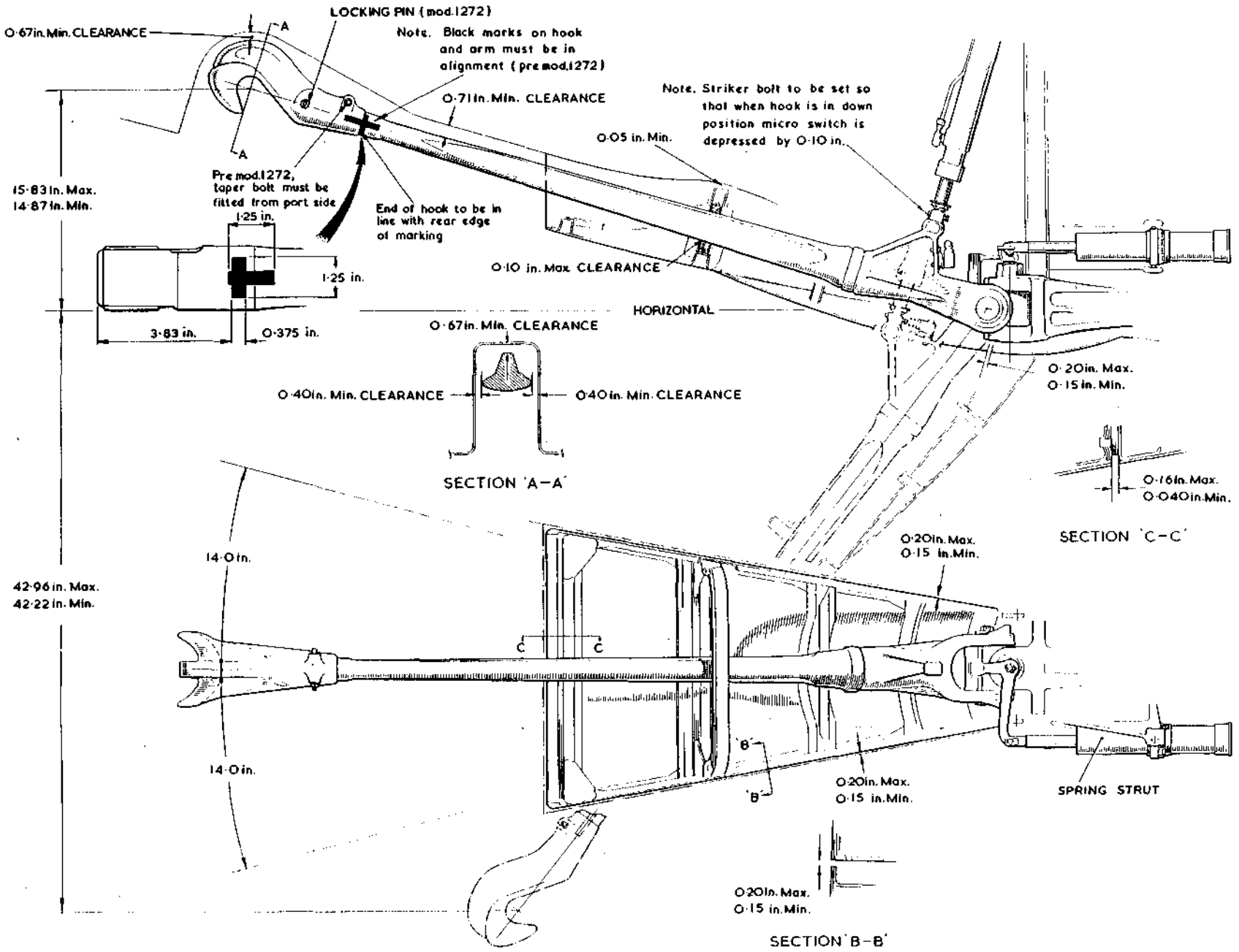


Fig. 16. Arrester hook rigging and clearance diagram

(MOD. 1272 ANNOTATION)

through the bolt hole in the rod and describing an arc on the starboard side wall in both positions. The connecting rod may be 0·10 in. higher when the undercarriage is locked up than when it is locked down. If necessary adjust the eccentric ball in the connecting rod attached to the leg.

(2) With hydraulic pressure on the steering jack, adjust the connecting links to both forward doors to bring them flush with the fuselage profile when the leg is up and 3,000 p.s.i. is applied to the retraction jack. Lengthen the link to the forward large door by half a turn to put a closing pressure on the doors.

(3) Check that, when the leg is up, the fairing lies flush with the fuselage profile and that its ends lie flush with the doors. Fore-and-aft adjustment to the fairing may be made by removing the split pins from both fairing supports, slackening the nut on the eccentric bolt and turning the bolt until the required position is obtained; then tighten the nut, drill through the holes in the supports and insert split pins. The fairing may be brought flush with the fuselage by shimming under the supports and adjusting the connecting links.

(4) Check that, when the leg is being lowered, the fairing does not foul the forward small door; chamfer the leading edge of the fairing, if necessary, to avoid this foul.

(5) Hold the rear door up by hand and check that, when the front edge is flush with the fuselage, the rear edge is also flush; shim under the hinge brackets if necessary.

(6) Check that the slots in the levers on the outboard ends of the door lock mechanism cross-tube are in line with the grooves in the cross-tube mounting brackets; adjust the levers on the serrations if necessary.

(7) With the rear door raised by hand, adjust the latch connecting rods, which run outboard of the wheel well, to give the latch positions shown in Fig. 15.

(8) Shim under the latch brackets on the rear door to give 0·02 in. to 0·04 in. clearance from the latches, when the front edge of the door is flush with the fuselage profile.

(9) Connect the door connecting rod to the rear door and adjust it so that, when the leg is down, the latch brackets are 1·75 in. above the latches.

(10) Check that, when the leg is up and the rear door closed, there is a minimum clearance of 0.5 in. between door and tyre.

(11) Check that, when the leg is being lowered and the rear door is rising, there is a clearance of 0·50 in. between door and tyre when the latter is inflated fully. If necessary, adjust the rod, introduced by mod. 831, between the door operating casting and the door operating lever to achieve this clearance. If adjustment is made, recheck the measurement detailed in sub-para. (9).

(12) Raise the leg and, with 3,000 p.s.i. pressure on the jack, check that the clearances of the doors and fairing are as shown in Fig. 15; trim to suit as necessary.

