

Chapter 5 ALIGHTING GEAR

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DESCRIPTION

1. The tricycle undercarriage consists of two main wheel units mounted in the outer planes, and a steerable nose wheel unit mounted in the forward part of the fuselage; raising and lowering is controlled by push buttons on the control pedestal. Each unit is raised and lowered by an electric actuator incorporating normal and emergency motors and, when in the retracted position, is totally enclosed by automatically-operated doors. Actuator construction and operation is given in A.P.4343D, A.P.1803N, Sect. 14, Chap. 3 and Sect. 11, Chap. 1, and A.P.4377A, Vol. 1, Book 2, Sect. 5, Chap. 2. The main undercarriages each comprise two wheels supported by oleo struts mounted in tandem. The nose undercarriage comprises twin wheels mounted on an axle which is supported centrally by a single oleo strut. The nose wheel steering and main wheel braking are effected by electro-hydraulic power.

2. Each main undercarriage door is in two parts; the inner door is attached to the undercarriage frame and incorporates at its upper end a flap to allow for the movement of the undercarriage, the outer door being hinged at the outboard end of the wheel bay and operated by a separate actuator.

Emergency system

3. If an undercarriage main motor fails, the undercarriage may be lowered (from whatever position it occupies) by the emergency motor, on operation of the EMERGENCY DOWN button on the control pedestal. The emergency system can be used only for undercarriage and door lowering; the electrical system is described in Book 2, Sect. 5, Chap. 2.

Extreme emergency system

4. This system covers the main undercarriage units only and is provided to cover a failure of the up-lock mechanism. If the EMERGENCY DOWN switch fails to lower the alighting gear, covered switches on the starboard console, marked EXTREME EMERGENCY DOWN, will fire explosive bolts to sever the main undercarriage up-lock brackets from

the structure, and the door actuators from the doors. This allows the doors to hang from their hinges, and leaves the main units free to be lowered by the actuators. After using the EXTREME EMERGENCY DOWN switches, press the DOWN button. If the alighting gear still fails to lower, the EMERGENCY DOWN button is pressed.

5. Six explosive bolts are used to attach the actuator mounting bracket to the undercarriage outboard door, and four explosive bolts attach the up-lock mounting bracket to the structure. Details of the electrical connections, wiring, etc., are given in Sect. 5, Chap. 2, Group 6.

MAIN UNDERCARRIAGE

Undercarriage frame (fig. 1)

6. The frame comprises the two oleo struts arranged in tandem, a hinge tube at the upper end, a cylinder which is part of the shock-absorber system and is connected diagonally between the struts, and a bracing tube connecting the bottom ends of the oleo cylinders. A telescopic torque tube is fitted between the two rams to prevent them rotating. Post-Mod. 2984, this torque tube is treated on assembly with molybdenum disulphide powder (Ref. No. 34B/9429867) rubbed well into the mating surfaces, the leather gaiter then being packed with anti-fretting grease (Ref. No. 34B/9425139). The diagonal bracing cylinder (A.P.1803N, Vol. 1, Sect. 13) has oil connections, incorporating restrictors, to both oleo struts, and is secured to mounting lugs at the top of the rear strut and at the bottom of the forward strut. A bracing tube is attached to the mounting lug of the diagonal cylinder on the forward strut, and to a lug at the bottom of the rear strut. The foot of each ram is formed as a half fork on which is mounted a cantilever axle to carry the wheel.

7. The V-shaped upper side stay is pivoted at its open end on a cross-tube mounted chordwise across the undercarriage bay at Station 156. The lower side stay is also

V-shaped, with its open end pivoted on a lug at the bottom of each oleo strut. The apices of the upper and lower side stays are brought together to form a knuckle joint.

Actuator attachment

8. The forward oleo strut top fitting incorporates a lever to which is attached the body of the actuator; the actuator ram is attached to a driving sleeve mounting on the side stay pivot tube. On post-Mod. 2468 aircraft the light alloy driving sleeve is replaced by a steel sleeve, and a steel reinforcing ring is fitted on the side stay pivot tube where the driving dogs meet. ◀Post-Mod. 3062, the reinforcing ring is prevented from creeping by two dowels which lock the ring to the side stay.▶ The driving sleeve has dogs formed on the in-board face, which mate in corresponding slots in the upper side stay mounting sleeve. These slots allow a small idle movement during which the down-lock operating rod, which is also attached to the driving sleeve, is pulled to disengage the down lock. Further extension of the actuator ram folds the side stays and raises the undercarriage.

Down-lock mechanism (fig. 2)

9. The down-lock mechanism, mounted on the upper side stays, consists of three spring-loaded latch plates housed between the side flanges of a centre block mounted between the forward and aft side stay members. The two outer latches are the emergency latches and engage the catch bracket on the lower side stay before the main or centre latch. The latches are spring-loaded to lock and are opened by a sliding yoke which is operated by a control rod attached to the double operating lever at the upper end of the mechanism. A bolt through the open end of the yoke passes under the latch levers and rides in a slotted hole in the side flanges of the centre block. One emergency latch and the main latch are anchored to levers mounted on a shaft carrying adjustable strikers which operate adjacent micro-switches when the lock is broken.

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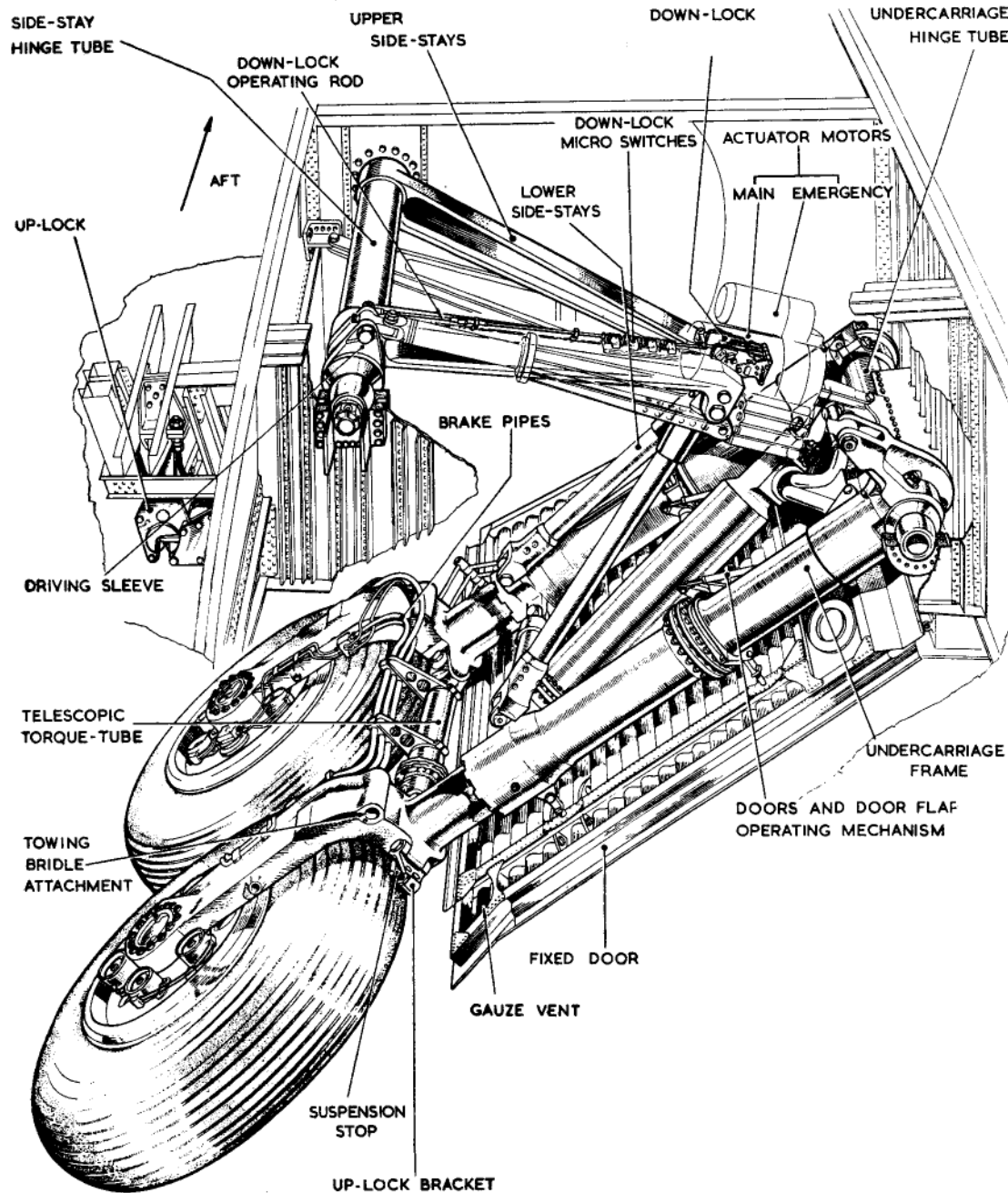


Fig. 1. Main undercarriage

10. A spring-loaded quadrant plate is mounted on the inner face of the side plates bolted to the flanges of the centre block. When the undercarriage leg is in the down and locked position, the point of each quadrant rides on the outer surface of each yoke arm; the lower part of each quadrant rests on an adjustable stop mounted on the catch bracket of the lower stay.

11. When the undercarriage is retracted, the first movement of the double operating lever at the upper end of the mechanism raises the yoke piece out of engagement with the quadrants and pulls out the latches. The free angular movement of the side stay operating lever has now been taken up and the undercarriage commences to retract: the adjustable stops move away from the quadrants and allow them to fall to their lowest position under the influence of their springs. The gear is now cocked ready for the lowering cycle.

12. On the lower part of the control rod which operates the double lever is a series of four springs separated by spools located by a nut at each end. Make-and-break contacts engage with the spools and with a contact on an adjacent micro switch; movement of the mechanism to engage the down-lock operates the micro switches and cuts off the current at the actuator motors.

Up-lock mechanism (fig. 3)

13. The up-lock mechanism operates in conjunction with the opening and closing of the undercarriage outboard door. A spring box, attached at one end to a bracket mounted on the hinge line of the door, transmits movement through a series of connecting rods and bell-crank levers to an actuating lever with a forked end which engages a collar in the up-lock housing. The spring-box acts as an override and also assists in the return of the operating mechanism.