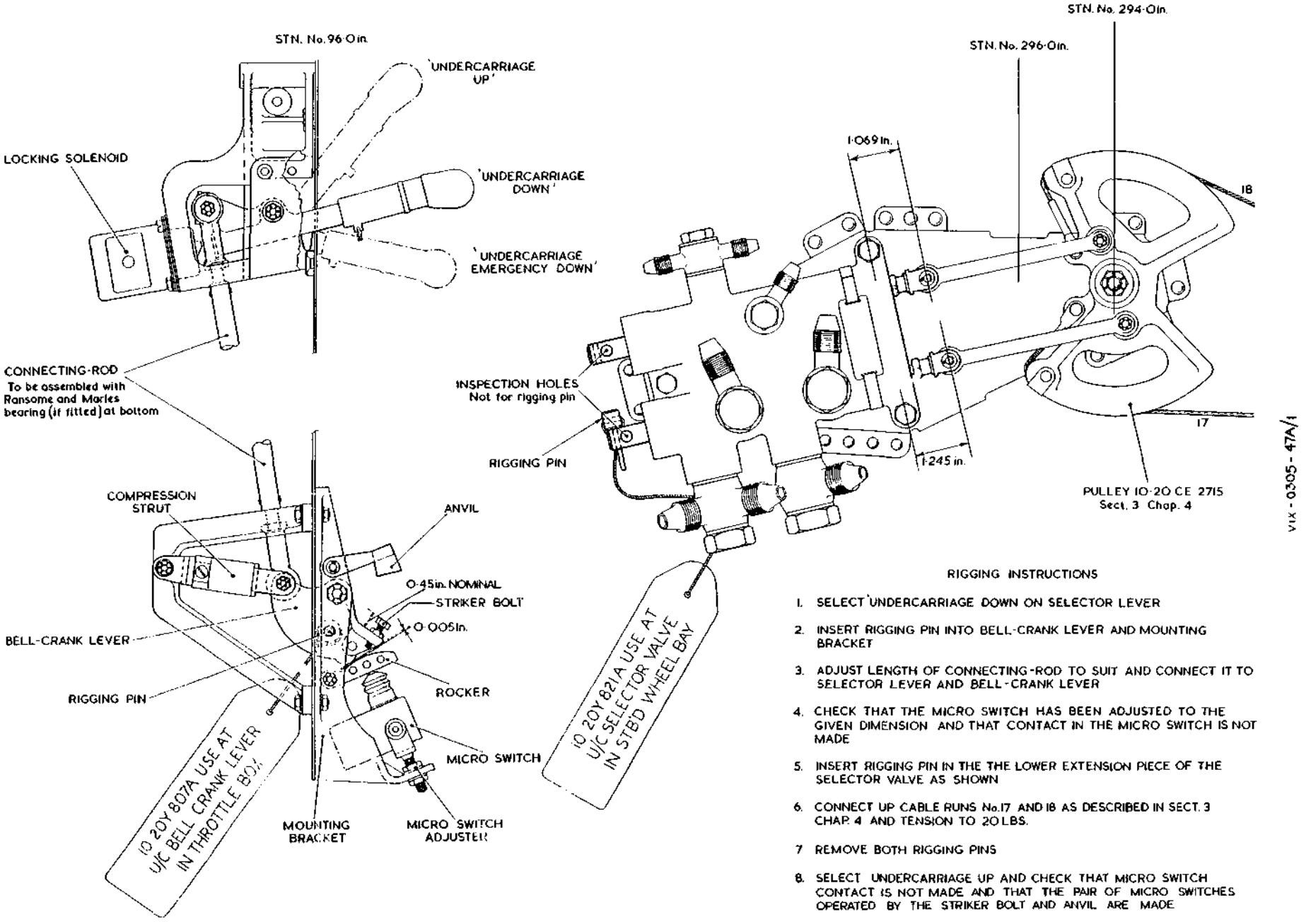
Microswitches

69. The operation of the microswitches (para. 43) should be checked after the following adjustments have been made :-

(1) Leg lock switches : With the leg locked down, screw the striker bolts towards the switch plungers until there is a gap of 0·005 in. to 0·010 in. between bolts and plungers, then wire-lock.

(2) Door lock switch : Disconnect the connecting rod from the port latch, and operate the latch by hand to lock the door and obtain the 0·17 in. to 0·19 in. dimension shown in Fig. 15. Adjust the microswitch striker bolt until the switch operates, screw out a further two turns and wire-lock; reconnect the connecting rod to the latch.

(3) Change-over microswitch :



RIGGING INSTRUCTIONS

1. SELECT 'UNDERCARRIAGE DOWN ON SELECTOR LEVER
2. INSERT RIGGING PIN INTO BELL-CRANK LEVER AND MOUNTING BRACKET
3. ADJUST LENGTH OF CONNECTING-ROD TO SUIT AND CONNECT IT TO SELECTOR LEVER AND BELL-CRANK LEVER
4. CHECK THAT THE MICRO SWITCH HAS BEEN ADJUSTED TO THE GIVEN DIMENSION AND THAT CONTACT IN THE MICRO SWITCH IS NOT MADE
5. INSERT RIGGING PIN IN THE THE LOWER EXTENSION PIECE OF THE SELECTOR VALVE AS SHOWN
6. CONNECT UP CABLE RUNS No.17 AND 18 AS DESCRIBED IN SECT. 3 CHAP. 4 AND TENSION TO 20 LBS.
7. REMOVE BOTH RIGGING PINS
8. SELECT UNDERCARRIAGE UP AND CHECK THAT MICRO SWITCH CONTACT IS NOT MADE AND THAT THE PAIR OF MICRO SWITCHES OPERATED BY THE STRIKER BOLT AND ANVIL ARE MADE

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Fig. 17 Undercarriage selector rigging diagram

With the leg up, and with the striker against the cam on the leg cross-tube, screw out the striker bolt until it is 0·010 in. to 0·020 in. clear of the switch plunger and wire-lock it to the striker.

(4) Nose wheel steering micro-switch : Adjust as shown in Fig. 4.

70. When all the above adjustments have been made, disconnect the jack from the hand pump and connect it to the aircraft hydraulic system. Check that all bolts and adjustment points have been locked correctly.

ARRESTER HOOK ADJUSTMENTS

71. The arrester hook jack and centring mechanism spring strut should be adjusted to bring the arrester hook movements within the limits shown in Fig. 16 so that, when the hook is retracted, the clearances from the surrounding structure are as shown. The illustration also shows the micro-switch setting, the black marks for aligning the hook and the arm, and the clearances to be obtained between the arrester hook fairing and the fuselage skin; the fairing may be trimmed to obtain these clearances. If the clearance between the arm and the rubbing strips is more than 0·10 in. the strips can be shimmed with light alloy shims to a maximum of 0·12 in. to give a clearance of 0·010 in. to 0·015 in. with the arm horizontal.

RIGGING

Undercarriage selector (Fig. 17)

72. Instructions for rigging the undercarriage selector cable circuit are shown in the illustration. The circuit is described in Sect. 3, Chap. 4.

Arrester hook selector (Fig. 18)

73. Instructions for rigging the arrester hook selector cable circuit are shown in the illustration. The circuit is described in Sect. 3, Chap. 4.

REMOVAL AND INSTALLATION

GENERAL

74. The following paragraphs describe only the removal and installation of major alighting gear components where difficulty may be experienced, but the instructions below should be adhered to for all items :-

(1) Since installation is almost invariably the reverse of removal, except where otherwise stated, it is advisable to make a note of the means of locking and the order of removal prior to dismantling.

(2) After removal, fit all nuts and washers to their respective fittings to avoid loss and to ensure correct installation.

(3) Except on the main and nose wheel axles, when grease XG-277 should be used, or where otherwise stated, all moving parts should be assembled with anti-freeze grease XG-295.

(4) An electrical tradesman must assist with the removal, assembly and testing of all electrical wiring components.

(5) Before any hydraulic parts are removed, the pressure must be released from the relevant accumulators (Sect. 3, Chap. 6).

WHEELS (Fig. 13)

General

75. For jacking a main wheel, special adapters are used and the jack should be placed carefully to minimize 'arcing' effect; the tyre must not be jacked more than two inches off the ground. Either of the methods shown for nose wheel changing may be used for a quick wheel change, the additional support structure shown in Sect. 2, Chap. 4 being necessary for long term jacking.