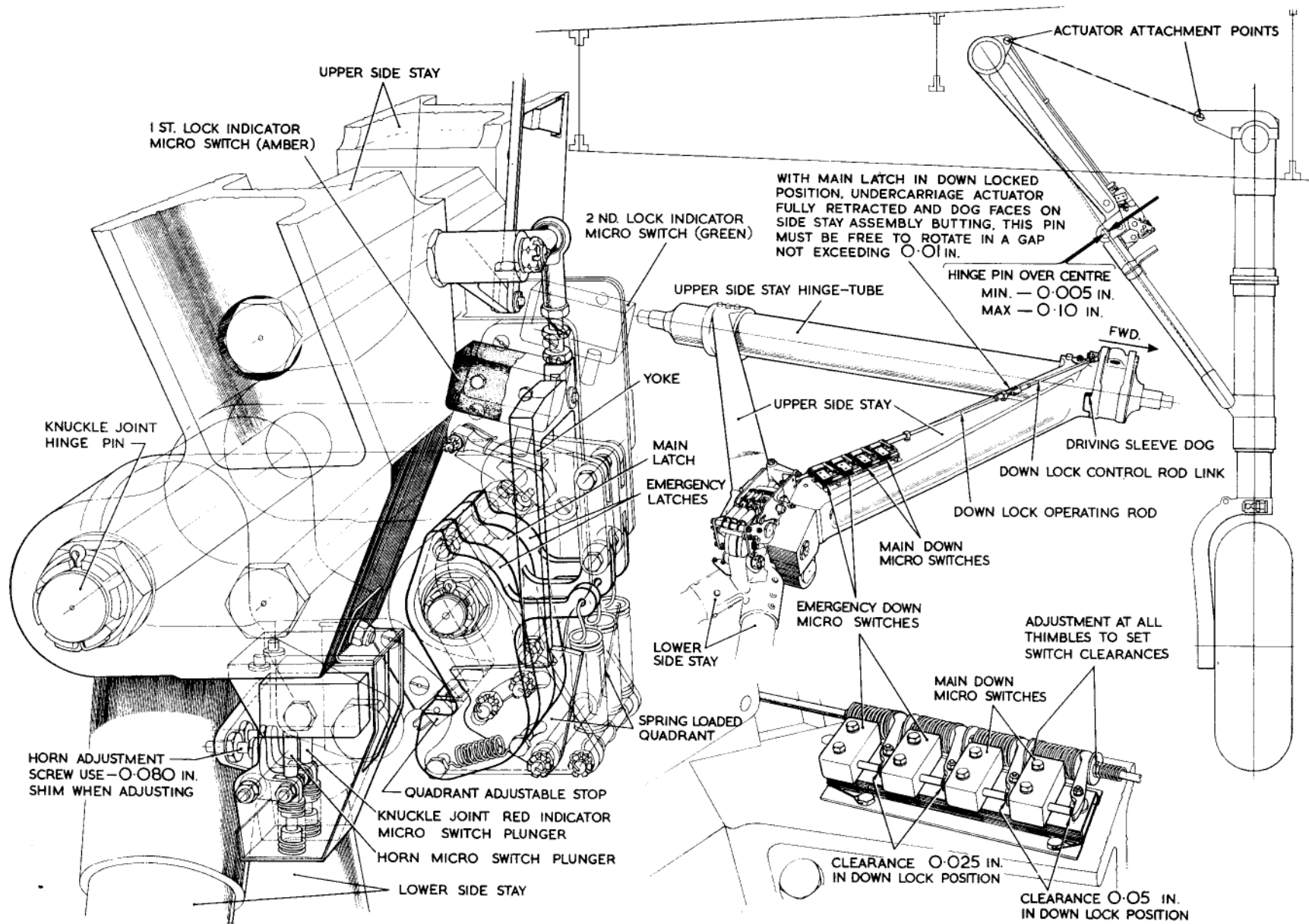


Fig. 2. Main undercarriage down-lock

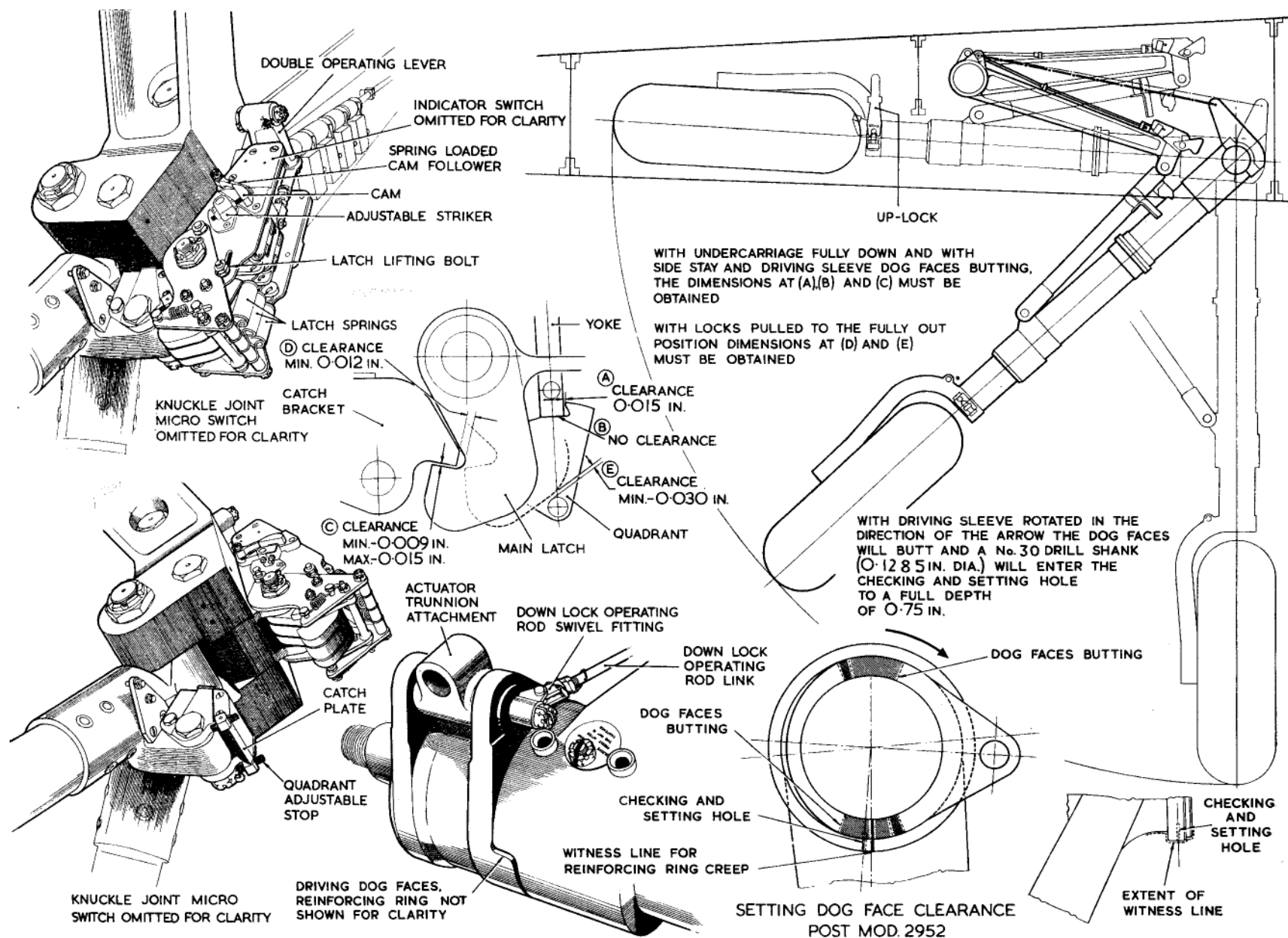


Fig. 3. Main undercarriage down-lock adjustments

14. The up-lock unit, mounted on a brace structure in the upper part of the undercarriage bay at Stn. 180·71, is held in position by two brackets secured by four explosive bolts. The unit includes two hooks which are rotated about a fulcrum pin through a linkage attached to their upper extremities. The linkage is in turn operated through its connection to the lower end of a vertical spindle, movement of which is controlled through the engagement of the forked end of an actuating lever in a collar screwed to the spindle; the downward movement of the actuating lever is resisted by a compression spring under the collar.

15. A functional diagram of the up-lock is given in fig. 4. When undercarriage DOWN is selected the fork-ended actuating lever, operated by the opening of the undercarriage outboard door, moves down. The downward movement is transmitted to the spindle and the linkage connected to it, the spring is compressed and the hooks are opened and retained in the open position by two spring-loaded latches. The up-lock suspension stop fixed to the forward oleo strut is now free and the undercarriage can be lowered.

16. When the undercarriage is raised the suspension stop lifts the two latches and frees the hooks, which are then closed by the action of the compressed spring and the linkage, and the undercarriage is locked UP. The suspension stop also operates a series of micro switches through contacts mounted on the connecting piece between the latches. Two of these are UP limit switches for the undercarriage actuator motor and the third operates position indicator lamps.

Operation (fig. 2 and 3)

17. In the descriptions of undercarriage retraction and lowering, reference is made only to micro switch operation and setting and not to relays and contactors. The electrical circuits are described in Book 2, Sect. 5, Chap. 2, Group 6, brief references to

them in this chapter being given as a functional guide only.

Main undercarriage retraction

18. Under airborne conditions, the undercarriage retraction circuit cannot be inadvertently operated before an airspeed of 80 to 85 knots is attained. At this speed, a bench-adjusted air-pressure switch in the port servicing bay is operated by the aircraft airspeed pressure system, and will trip a micro switch to withdraw the lock from the UP push switch in the cockpit (A.P.1275A, Sect. 24 and A.P.4377A, Vol. 1, Book 3, Chap. 6). For ground testing or in emergency, the circuit can be operated by turning the cockpit push switch through 90 deg. to release the lock before pressing the button.

19. When the UP push switch is depressed, the actuator ram starts to extend, moving the side cross-stay driving sleeve over its free movement to engage the hinge tube dogs. During this movement, the down-lock operating rod (attached to a swivel fitting on the actuator attachment bolt) is pulled up to release the down-lock catches, at the same time operating the down-lock micro switches. The catches give cockpit lamp indication, GREEN (on the main indicator panel in the centre instrument panel) going out as the second lock is released, and AMBER (adjacent to the main panel) as the first lock is released. Immediately the control rod moves, the spring-loaded thimbles on it depress the four micro switches, two main and two emergency fitted to the upper side-stay, thus preparing the circuit for subsequent DOWN operation. With the free move-

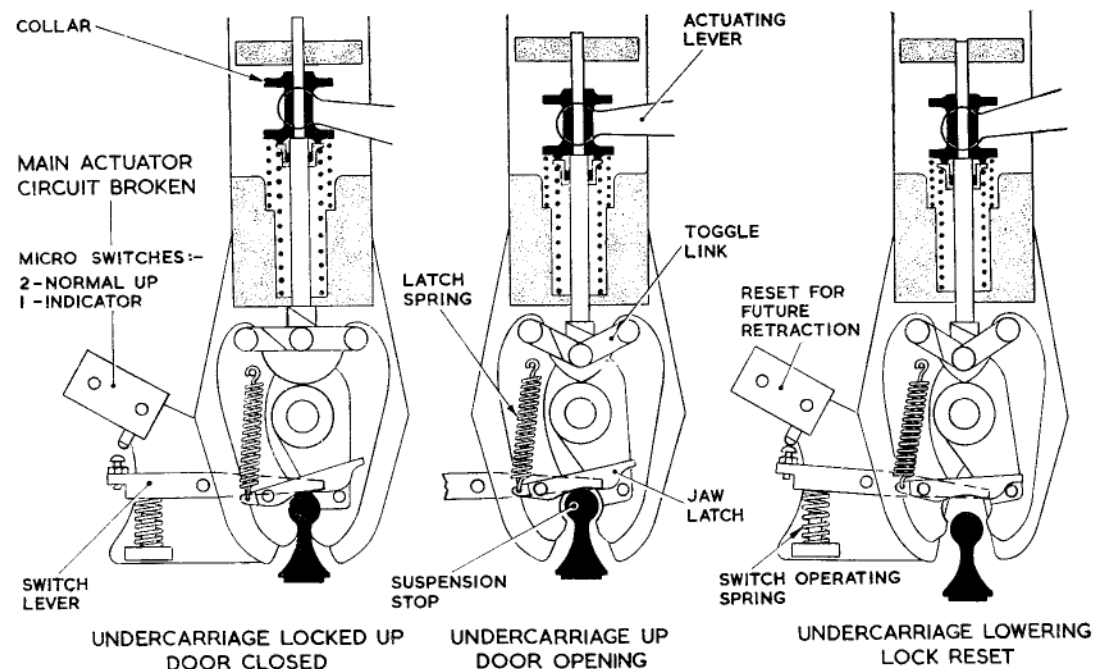


Fig. 4. Main undercarriage up-lock functional diagram

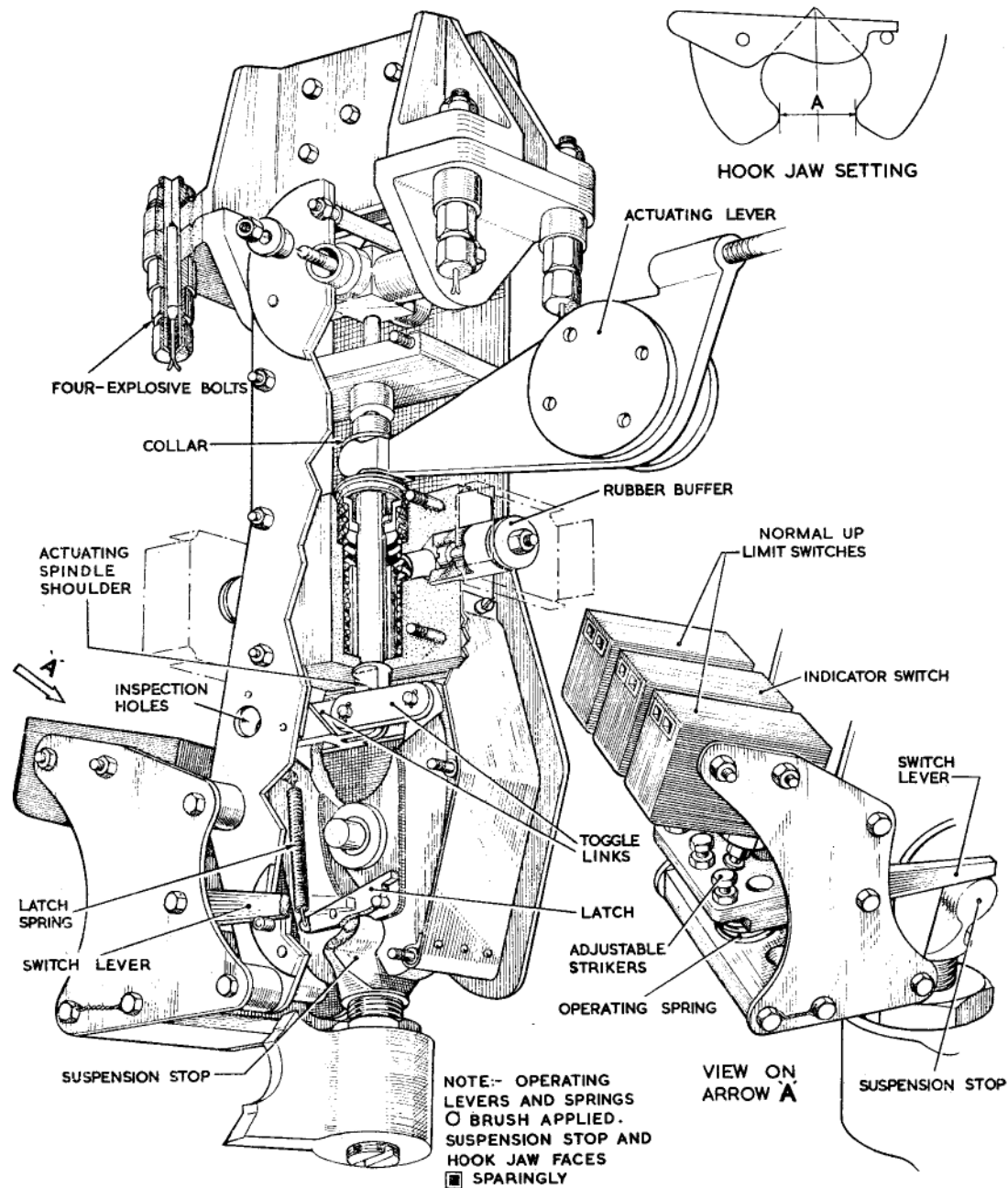


Fig. 5. Main undercarriage up-lock mechanism

ment between the dog faces taken up, a load is imparted to the lever at the top of the front oleo and the legs commence to move up, breaking the knuckle joint.

20. As the joint breaks, micro switches operate to bring on the cockpit indicator RED lamp. At certain low throttle settings it will also operate a warning horn (Sect. 4, Chap. 1) or, at low flying speeds, a flag warning device in the air speed indicator (Book 2, Sect. 2, Chap. 5, Group 6). As the legs fold, the undercarriage fixed door flap linkage moves the flap to cover the area occupied by the undercarriage unit in the down position. Near completion of retraction the suspension stop on the forward half-fork enters the up-lock jaws, and in addition to lifting the lock latch to release the jaws, presses the up-lock switch lever to release the switches.

21. The two up-lock NORMAL UP limit switches having been depressed by a spring to connect the electrical circuit to the main actuator, now break the circuit to switch off the main actuator and make the door actuator circuit. Under spring action, the lock jaws close to lock the undercarriage up, at the same time the indicator micro switch cutting the cockpit RED warning light. The circuit to the door through the NORMAL UP limit switches is taken through the actuator built-in IN LIMIT switches which remain operative until the door is fully closed and the ram trips the switches. A separate micro switch in the wheel bay controls the door warning lamp on the cockpit starboard coaming, the switch being depressed and the lamp extinguished as the door reaches the closed position.

Main undercarriage lowering

22. When the DOWN button is pressed the door actuator is activated, the IN LIMIT switch closing in readiness for subsequent retraction. As the door opens the indicator switch brings the coaming warning lamp ON and, at the same time, the up-lock control rod is freed at the spring-box (*para.* 13). When the door reaches the open position the up-lock is released and the actuator ram trips the OUT LIMIT switch to stop the door actuator and divert the supply to the main actuator. This releases the main actuator internal brake to resist the rate of descent, the undercarriage lowering under its own weight and keeping the dog-faces engaged.

23. As the suspension stop leaves the up-lock, the NORMAL UP switches are reset by spring action in readiness for future retraction and the indicator switch brings on the RED lamp. As the legs approach the fully-down position, a point is reached where the knuckle hinge pin passes over a straight line between the outer attachment points of the upper and lower sidestays (*fig.* 2) to form a geometrical lock. At this point the knuckle joint closes, operating a micro switch to cut the RED lamp, horn and A.S.I. flag indicator. The main actuator gradually takes up the load as the fully-down position is approached and, when reached, the dog-face free movement is taken up, the control rod depresses the four micro switches, and the MAIN DOWN switches cut the main actuator supply. Simultaneously, the lock catches engage, giving (in turn) AMBER indication for first lock engagement and GREEN for main lock. The indicator lamps will not be on until the latches have a minimum of 75% engagement.

Main undercarriage emergency down

24. The emergency system cannot be used for retraction. On selecting EMERGENCY DOWN on the control pedestal, the system works similarly to NORMAL DOWN except

that the actuator emergency motors are brought into use, the door actuator is stopped when the ram operates the EMERGENCY OUT limit switches on the actuator, and the leg is stopped in the down position through the EMERGENCY DOWN limit switches operated by the down-lock control rod.

Main undercarriage extreme emergency down

25. This system is independent for each main undercarriage, switches on the port console controlling the up-lock and door actuator explosive bolt detonation, after which the main undercarriage is operated normally through the MAIN DOWN switches.

NOSE UNDERCARRIAGE (*fig.* 6)

26. The nose undercarriage consists of a single, oleo-pneumatic shock-absorber strut, carrying steerable twin wheels. The wheels are mounted on a common axle carried in the ram end which is connected by means of articulated torsion links to the rotatable steering head mounted between fixed brackets on the oleo cylinder.

27. The unit retracts rearwards under the action of a motor-driven actuator, and, to ensure that the wheels are directly fore-and-aft before they are raised, the ram exterior is provided with a self-aligning cam which engages a double helix inside the oleo cylinder. When the weight is removed and the ram extends, the cam contacts the helix and is guided to its base to locate the wheel centrally. A centralizing switch (*fig.* 7), controlling the supply to the actuator, is mounted on the steering head brackets and prevents retraction until the leg is correctly positioned. The switch is set with the leg central and fully extended, by operating the adjuster screw until the micro switch just makes when connected to a test lamp. The screw is then advanced $1\frac{1}{2}$ turns and locked in position.

Locks (*fig.* 16 and 17)

28. The nose undercarriage is locked in either the raised or lowered position by a plunger, housed in the top of the locking arm, which engages in either the up-lock or down-lock socket. Adjacent to both the up-lock and the down-lock sockets is a battery of micro switches the function of which is described in Sect. 5, Chap. 2, Group 6.

Steering gear (*fig.* 11)

29. The nose-wheel steering is effected by power from the hydraulic system (*Chap.* 6) through two jacks pivoted between brackets keyed to the oleo cylinder. These jacks have their piston ends connected to a steering head, which, subject to the variable pressure exerted by the jacks, rotates in ball bearings between upper and lower fixed brackets. The steering head is, in turn, connected to the axle end of the sustaining ram by torsion links. By virtue of the alternate supply of hydraulic fluid to the appropriate ends of the jacks, the sustaining ram revolves on its axis and the nose-wheels are turned in the required direction.