MAIN WHEEL

Removal (Fig. 13)

76. To remove a main wheel, a special spanner (Item K12, Sect. 2, Chap. 4) must be used to unscrew the wheel nut after the locking strip has been removed. The nut and axle sleeve may then be withdrawn and the wheel slid off the stub axle.

Installation (Fig. 13)

77. When the wheel is to be installed proceed as follows :-

(1) Assemble all the parts, except the locking strip, and tighten the wheel nut with the special spanner,

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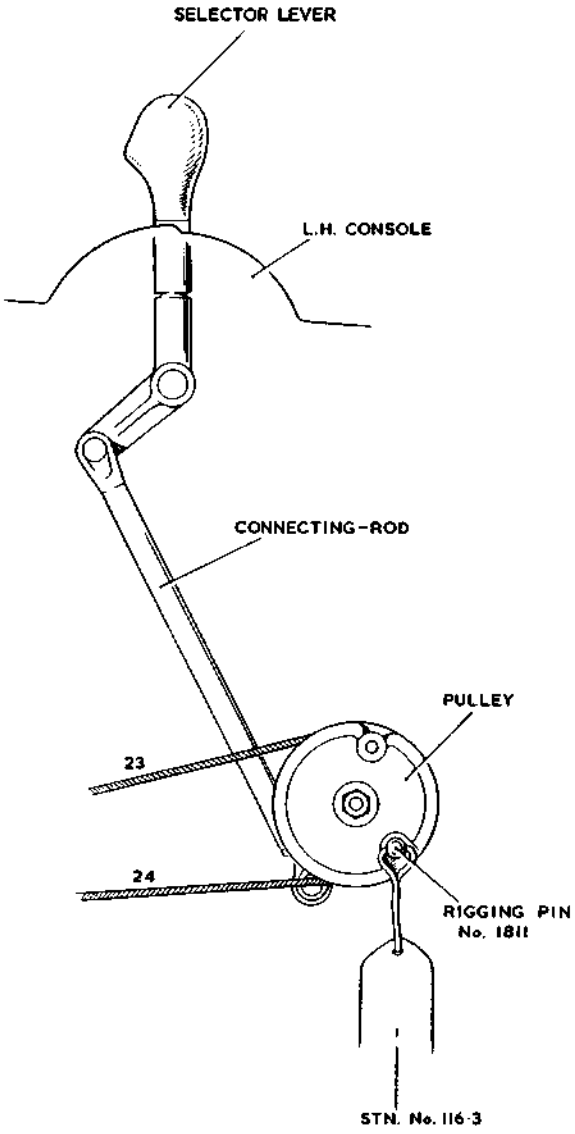

RIGGING INSTRUCTIONS

(The rigging pins mentioned are contained in item F5, Sect. 2, Chap. 4).

1. Select hook DOWN with lever on L. H. console
2. Insert $\frac{1}{4}$ in. dia. rigging pin No. 1811 into pulley and pulley bracket casting at Stn. No. 116. 3 below console.
3. Adjust length of connecting-rod to suit (nominal length 10. 17 in.).
4. Remove rigging pin No. 1811
5. Insert rigging pin No. 833 into terminal pulley quadrant just aft of spectacle beam.
6. Connect cable runs No. 23 and 24, as shown in Sect. 3, Chap. 4 and tension cables to 20 lb. using tensiometer (item H25, Sect. 2, Chap. 4).
7. Insert rigging pin No. 835 into hook selector valve and adjust length of connecting-rod which connects valve to pulley quadrant.
8. Remove rigging pins No. 833 and 835.

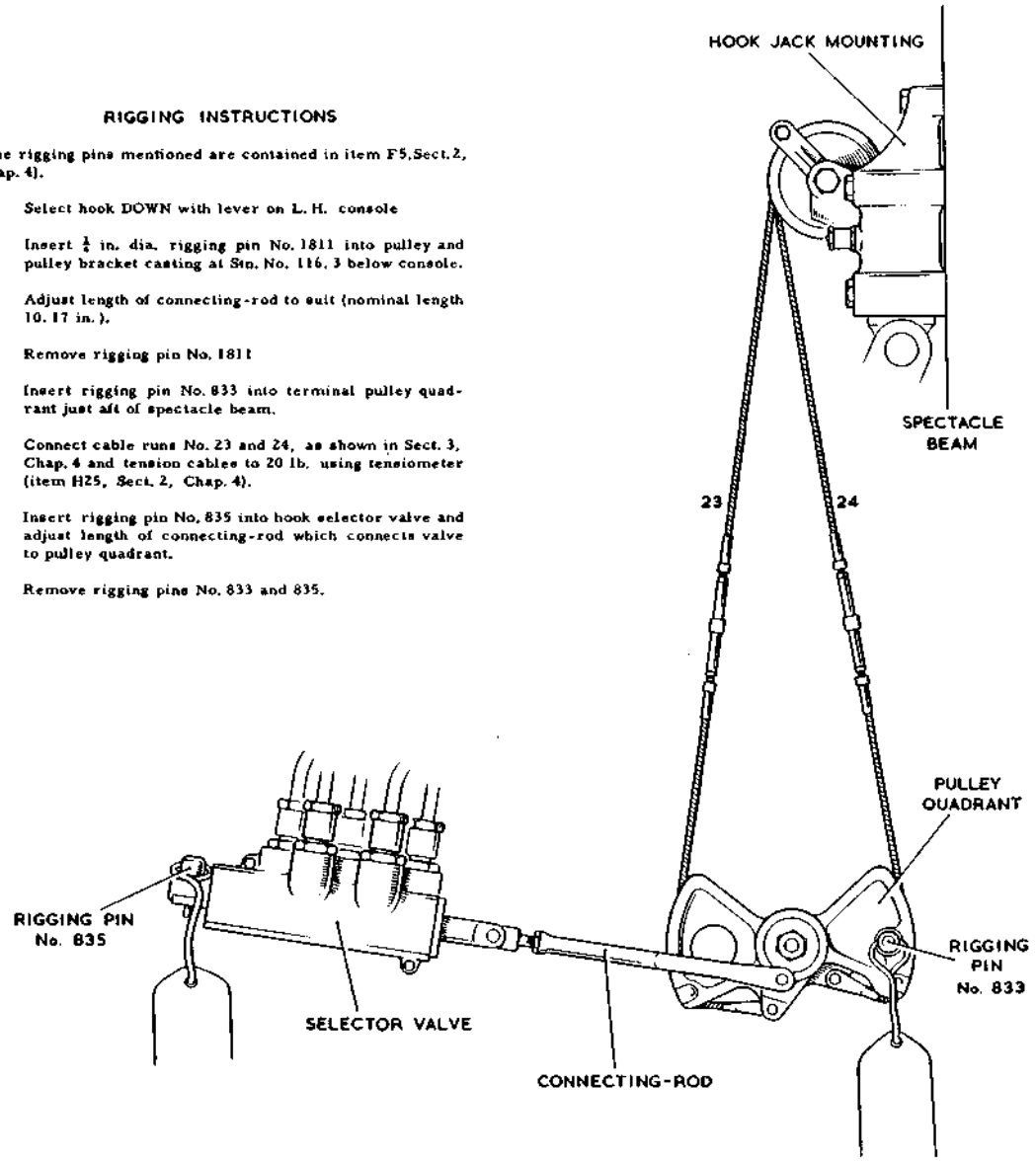

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Fig. 18 Arrester hook selector rigging

shaking the wheel until the nut is tight.

(2) Unscrew and remove the nut and check that the minimum engagement of the axle tongues in the sleeve is 0·22 in. as engraved on the sleeve.