30. A steering handwheel, fitted at the port side of the cockpit is connected by series of tie-rods, chains and sprockets to a shaft assembly on the pressure bulkhead, thence to a double segment sprocket mounted on the port outboard face of the nose-wheel bay. The sprocket is keyed to a shaft passing through the bay side wall, on the other end of which is a V-shaped engagement bracket with a stop cam riveted to one face; when the oleo is retracted this cam engages a corresponding cam on the undercarriage trunnion, thus locking the steering handwheel in a central position and keeping the engagement bracket in a position to accept the ball-ended lever when the unit is lowered again.

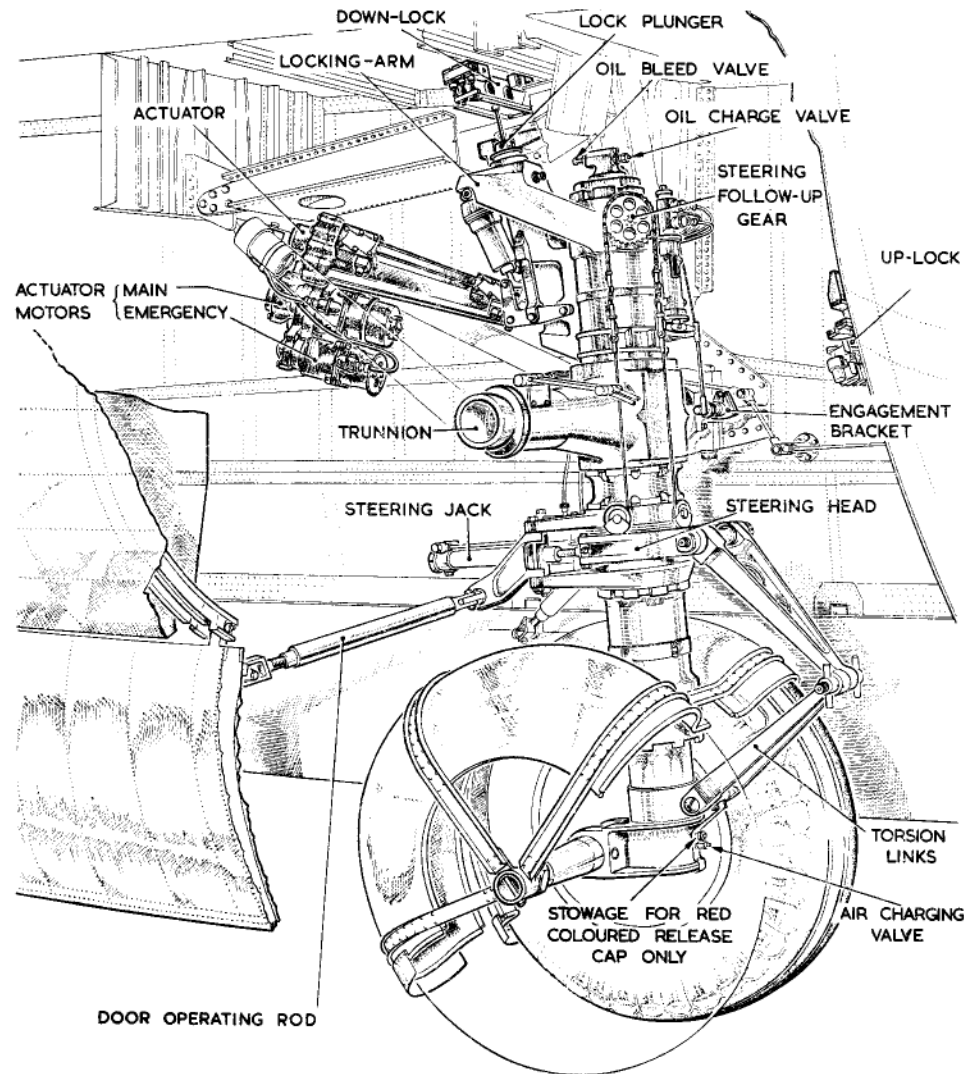


Fig. 6. Nose undercarriage

31. A ball-ended lever, keyed to a control shaft mounted on the trunnion, engages the V-shaped bracket when the undercarriage is down, and will disengage as it is retracted, connecting or disconnecting the cockpit steering wheel. When engaged, no move-

ment can be effected by the cockpit hand-wheel until the oleo has been compressed by the weight of the aircraft. The control shaft continues along the trunnion and, by means of a ball-joint, connects with a vertical shaft attached to a centralizer lever

which, in turn, is connected to a control valve. Through the centralizer, the control valve plunger is actuated to permit the hydraulic fluid to flow to the appropriate ends of the steering jacks. The centralizer lever is connected to the follow-up gear from the steering head, through a sprocket, bevel gearbox and vertical shaft. As the nose wheels turn, motion is transmitted back to the centralizer and the control valve is closed.

Operation

Nose undercarriage retraction

32. With the nose undercarriage locked down the GREEN indicator lamp is on. When the UP button is pressed, the actuator extends and exerts pressure through the trip lock lever, initial pressure withdraws the lock plunger from the down-lock fitting and further ram extension retracts the wheels to the rear. As the lock plunger is withdrawn, the six down-lock micro switches (fig. 8) are depressed by a spring, Main No. 1, No. 2 and EMERGENCY DOWN LIMIT switches preparing the circuit for future lowering, the indicator switch breaking the GREEN and bringing on the RED lamp, and the two hydraulic motor switches breaking the control supply to both pumps. If these have been running, they will stop. As the up-lock is approached, the plunger will spring into the up-lock socket and operate a lever to five micro switches (fig. 10). The Main No. 1 and No. 2 UP LIMIT switches stop the actuator motor, the indicator switch cuts the RED lamp, and the hydraulic motor switches ensure that the hydraulic magnetic indicator shows BLACK (off).

Nose undercarriage lowering

33. When the DOWN button is pressed the actuator withdraws the lock plunger which, when clear of the lock socket, releases the up-lock switches. The main No. 1 and No. 2 UP LIMIT switches prepare the circuit for future retraction, the indicator switch brings on the RED lamp, and the two hydraulic motor switches prepare the pump circuit.