(3) Refit the nut so that it just nips the wheel and then unscrew it to the first position at which a locking slot in the nut mates with one in the sleeve.

(4) Refit the locking strip and check that the end float of the wheel is 0·003 in. to 0·011 in.

NOSE WHEEL

Removal (fig. 13)

78. Before removing the nose wheel it is advisable to mark the axle, end plugs, sleeves and trailing fork arms with a pencil to facilitate alignment when the parts are re-assembled. Then proceed as follows:—

(1) Remove the two $\frac{3}{8}$ in. B.S.F. bolts locating the axle in the trailing fork and remove the axle nut locking tag which is attached to the starboard arm of the fork by two $\frac{1}{4}$ in. B.S.F. bolts.

(2) Screw the axle nut as far as possible away from the wheel. Support the wheel, push out the axle to port, and remove the wheel; remove the starboard sleeve and the wheel nut.

Installation (fig. 13)

79. Before installation, ensure that all the parts are clean and check that the sleeves are an easy slide fit on the axle. Check that the two $\frac{3}{8}$ in. bolts can be inserted easily through the holes in the sleeves, end plugs and axle, when these parts are assembled together and their holes lined up. The wheel may now be fitted as follows:—

(1) Insert the threaded sleeve into the starboard arm of the fork with the axle nut screwed a few turns on to the sleeve.

(2) Hold the wheel in position and insert the axle, complete with the other sleeve, from the port side. Align all the $\frac{3}{8}$ in. holes on the port side, using the special spanners (*Items K*15 *and K*19, *Sect.* 2, *Chap.* 4) to align the end plug and axle; insert the $\frac{3}{8}$ in. bolt and secure it.

(3) Tighten the axle nut against the arm of the fork, using a special spanner (*Item K*20, *Sect.* 2, *Chap.* 4) if necessary, until the sleeve is pulled flush with the axle. Align the $\frac{3}{8}$ in. holes on the starboard side, insert the bolt and secure it.

(4) Screw the axle nut away from the arm of the fork until it is hand-tight, then slacken it to the nearest position at which the locking tag can be refitted and lock it.

(5) Check manually that there is no side play and that the wheel is free to rotate.

Note . . .

Every time a new nose wheel tyre is fitted, the main hub half attachment bolts are to be greased and torque-loaded to 40 *lb. ft.*

MAIN UNDERCARRIAGE LEG

Removal

80. Before a main undercarriage leg is removed, the aircraft must first be jacked and trestled (*Sect.* 2, *Chap.* 4) and the wheel removed (*para.* 76) without the brake mechanism. Fig. 19 shows the points at which the leg should be disconnected, the ringed numbers conforming to the numbering of the following sub-paragraphs:—

(1) Disconnect the electrical wiring ing (*Book* 2, *Cover* 1, *Sect.* 5 *of this publication*) and screw the striker bolts well clear of the leg lock and selector lever lock microswitches.

(2) Carry out the instruction of para. 74(5) and disconnect the three hydraulic flexible pipes (*detail A*, *fig.* 19) from the rigid pipes at the top of the leg.

(3) Disconnect the telescopic ◀tie-rod from the door lock operating lever.▶

◀(4) Disconnect the eye end of the▶ retraction jack from the crank at the top of the leg.

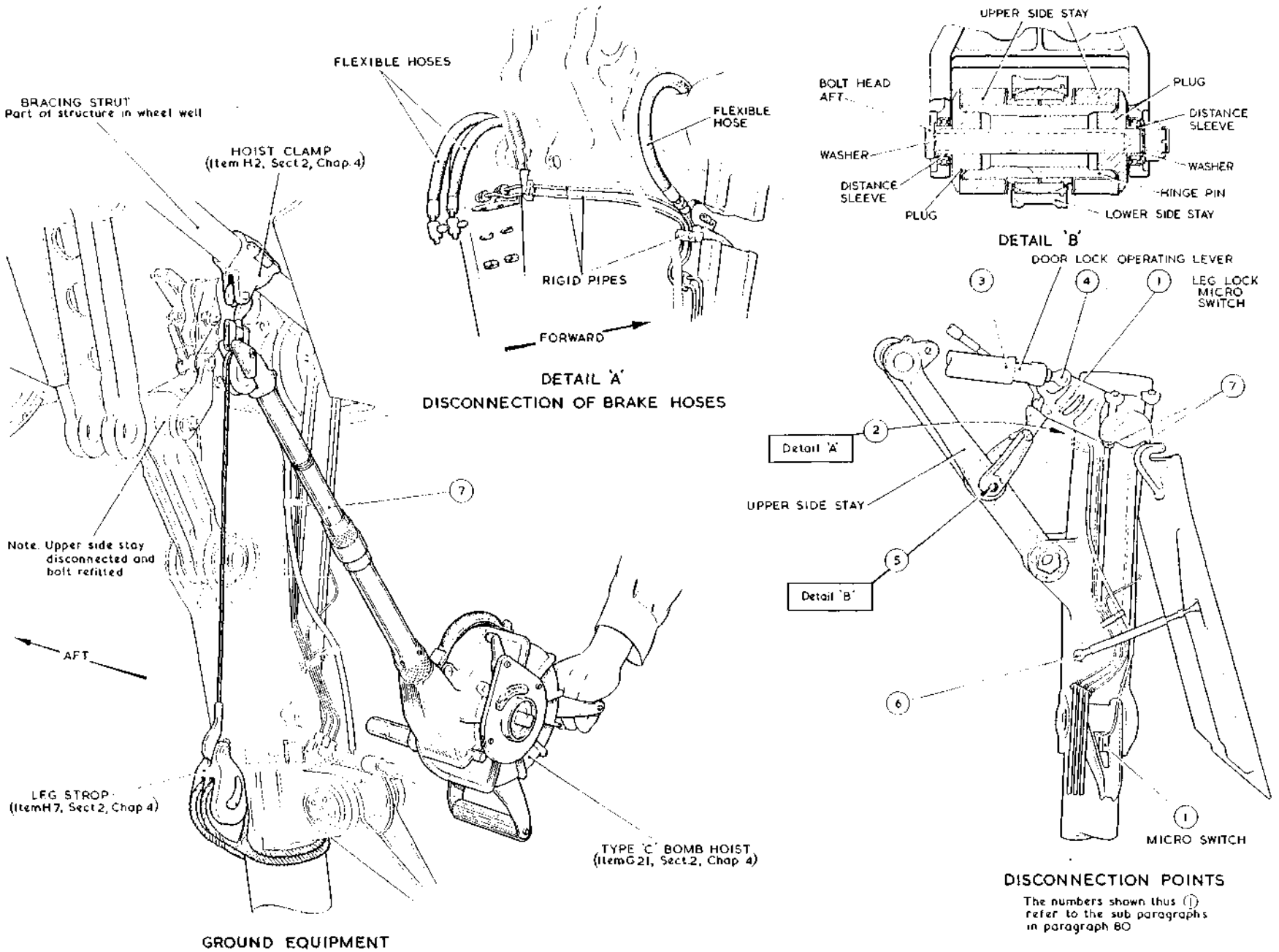

Fig. 19. Main undercarriage removal, port

◀Detail 'B' added▶

(5) Disconnect the upper side-stay from the lower side-stay and refit the bolt and hinge pin to keep the lower side-stay connected to the lower stabilizer (this will prevent damage during leg handling).