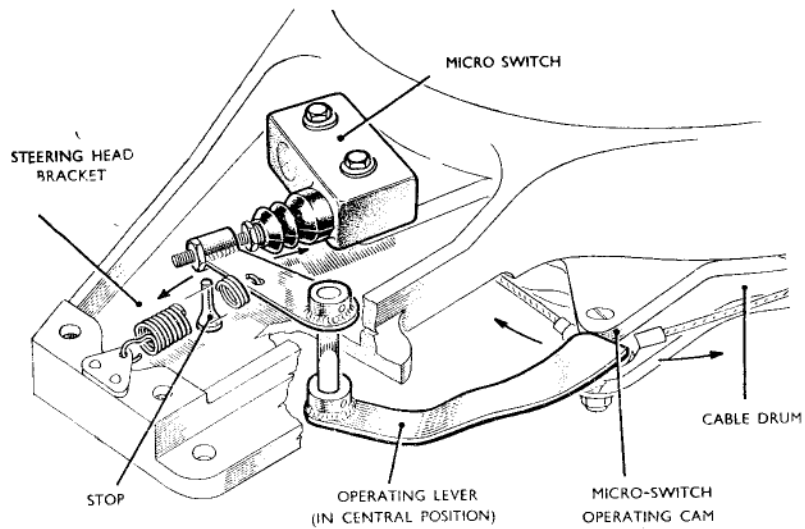


Fig. 7. Nose undercarriage centralizing switch

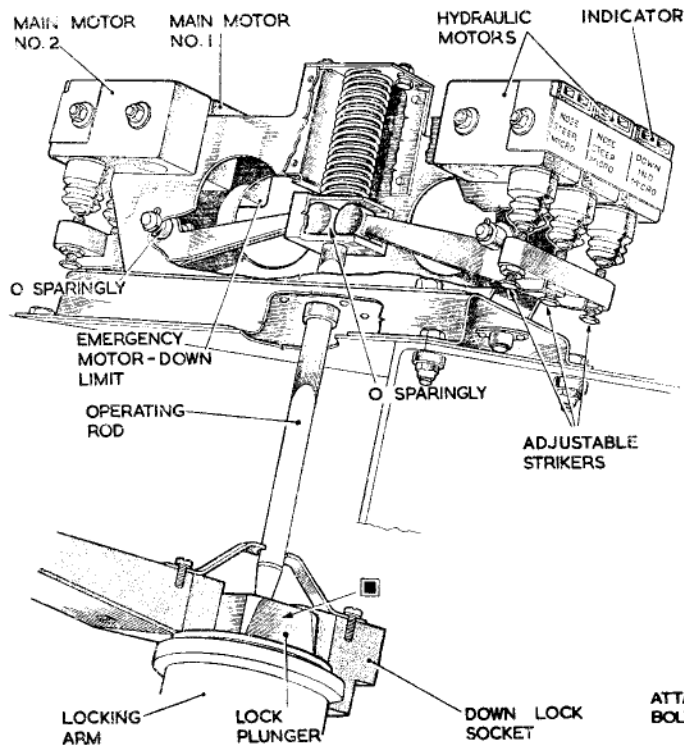


Fig. 8. Nose undercarriage down-lock switch mechanism

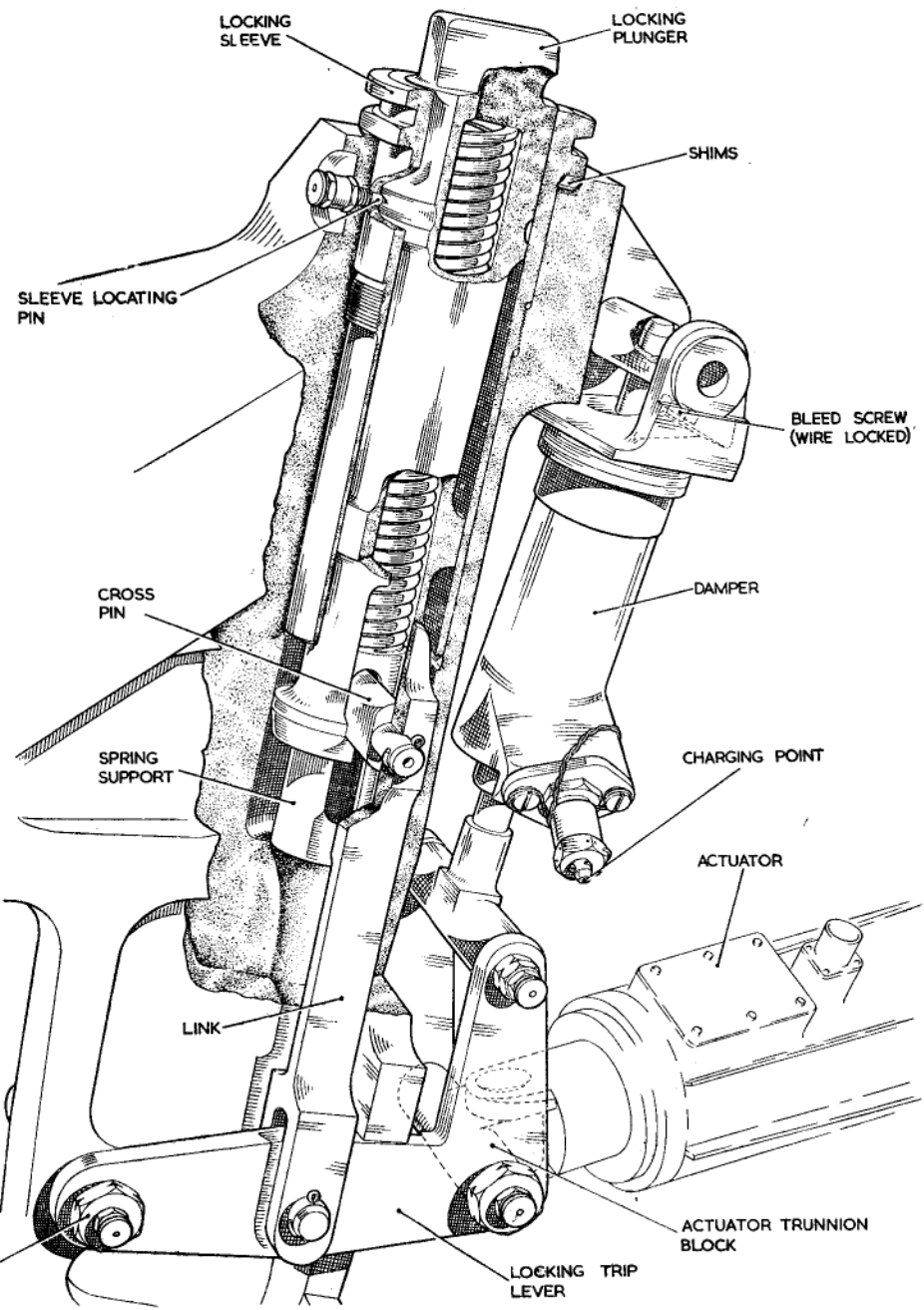


Fig. 9. Nose undercarriage spring lock

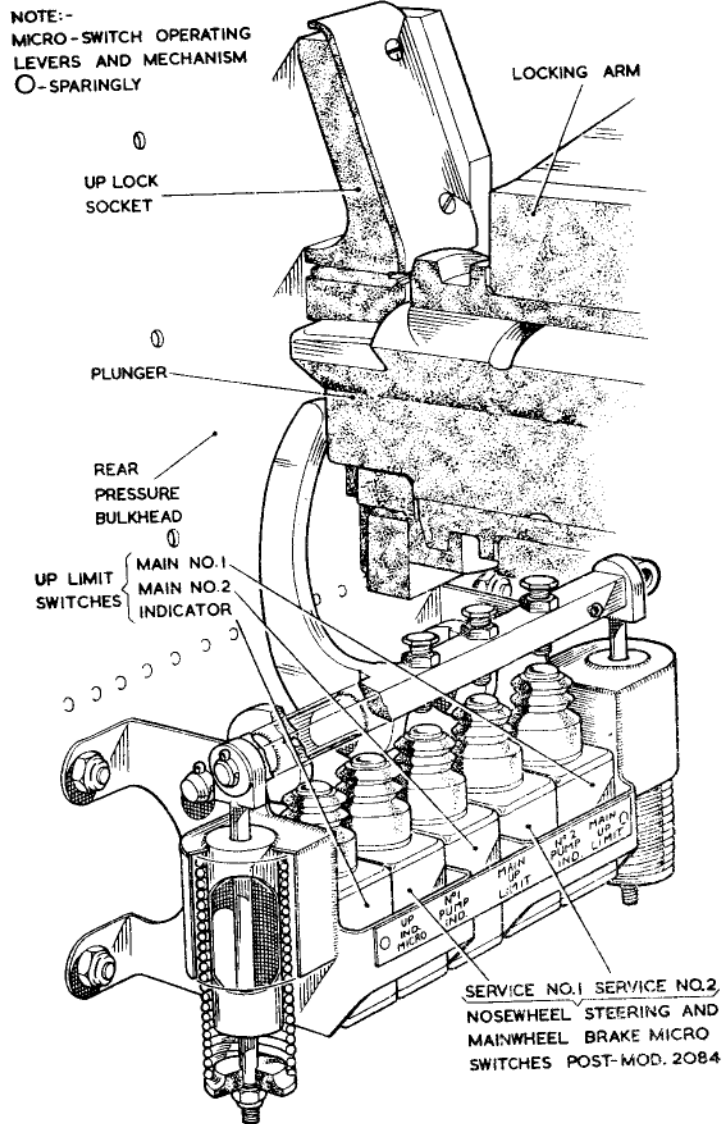


Fig. 10. Nose undercarriage up-lock switch mechanism

If the hydraulic pressure is below 1,900 lb/in² the magnetic indicator will show WHITE (on) although the pumps will not start until the undercarriage is locked down. As the lock plunger engages the down-lock socket the switches are released. Main

No. 1 and No. 2 DOWN LIMIT switches stop the actuator motor, the indicator switch cuts the RED lamp and brings on GREEN, and the hydraulic motor switches start the pumps if the pressure is below 1,900 lb/in².

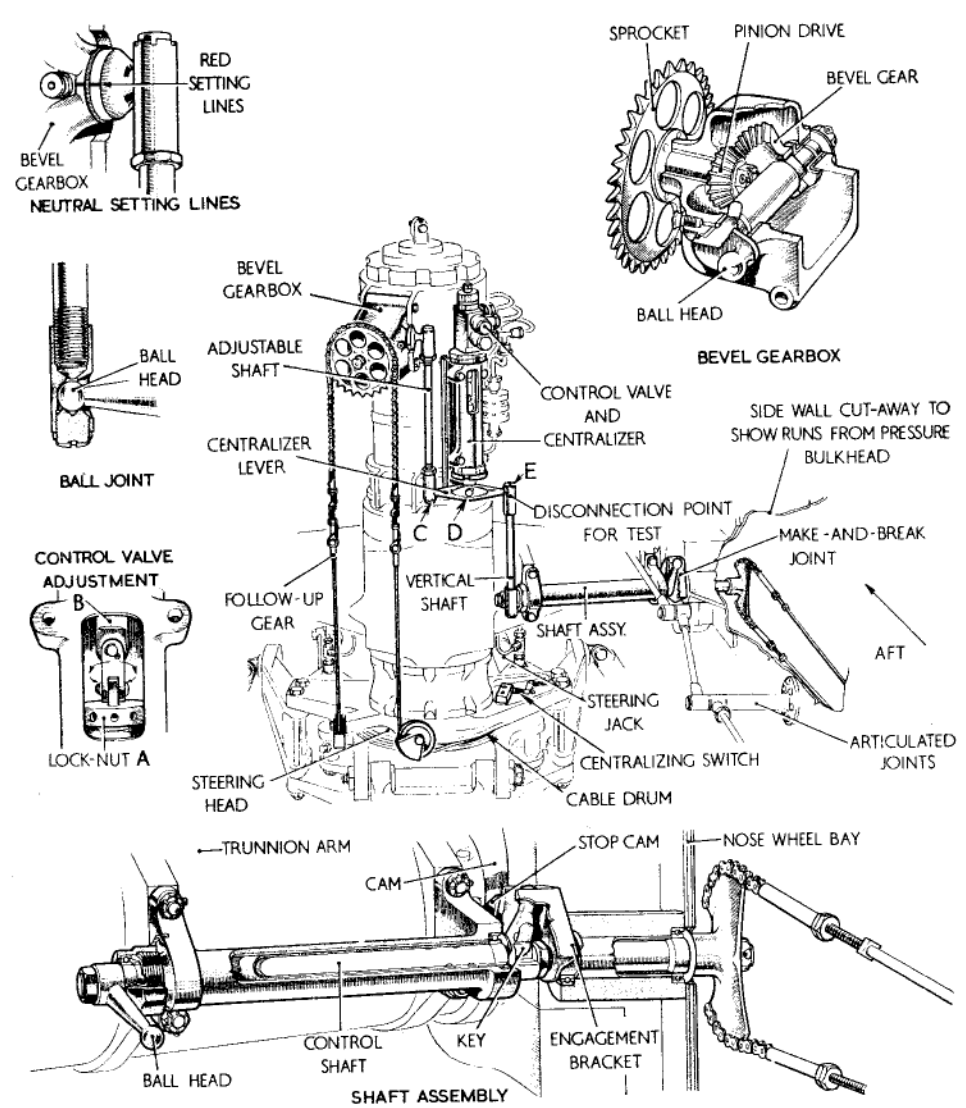


Fig. 11. Steering gear

Nose undercarriage emergency down
34. There is no extreme emergency operation for the nose undercarriage and only EMERGENCY DOWN. When used, this operates as for MAIN DOWN except that the actuator emergency motor is used and stopped by the EMERGENCY DOWN LIMIT switch.