(6) Disconnect the fairing operating rod from the leg and support the rod and fairing clear from the leg.

(7) Fit the ground equipment as shown in fig. 19, wind up the hoist to take up the slack and then unscrew the four attachment bolts. Lower the leg to the deck.

Installation

81. Installation of the leg is the reverse of the removal procedure, but the following points should be noted:–

(1) Do not connect the leg fairing operating rod until the checks in para. 58 and 59 have been completed.

(2) The front attachment bolts must be tightened to a torque-loading of 2500 ±100 lb in., and the rear attachment bolts to 2000 ±80 lb in. (post Mod. 382) or to 1700 ±80 lb in. (pre Mod. 382).

(3) The side-stay/stabilizer joint must be assembled as shown on fig. 19, as follows:–

(a) Connect the upper and lower side-stays by inserting the hinge pin, then fit a plug in each end of the hinge pin.

(b) Insert a distance sleeve, with the flange inwards, into each bearing of the lower stabilizer.

(c) Align side-stay and lower stabilizer, and insert bolt, with the head facing aft, and a washer (*Pt. No.* 10.20 *U.*1713) under head.

(d) Fit washer (*Pt. No.* 10.20 *U.*1711) and castellated nut to bolt, and split-pin nut.

(4) Connect the eye-end of the retraction jack, with the grease nipple facing down, and the special washer, between crank and eye-end, fitted with the flat towards the crank. Ensure that the bolts securing the eye-end bearing are fitted with their heads aft.

(5) If a replacement leg to Mod. 1145 standard is fitted, the other leg and the aircraft wiring must also be modified.

Fitting a new door (fig. 14)

82. Before any work is commenced, it is essential that a pencil mark should be made on the structure to indicate the rigging of the red line on the closed hook with the centre line of the pivot bolt. A plumb-bob may be used for this on shore-based aircraft only. Then proceed as follows:—

(1) Offer up the new door and refit the hinge bolts.

(2) Reconnect the door servicing strut and carefully push up the door.

(3) Mark any point where fouling occurs and dress back until the clearances quoted in fig. 14 are obtained.

◀(4) Disconnect the adjustable link from the lever on the door Servodyne, and suspend a 20 lb. weight from the eye end to take up play in the linkage, then check that the vertical position of the inboard end of the door operating lever does not vary more than 0·03 in. when the undercarriage is locked up and when it is locked down. If incorrect, adjust the rod which runs parallel to the inboard face of rib No. 3 until there is a minimum safety clearance of 1 in. between the inboard end of the operating lever and the structure above the lever, then adjust the eccentric serrated pin in the large lug at the top of the upper side-stay (*fig.* 1) until the conditions above are satisfied.

(5) Check that the clearance between the operating lever and structure is 0·10 to 0·15 in. (*fig.* 14), and that the adjuster screw just touches the lever. If incorrect, or if the adjustment in sub-para. (4) was necessary, adjust the rod parallel to rib No. 3 to achieve this clearance, screw out the adjuster until it touches the lever, and wire-lock. Remove 20 lb. weight.

Note . . .

Sub-paras. (4) *and* (5) *are also applicable if the Servodyne or associated linkage are disturbed or replaced.* ▶

(6) Pull down the forward operating hinge and engage the quick-release hook with the pin on the latch bracket. Check that this is a snug fit, adjusting the shims under the bracket as necessary (*para.* 60, *WARNING*). This adjustment may have to be repeated after a few retractions due to 'bedding-in'. Reconnect the adjustable link.

(7) Disconnect the telescopic tie-rod and strut from the levers on the torque tube (*fig.* 1) and screw the striker bolt clear of the door lock microswitch. Adjust the length of the spring strut so that the rigging face of the torque tube lever is as shown in detail B. Adjust the shorter of the two connecting rods to the outboard forward hook until the red line on the hook is vertically below the centre line of the hook pivot bolt and then similarly adjust the connecting rods to the inboard forward and rear hooks.

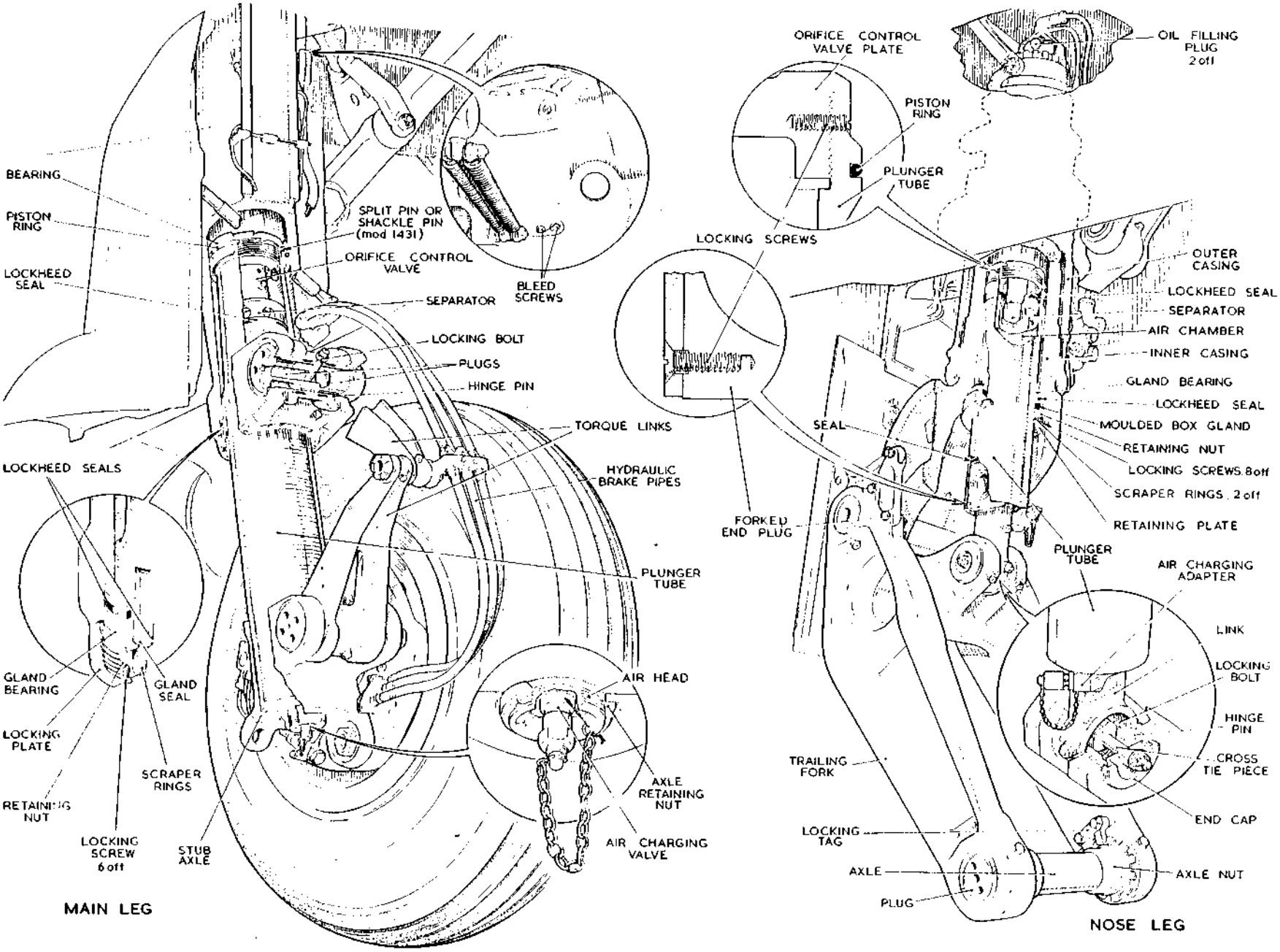

Fig. 20. Sectional views of undercarriage legs

WARNING . . .

Before the next operation is undertaken, it is essential that there is no possibility of the leg retracting since this will result in serious injury to personnel.

(8) With an operator in the wheel well, carefully raise the door by hand until the hooks can be engaged with the rollers. Adjust the serrated plates of all three rollers to give the clearance quoted in detail D, CLOSED, and then vertically on the outboard forward and rear rollers until the wing profile is proud of the door and fairing profiles, as indicated in the main view, when the rollers are touching the top faces of their hooks. Adjust the inboard forward roller so that it is in the centre of the hook. Raise the rear roller by one serration, i.e. so that it is clear of the hook by 0·04 in. Lower the door.

(9) Reconnect the telescopic strut and adjust on the turnbarrel until the outboard forward hook is clear of the centre line of the pivot bolt as indicated in detail D, OPEN.

(10) Measure the 'between centres' length of the telescopic tie-rod when it is compressed and the adjustable eye-end screwed out to its safety maximum. Reconnect the rod and retract the leg slowly until the tie-rod is at its minimum length when its centre line is coincident with that of the crankshaft.

(11) Slowly retract the leg to the locked up position. Remove the access panels from the wall of the rear wheel well and the bottom skin respectively between ribs No. 3 and 4. ◀ Shorten ▶ the rod until all slack has been up, i.e. the centre sleeve cannot be moved up or down but is free to revolve. Slowly lower the leg and check that the tip of the outboard forward hook has moved a minimum of 1.2 in. from the locked position when the door lock mechanism lever is at the extreme outboard limit of its travel (i.e. when the leg is fully retracted but the upper stabilizer has not yet locked). At this position, rotate the telescopic strut by hand within the limits of its ball-ends to ensure that it has not bottomed on its internal stops.

(12) While the leg is down, check that there is a gap of 0·005 to 0·018 in. between the lock roller and upper stabilizer and that the middle joint of the two stabilizers is 'over-centre' ◀ by 0·08 to 0·20 in. ▶

Note . . .

It is important that the closed 'between centres' length of the door servodyne should be noted before making the next adjustment.

(13) Extend the door servodyne fully on its internal stops and slowly retract the leg until the adjustable link hangs in its lowest position. Lengthen the link to its maximum safe length and check that it will not reach the valve of the servodyne by a minimum of 0·2 in. Reconnect the door with hydraulic pressure released.

(14) Retract the leg and note the amount by which the outboard forward corner of the door hangs below the wing profile. Lower the leg and press the quick-release handle. Shorten the adjustable link to bring the outboard edge of the door (along rib 3) 0·25 in. to 0·30 in. inside the wing profile. Check that the front outboard latch roller is just touching the top of the hook slot, and that the servodyne is not bottoming on its internal stops.

(15) Lower the leg and shorten the adjustable link one turn, to maintain a closing load on the door.

Note . . .

After the preliminary adjustments, using the hand pump, bedding down will occur when the power rig is used, and the adjustments in (14) *and* (15) *will have to be repeated.*

◀ (16) During final retraction, check that there is a minimum clearance of 1·0 in. between tyre and door while leg is raised and lowered, assuming a tyre diameter of 35 in. ▶

NOSE UNDERCARRIAGE LEG (fig. 21)
Removal

83. The nose of the aircraft must be jacked as detailed in Sect. 2, Chap. *, and the wheel removed to lighten the load when lowering the leg from the aircraft. The numbers in balloons on the illustration conform to the following sub-paragraphs. Proceed as follows:–

(1) Disconnect the two flexible pipes from the starboard side of the steering mechanism.

(2) Disconnect the retraction jack from the leg.

(3) Disconnect the eccentric eye-end of the rear door operating tie-rod from the serrated spigot on the starboard side of the leg.

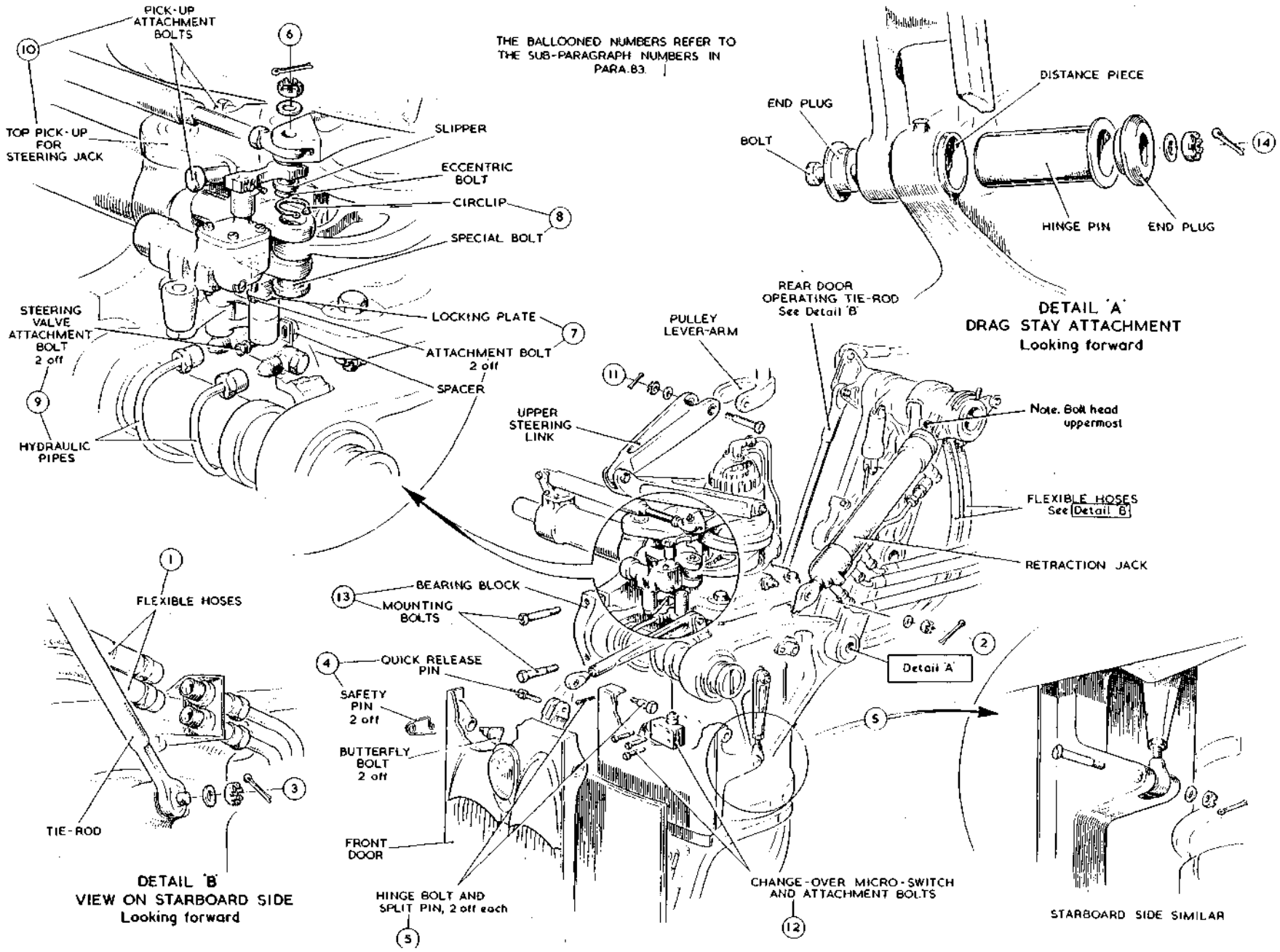

Fig. 21. Nose undercarriage removal

(NOTE ADDED TO RETRACTION JACK)

(4) Withdraw the quick-release pin from the connecting rod on the front door and the safety pins and wing bolts from the front door. Support the door to prevent damage to the electrical cables and lamps.