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SERVICING

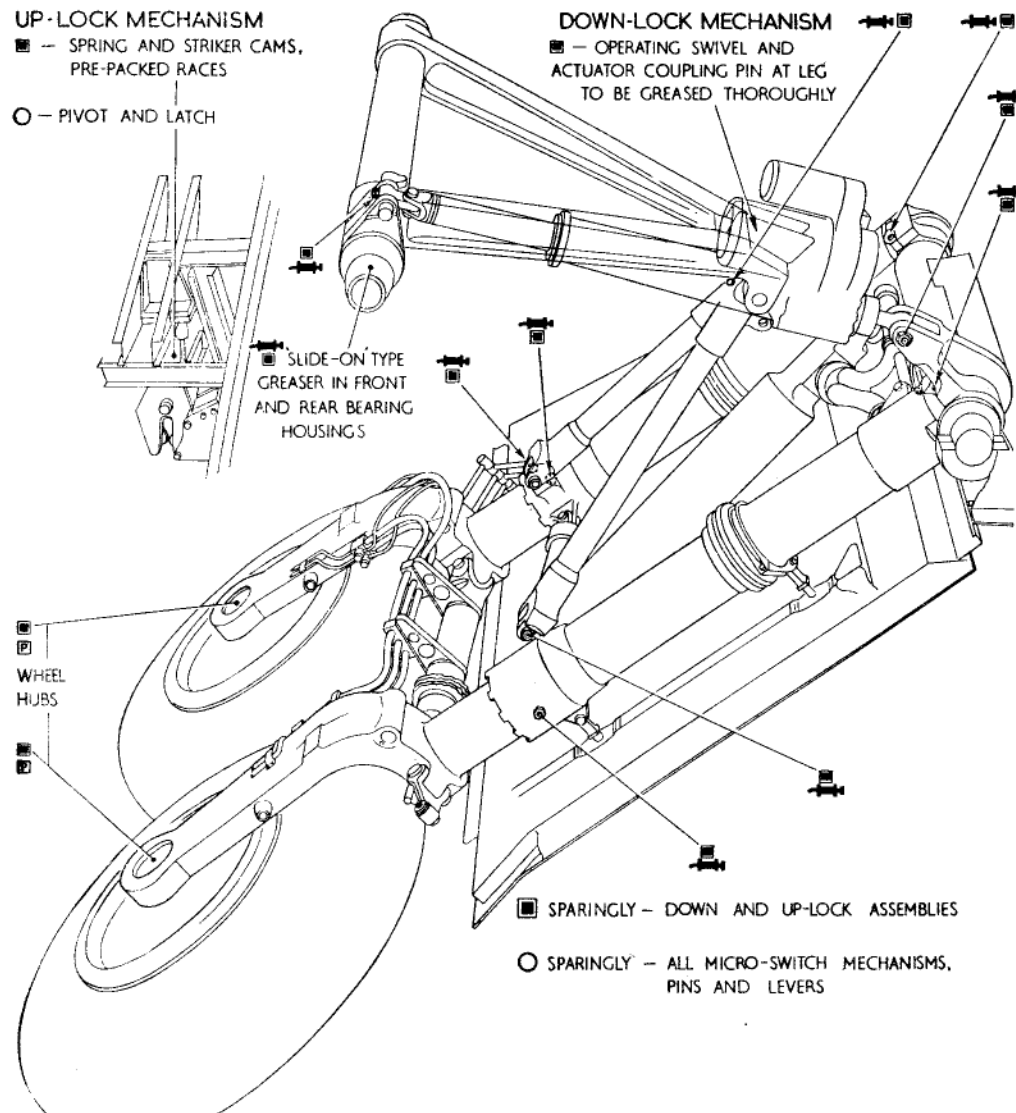


Fig. 12. Main undercarriage lubrication

LUBRICATION

35. Lubrication points and the correct

lubricant to use are shown in fig. 12 and 13. In winter conditions, special attention must

be given to the up-lock mechanism lubrication as an added precaution against freezing in the retracted position. For particulars of lubricants see the back of the Contents marker card.

MAIN UNDERCARRIAGE SHOCK-ABSORBER STRUTS (PRE-MOD. 1293)

Charging with fluid

36. When charging a main wheel shock absorber strut with fluid, the aircraft must be standing on its wheels with the strut at full compression. *It is dangerous to charge it otherwise.* Referring to fig. 14, proceed as follows:—

(1) Remove the cap from the air charging valve No. 1 at the lower end of the air cylinder and release the air pressure from No. 1 chamber by screwing on one of the red caps adjacent to the valves.

(2) Remove the cap from the air charging valve No. 2 and release the air pressure from No. 2 chamber, using the second red cap as in operation (1). The weight of the aircraft will fully compress the undercarriage.

(3) Remove the red cap from No. 2 valve and stow it.

(4) Unscrew two or three turns the three fluid bleed valves (B) and (C) at the top of the air cylinder and oleos. Connect a pipe to the oil charging valve (D) at the top of the air cylinder and pump in oil until it flows freely from all the bleed valves. Close the bleed valves and raise the fluid pressure to 200 lb/in² to ensure that the lower separator is at the bottom of its travel.

(5) Remove the red cap from the air charging valve No. 1 and screw it on No. 2 valve. Continue pumping in fluid until the fluid pressure of 200 lb/in² is restored; this will ensure that the upper separator is at the bottom of its travel.

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(6) Open the bleed valves to release the fluid pressure and when the fluid ceases to flow, close the bleed valves, screw the cap on the fluid charging valve and wire-lock the bleed valves.

Note . . .

Before bleeding it is advisable to connect suitable lengths of rubber hose to the bleed valves, so that excess oil can be drained into a suitable receptacle. On completion of any servicing operation, all bleed valves and charging valves on oleos and air cylinders must be wire locked together or to the nearest suitable point.

Charging with air—aircraft on wheels

37. To charge the main wheel shock absorber struts with air, with the aircraft standing on its wheels, proceed as follows, referring to Sect. 2, Chap. 2, fig. 4 :—

- (1) Open the air charging valve No. 2, using the red cap.
- (2) Connect a Turner gauge adapter to No. 1 air charging valve and pump in air until dimensions A and B are each not less than 3 in.
- (3) Read the pressure on the adapter gauge.
- (4) Determine the dimension A + B from graph No. 1, using the pressure reading obtained in operation (3).
- (5) Pump in air at No. 1 valve until A + B on the rams agrees with dimension A + B found in operation (4).

Note . . .

If the pressure read at operation (3) is less than the minimum pressure for the curve on graph No. 1, increase the pressure to that minimum, when the appropriate dimension A + B will be $18 \pm \frac{1}{4}$ in.

(6) Remove the adapter from No. 1 valve and fit the cap.

UP AND DOWN-LOCK MECHANISMS

- ▣ LIGHTLY SMEAR LOCK SOCKET RAMP
- SPARINGLY ALL MICRO-SWITCH MECHANISMS

STEERING CONTROLS

- ▣ ALL MOVING PARTS
- ▣ CONTROL SHAFT BEARINGS

- ▣ GREASER BENEATH EACH
- ➔ TRUNNION BEARING HOUSING

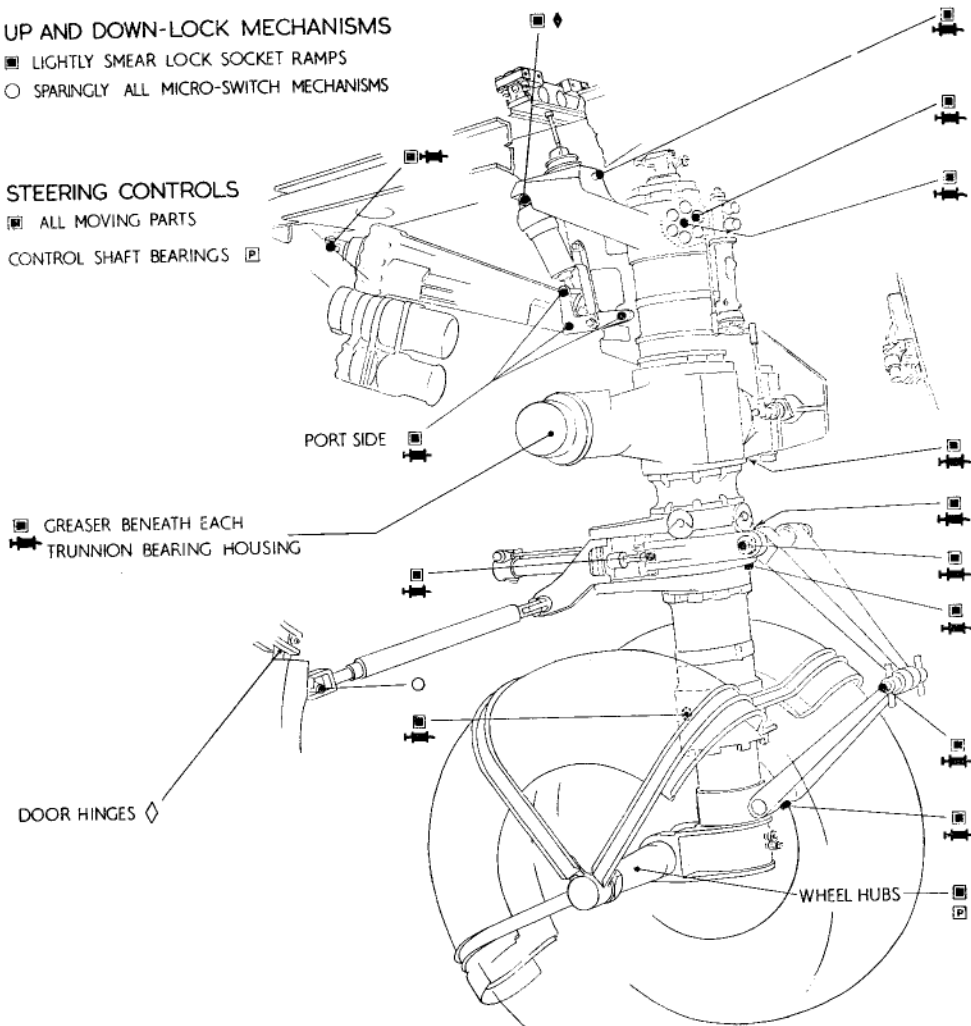


Fig. 13. Nose undercarriage lubrication

(7) For the gauge pressure found in operation (3), find the dimension A + B from graph No. 2.

(8) Pump in air at No. 2 valve until dimen-

sion A + B on the rams agrees with dimension A + B found in operation (7).

(9) Remove the air line from No. 2 valve and fit the cap. *The unit is now charged.*

Charging with air—aircraft on jacks

38. With the aircraft jacked *after* the unit has been fully charged with fluid (*para.* 36) proceed as follows :—

(1) Connect a dry air line to the air charging valve No. 1 and charge with air until the correct full extension pressure for No. 1 chamber is obtained. (This may not extend the rams beyond half stroke).

(2) Remove the air line and fit the cap. Connect the air line to the air charging valve No. 2 and charge with air until the correct full extension pressure for No. 2 chamber is obtained. (This will fully extend the rams).

(3) Remove the air line and fit No. 2 valve cap. *The unit is now fully charged.*

Note . . .

It is important that the air chambers are fully charged in correct sequence as stated above. With the aircraft fully loaded the full extension pressure in No. 1 chamber is 500 lb/in² and the full extension pressure in No. 2 chamber is 110 lb/in²

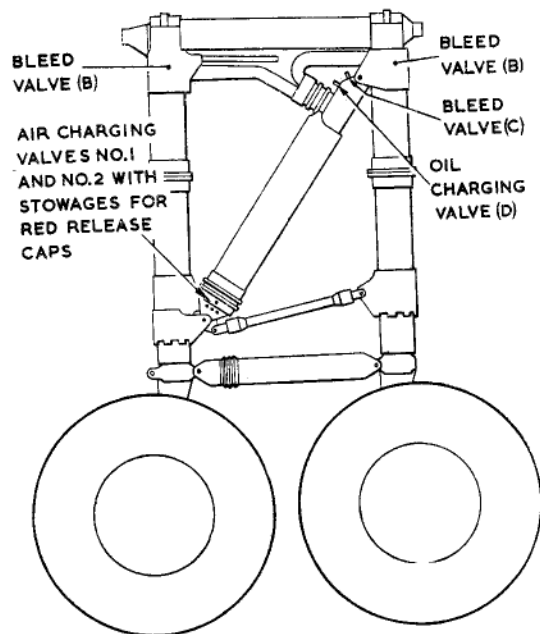


Fig. 14. Main undercarriage charging and bleed valves

Checking or adjusting the oleo pressure—aircraft on wheels

39. Refer to Sect. 2, Chap. 2, fig. 4 and proceed as follows :—

(1) Open the air charging valve No. 2, using the red cap.