(5) Disconnect the two rods connecting the leg to the forward door. Withdraw the split pins and pivot bolts from the door hinges and remove the door.

(6) Disconnect the eye-end of the spring strut.

(7) Remove the wire-locking and then the two 2 B.A. bolts and locking plate from the lower yoke of the steering jack.

(8) Remove the circlip and withdraw the bolt from the yoke.

(9) Disconnect the two rigid pipes, and remove the two bolts securing the steering selector valve, and the spacer.

(10) Remove the two jack pick-up attachment bolts, then remove the top pick-up and lift the jack and spring strut assembly into the cavity of the well structure. (This may be facilitated by breaking the lock of the drag stay and partly retracting the leg.)

(11) Disconnect the upper steering link from the pulley lever arm.

(12) Remove the bolts securing the change-over microswitch to the leg, and position the microswitch so that the leads are not damaged.

(13) Support the leg and remove the four mounting bolts from the bearing blocks. Swing the leg aft and up into the wheel well.

(14) Disconnect the lower end of the drag stay, and lower the leg to the deck.

Installation

84. Installation is the reverse of removal, but the following points must be noted:–

(1) The mounting bolts must be tightened to a torque-loading of 400 ± 25 lb. in.

(2) The end-float of the leg on the main hinge pin must not exceed 0·02 in. If necessary, use shims (*Part. No.* 10.20. *UN* 1019*ND*) to take-up excessive end-float, ensuring that the leg remains on the centre line of the aircraft.

ARRESTER HOOK (pre Mod. 1272)

Removal

85. Remove the arrester hook as follows:—

(1) Remove the split pin, castle nuts and washer.

(2) Remove and discard the taper bolt.

(3) Unscrew the arrester hook.

Installation

86. Install the arrester hooks as follows:—

(1) Check that the arrester arm is marked as shown in fig. 16.

(2) Screw the arrester hook to align the forward edge of the hook with the aft edge of the vertical marking, i.e. 3·83 in. from the aft end of the arrester hook arm. The hole for the taper bolt will now be positioned at the mid-point of the machined flat on the arm.

(3) Fit a NEW taper bolt, Part No. 10.20 D.609 (*Ref. No.* 26*FY*/1797) from the port side. Drive firmly home, but the end of the taper bolt must not enter the forging by more than 0·06 in.

(4) Apply grease, ZX-28 to the taper bolt threads, and fit the washer and castle nut.

(5) Torque-load the nut to 100 lb. in.

(6) Fit a split pin using a 1·70 mm drill for the split pin hole.

(7) Remove any excess thread from the taper bolt.

(8) Continue the horizontal marking from the arm to the hook for future alignment checks.

ARRESTER HOOK (post Mod. 1272)

Removal

87. Remove the arrester hook as follows:—

(1) Remove split pin, washer and nut from locking pin.

(2) Remove locking pin and unscrew the hook.

Installation

88. Install the arrester hook as follows:—

(1) Check that the arrester hook arm is marked with a black vertical line as shown on fig. 16.

(2) Screw on the hook to align the forward edge of the hook with the aft edge of the vertical marking, i.e. 3·83 in. from the end of the arm, to ensure that the locking pin is in full engagement with the slot in the arm.

(3) Fit locking pin, washer, nut and split pin.

◀ Note . . .

A post mod. 1272 *hook can be fitted to a pre mod.* 1272 *arm using the pre. mod attachments, but the unused locking pin holes must be filled with sealing compound (Ref. No.* 33*H*/200). ▶

ARRESTER HOOK ARM

89. The removal and installation of the arrester hook arm is readily apparent, and is facilitated by the special spanner (*Item K*64, *Sect.* 2, *Chap.* 4) for removing the fork end trunion pin.

UNDERCARRIAGE SELECTOR LEVER

90. When fitting the undercarriage selector lever, and Mod. 1114 is not embodied, ensure that the solenoid plunger striker is facing outboard before refitting the pin and spring clip.

NOSE DOOR LOCK OPERATING LINK

91. The modified link, introduced by Mod. 1359, between the drag stay casting and lever, must be fitted with the bearing retaining rings facing away from the lever and casting lug.

BRAKE UNIT

Removal

92. Remove the brake unit as follows:—

(1) Jack the aircraft and remove the wheel.

(2) Release Red and Green system hydraulic pressure.

(3) Position container to collect hydraulic fluid, disconnect hoses to brake unit, and blank off hoses and brake unit connection block.

(4) Remove two bolts inside brake unit locked by tabwashers.

(5) Remove split pin, washer and nut from torque plate attachment bolt.

(6) Remove brake unit from stub axle.

Caution . . .

Do not use excessive force to remove the brake unit. Abnormal loads applied to the end of the attachment bolt can cause failure of the countersunk screw securing the bolt to the torque plate.

Installation

93. Install the brake unit as follows:—

(1) Lubricate torque plate attachment bolt and corresponding hole in stub axle with grease, ZX-28.

(2) Fit brake unit to hub axle, sealing the joint with jointing compound (*Ref. No.* 33H/80).

(3) Fit two bolts, with new tabwashers, from inside of the brake unit. Tighten bolts, and lock with tabwashers.

(4) Fit washer and nut to attachment bolt, using jointing compound (*Ref. No.* 33*H*/80) under the washer. Tighten nut and fit split pin.

(5) Connect hydraulic hoses, bleed brake unit and Maxaret unit (*Sect.* 3, *Chap.* 6) and check for leaks.

(6) Fit wheel, if necessary using the brake alignment fixture (*Item K*138, *Sect.* 2, *Chap.* 4), and check operation of brakes.

(7) Check hose connections and charging valve for leaks; fit dust cap, and wire-lock connections and dust cap.

(8) Lower aircraft and remove jacks.

NOSE UNDERCARRIAGE REAR DOOR

94. When installing the door operating fork-end, ensure that the spigot screw is correctly engaged in the fork-end before tightening the retaining nut (detail 'C', fig 4).

◀ NOSE RETRACTION JACK

95. The upper bolt connecting the jack to the bridge casting must be inserted from above to avoid a foul with the bridge casting during retraction. ▶

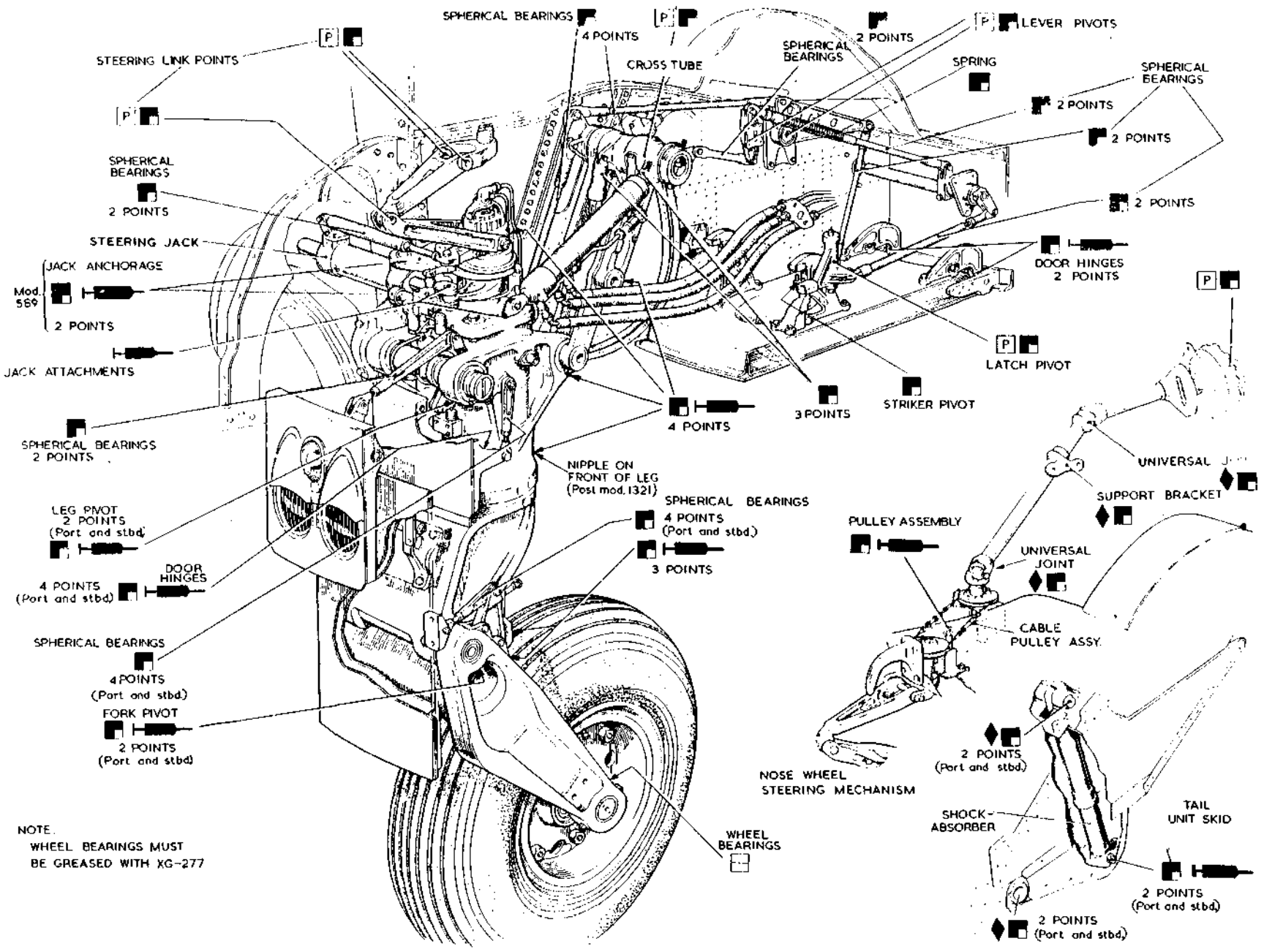

Fig. 22. Lubrication—nose undercarriage and tail unit skid

(SHOCK ABSORBER—MOD. 1182)

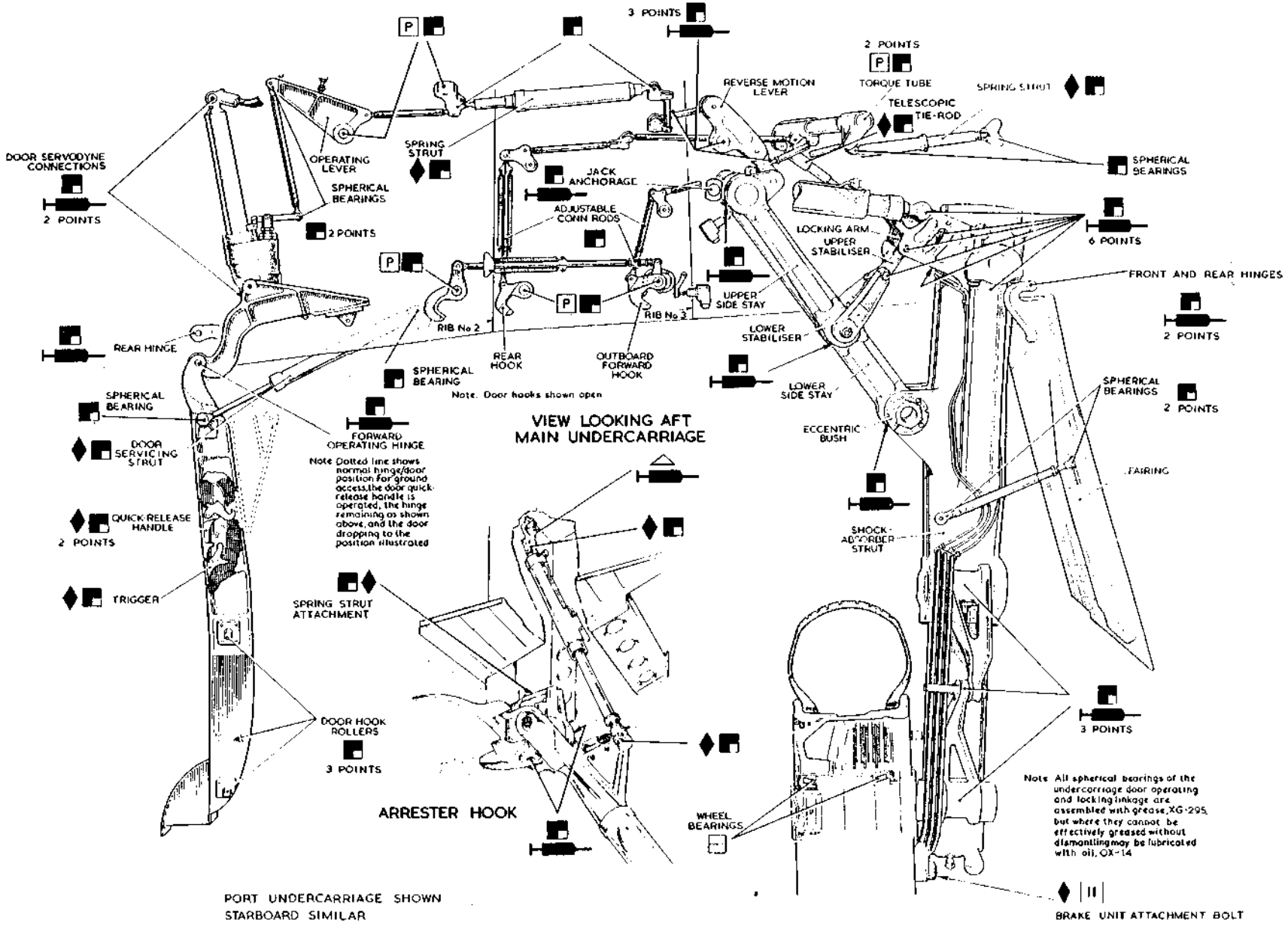

Fig. 23. Lubrication—main undercarriage and arrester hook

(BRAKE UNIT ATTACHMENT BOLT)