(2) Connect a Turner gauge adapter to No. 1 air charging valve.

(3) Read the pressure on the adapter gauge.

Note . . .

If the dimension A or B on the rams is less than 3.0 in. pump air through No. 1 valve until this dimension is obtained, then read the pressure.

(4) Determine dimension A + B from the graph No. 1, using the pressure reading obtained in operation (3).

(5) Pump in or release air at No. 1 valve until dimension A + B on the rams agrees with dimension in operation (4).

Note . . .

If the pressure read at operation (3) is less than the minimum pressure for curve in graph No. 1, increase the pressure to that minimum, when the appropriate dimension A + B will be $18 \pm \frac{1}{4}$ in.

(6) Remove the adapter from No. 1 valve and fit the cap.

(7) For the gauge pressure found in operation (3), find the dimension A + B from graph No. 2.

(8) Pump in air at No. 2 valve until dimension A + B on the rams agrees with dimension A + B found in operation (7).

(9) Remove the air line from No. 2 valve and fit the cap. *The unit is now fully charged.*

MAIN UNDERCARRIAGE SHOCK ABSORBER STRUTS (POST-MOD. 1293)

Charging with fluid

40. A main undercarriage unit must be charged with fluid when the aircraft is standing on its wheels. *It is dangerous to charge it otherwise.* Referring to fig. 14, proceed as follows:—

(1) Remove the cap from the air charging valve No. 1 at the lower end of the balance cylinder and release the air pressure from No. 1 chamber by screwing on one of the red caps.

(2) Remove the cap from the air charging valve No. 2 and release the air pressure from No. 2 chamber, using the other red cap (as in operation (1)). The weight of the aircraft will fully compress the undercarriage.

(3) Unscrew two or three turns, the three fluid bleed valves (B) and (C) at the top of the balance cylinder and oleos. Connect a pipe to the oil charging valve (D) at the top of the cylinder and pump in oil until it flows freely from all three bleed points. Close the bleed valves and raise the fluid pressure to 200 lb/in² to ensure that both separator pistons are at the bottom of their travel.

(4) Open the bleed valve on the front oleo only to release the fluid pressure and when fluid ceases to flow, close the valve and screw the cap on the oil charging valve; wire-lock the bleed valves.

Note . . .

Before bleeding it is advisable to connect suitable lengths of rubber hose to the bleed valves so that excess fluid can be drained into a suitable receptacle.

Charging with air—aircraft on wheels

41. To charge the main wheel shock absorber struts with air with the aircraft standing on its wheels, proceed as follows, referring to Sect. 2, Chap. 2, fig. 4:—

(1) Connect a Turner adapter to No. 1 air charging valve and pump in air until dimensions A and B are each not less than 3 in.

(2) Read the pressure on the adapter gauge.

(3) Determine the dimension A + B from the graph No. 2, using the pressure reading obtained in operation (2).

(4) Pump in air at No. 1 valve until A + B on the rams agrees with dimension A + B found in operation (3).

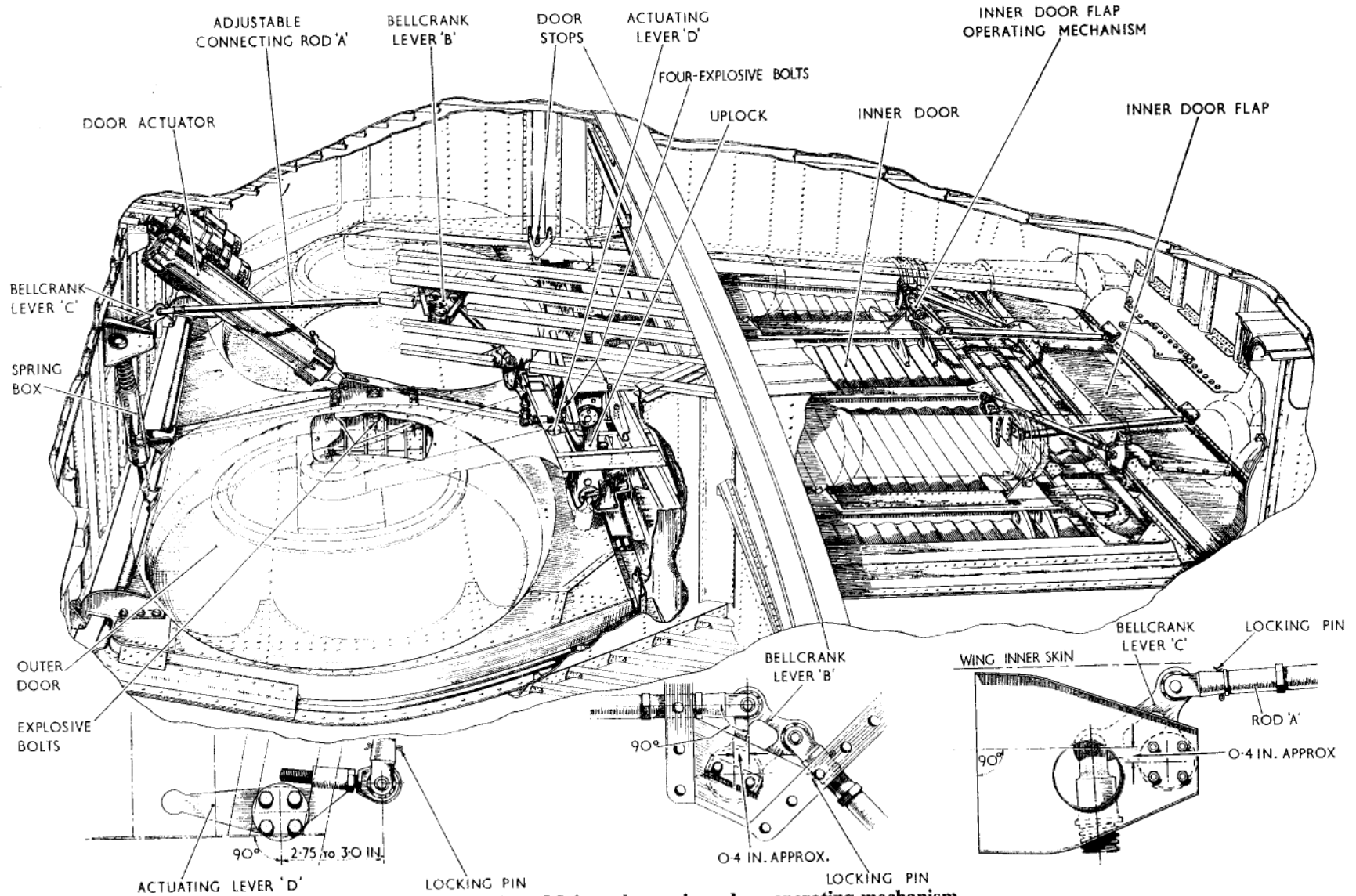


Fig. 15. Main undercarriage door operating mechanism

- (5) If the gauge pressure recorded at operation (2) is less than 500 lb/in², increase the pressure to this figure, when the dimension A + B will be 20.5 in. (approx.) and the rams will have ceased to extend.
- (6) Remove the adapter from No.

- 1 valve and correct it to No. 2 valve.
- (7) Pump in air at No. 2 valve until the dimension A + B on the ram agrees with the dimension A + B determined in operation (3).
- (8) Remove the adapter and fit the

valve caps. The unit is now correctly charged.

Charging with air—aircraft on jacks

42. With the aircraft jacked, after the unit has been fully charged with fluid (para. 40), proceed as follows:—

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(1) Connect a dry air line to the air charging valve No. 1 and charge to 500 lb/in². This will extend the rams to 20.5 in. minimum. Remove the air line and fit the cap.

(2) If necessary, connect the air line to the air charging valve No. 2 and charge to 110 lb/in². This will extend the rams to 32 in. Remove the air line and fit No. 2 valve cap. *The unit is now correctly charged.*

Note . . .

It is important that the air chambers are fully charged in correct sequence as stated above.

**Checking or adjusting the oleo pressure—
aircraft on wheels**

43. Proceed as follows:—

(1) Connect an adapter to No. 1 air charging valve.

(2) Read the pressure on the adapter gauge.

Note . . .

If the dimension A or B on the rams is less than 3.0 in., pump air through No. 1 valve until this dimension is obtained, then read the pressure.

(3) Determine dimension A + B from the graph, using the pressure reading obtained in operation (2).

(4) Pump in or release air at No. 1 valve dimension A + B on the rams agrees with dimension found in operation (3).

(5) If the pressure recorded at operation (2) is less than 500 lb/in², increase the pressure to that figure. The dimension A + B will be 20.5 in. (approx.) (and the rams will have ceased to extend.

(6) Remove the adapter from No. 1 valve and connect it to No. 2 valve.

(7) Pump in air at No. 2 valve until the dimension A + B on the rams agrees with the dimension A + B determined in operation (3).

(8) Remove the adapter and fit the valve caps. *The unit is now correctly charged.*

Topping up

44. Topping up with fluid is done in the same manner as for the initial charging and must not be attempted unless the aircraft is standing on its wheels.

**NOSE UNDERCARRIAGE SHOCK-
ABSORBER STRUT**

Charging with fluid

45. The nose undercarriage unit must be fully compressed when being charged with fluid. The operation must not be carried out with the aircraft jacked. Referring to fig. 6 and 9 for bleed valves and charging points, proceed as follows:—

(1) Remove the cap from the air charging valve, and release the air pressure by screwing on the adjacent red release cap. The weight of the aircraft will fully compress the unit.

(2) Unscrew the fluid bleed valve two or three turns.

(3) Remove the safety cap from the fluid charging valve and couple up to a fluid supply pipe.

(4) Pump in fluid until it flows freely from the bleed valve.

(5) Wait for two or three minutes to enable air to escape from the internal chambers, and continue pumping until a further free flow is obtained. If air still appears to be present, repeat the alternate waiting and pumping until air-free fluid passes.

(6) Close the oil bleed valve and raise the fluid pressure to ◀(400 lb/in²)▶, to ensure that the internal separator piston is at the bottom of its travel.

(7) Cease pumping and release the fluid pressure by carefully opening bleed valve. When fluid ceases to flow, close and wirelock the bleed valve.

(8) Remove the pipeline and replace the safety cap on the fluid charging valve. *The unit is now charged with the correct quantity of fluid.*

Charging with air

46. With the unit charged with the correct quantity of fluid, couple up a dry-air line to the air-charging valve (fig. 6) and charge with air, using either of the following methods:—

(1) With the aircraft jacked until the wheels are clear of the ground, charged to a pressure of 180 lb/in².

or

(2) With the aircraft standing on its wheels refer to the pressure chart given in Sect. 2, Chap. 2 and charge with air until the correct oleo strut extension is obtained.

**Checking or adjusting the oleo pressure—
aircraft on wheels**

47. Proceed as follows:—

(1) Connect an adapter to the air-charging valve (fig. 6) and read off the existing pressure in the oleo strut.

(2) Refer to the pressure/extension curve in Sect. 2, Chap. 2, and determine the required dimension A at the oleo pressure found in operation (1).

(3) Measure the dimension A on the strut (i.e., the exposed portion of the sustaining ram between the bottom lip of the outer cylinder and the top face of the axle fitting).

(4) If the dimensions found in operations (3) and (2) do not agree then either pump in or release air until the two dimensions agree.

Topping up

48. Topping up with fluid is done in the same manner as for the initial charging and must not be attempted unless the aircraft is standing on its wheels.

Nose undercarriage damper replenishing

(fig. 9)

49. It is important that the nose undercarriage damper is kept filled with fluid. When charging the damper remove the bleed screw at the top of the damper, undo the cap from the charging valve and pump in fluid until a clear flow emerges from the bleed screw hole; replace the bleed screw and charging valve cap. Full particulars of the damper are given in A.P.1803N, Sect. 8, Chap. 15.

CHECKING THE UNDERCARRIAGE LOCKS**Main undercarriage up-lock check**

50. When checking the up-lock, ensure that the wheel is correctly positioned relative to the main plane structure, this being particularly necessary if a new outer door or main actuator has been fitted. Actuators should always be set out and progressively adjusted to the correct settings in order to avoid overstressing the structure (See also Sect. 3, Chap. 2, para. 45).

51. When setting the wheel position in the wheel bay, the suspension stop should be set well out, and progressively adjusted until the minimum clearance permissible at any one of the following points is obtained:—

Between main plane diagonal brace and oleo	0.07 in.
Between wheel half fork and cranked up-lock rod	0.10 in.
Between down-lock box and well roof	0.10 in.

With the wheel positioned, adjustment of the up-lock mechanism is made at the connecting rod 'A', bell-crank levers 'B' and 'C', and actuating lever 'D', to the settings given in fig. 15. When the undercarriage outer door commences to open, the spring-box rod extends freely for approx. 2.7 in. (approx. 47 deg. of door opening). During the next 0.7 in. extension (13½ deg. door opening) the up-lock linkage is operated. On further opening of the door the remaining rod extension of approx. 0.8 to 1.05 in. (15½ to 19½ deg. door opening) is taken up in the spring box.

Main undercarriage up-lock adjustment

(fig. 3)

52. When fitting a new main undercarriage up-lock, it will be necessary to check the dimensions of the hook jaws and the settings of the toggle links and microswitches. Adjustment, where necessary, should be as stated. The hook jaws will have been set on assembly. The distance between the jaws, dimension A, with the jaws latched open should be 0.68 to 0.72 in. With the lock spring compressed 0.65 in. from the locked position, dimension A should be not less than 0.8 in. The toggle links of the hook lock are to be in a straight line when the lock is closed. Adjustment to attain this condition is made at the shoulder of the actuator spindle by either removing metal or adding shims as necessary. To set the microswitches, it will be necessary to insert a spare suspension stop in the hook jaws and close them. With the suspension stop resting on the bottom of the jaws, file the switch lever stop as necessary so that it is at least 0.03 in. clear of the switch lever when the lever is resting on the spare suspension stop. In this position, using a lamp, adjust the microswitches to a position so that they will just operate.

Main undercarriage down-lock check

53. All undercarriage down-lock moving and mating parts are jig-set on assembly and,

beyond checking, should require no adjustment. Clearances and settings are given in fig. 3, the setting up being described in para. 72. Where on jig assembly difficulty has been experienced in obtaining the clearance (D) specified in fig. 3, it will be noted that a sleeve, Part No. A.753, has been fitted over the yolk bolt and must be considered as part of the particular assembly.

Nose undercarriage up-lock setting

54. Using a locally-made gauge (fig. 16), set the position indicator switch operating lever so that one switch is tripped and the RED lamp goes out when dimension A is 0.65 in., and the plunger sleeve face is butting hard against the up-lock fitting. Ensure that there is 0.02 in. minimum gap along the square face between the lock plunger and the up-lock fitting. Insert a 0.02 in. shim to maintain the gap and operate the leg to the up-lock position. The switch should trip and put out the RED lamp. Reset the lever to trip the switch when dimension A is reduced to 0.04 in., and set the two remaining switches to operate at this dimension.

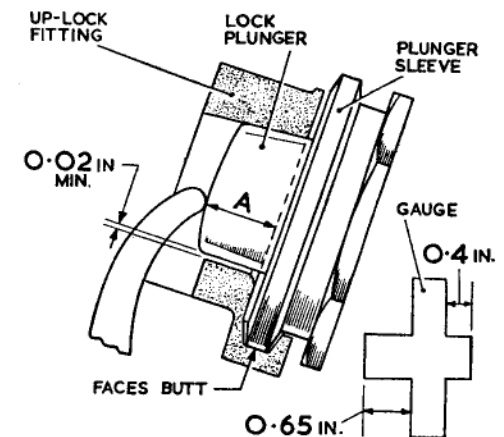


Fig. 16. Nose undercarriage up-lock setting

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Nose undercarriage down-lock setting

55. The down-lock setting is checked as follows:—

- (1) With the aircraft suitably jacked, remove the actuator.
- (2) To gain access to the lock housing, partially retract the undercarriage manually. Using a gauge made locally (*fig. 17*), set one of the position indicator switch strikers to bring on the GREEN lamp when dimension A is 0.4 in.
- (3) Move the undercarriage into the fully locked down position, i.e., with the faces of the fitting and the lock sleeve butting hard; the lock plunger should fully enter the housing. Manually withdraw the plunger and allow it to re-enter the lock housing until the GREEN lamp just comes on. Manually restrain further entry, as the plunger will then have entered 0.4 in. into the housing. In this position there must be at least 0.02 in. clearance between the square face of the plunger and the corresponding face of the housing, measured on the side that the lock sleeve and lock fitting are butting. If the clearance is insufficient it can be obtained by filing the face of the lock housing.

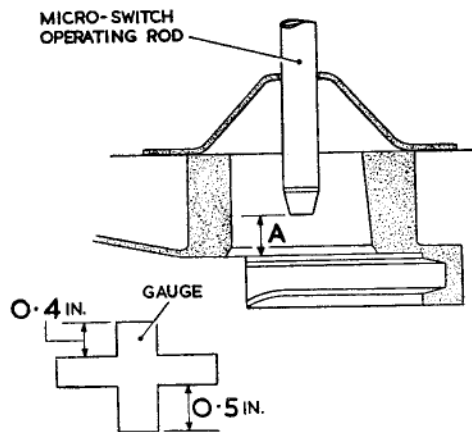


Fig. 17. Nose undercarriage down lock setting

- (4) Allow the lock plunger to fully enter the housing and check that the maximum clearance which then exists between the square face of the lock plunger and the corresponding face of the housing is 0.01 in.
- (5) Repeat operation (2), but set the switch striker to operate when dimension A is 0.5 in. Fully lower the undercarriage and, allowing the lock plunger to fully enter the housing, check that the GREEN lamp comes on.
- (6) Again partially retract the undercarriage and set all six switch strikers to operate when dimension A is 0.4 in. This setting will ensure a 0.1 in. minimum override in switch operation by the lock plunger and operating rod.
- (7) Refit the actuator and complete a retraction test.

NOSE WHEEL STEERING ADJUSTMENT

Adjustment of control valve neutral setting (*fig. 11*)

56. If it is necessary to adjust the control valve it should be set to the neutral position on the bench as described below.

- (1) Remove the valve, complete with the centralizer, from the aircraft and fix the centralizer lever at C relative to the valve.
- (2) Connect a hand pump supply to the inlet port and apply a light pressure.
- (3) Depress the centralizer lever and then allow the spring to centralize the valve in an upward direction. Note the rate of flow from the jack connections on the valve.
- (4) Lift the centralizer lever and then allow the spring to centralize the valve in a downward direction. Note the rate of flow from the jack connections.
- (5) Slacken the locknut A, screw the spindle in the required direction until

the unequal flow from the jack connections, due to backlash of moving parts, changes over with alternate movements of the valve, then secure the locknut.

- (6) Replace the valve in the aircraft, remove the pin D and connect up at C and E.
- (7) With the nose wheels central, as indicated by the marks on the oleo strut between and just below the steering jacks, and the pilot's handwheel central as indicated by an equal length of chain on each side of the hand-wheel sprocket, adjust the follow-up cables to that there is equal tension in the cable on each side of the sprocket, and the red setting lines on the bevel gearbox are in line.
- (8) Check that the control shaft ball-end mates correctly at the make-and-break joint, and that there is a distance of 5 in. from the centre line of the nose wheel trunnions and the centre of the slot in the V-shaped engagement bracket.
- (9) Adjust the shaft connecting the centralizer lever to the bevel gearbox to align the holes in the end of the valve spindle and the centralizer lever at D until the pin can be inserted without disturbing the centralizer spring.

Checking for nose wheel steering

57. Proceed as follows before testing and adjusting for power steering:—

- (1) Jack the nose wheels clear of the ground, ensure that the ram is fully extended and release all air pressure from the oleo leg.
- (2) Place the nose wheels central and check that the red setting lines on the bevel gearbox are in line. Check that the steering control is set at neutral, and couple the hydraulic pressure supply to the steering jacks.
- (3) Operate the steering control to give a full turn to port (the control lever ball end

will move aft), and check that the wheel makes a full turn of $50 \pm \frac{0}{\frac{1}{2}}$ deg. Observe the operation of the follow-up mechanism.

(4) Return the steering control to neutral and check that the wheels and alignment marks adopt their correct positions.

(5) Operate the steering control to starboard and check for a full wheel turn and correct follow-up mechanism operation (the control lever ball end moving forward).

(6) Carry out centralizing checks.

Note . . .

When the steering control is neutral, the steering head centralized and the index marks in line, the control lever ball end should be 1.8 in. from the trunnion cam.

Checking for nose wheel centralizing

58. The check is made from a full lock as follows:—

(1) Jack the nose wheels clear of the ground, ensure that the ram is fully extended and release all pressure from the oleo leg.

(2) Operate the steering control for full

lock in either direction, Secure the hand wheel in the full-lock position.

(3) Whilst fully locked, charge the oleo leg to 250 lb/in² air pressure.

(4) Release the hand wheel and check the time taken to centralize under helix cam action. From full lock to centralized should not exceed 12 sec.

(5) Release the air pressure, select full opposite lock and repeat operations (3) and (4). If the time difference exceeds 4 sec. the steering control valve requires adjustment.

Shimmy damper adjustment

59. After storage or long periods of non-use it may be necessary to readjust the shimmy damper to prevent it sticking; this applies particularly to stored new items. To check and adjust, proceed as follows:—

- (1) Loosen the 10 shimmy damper adjuster bolts on the clamp ring.
- (2) Jack the nose wheels clear of the ground and allow the oleo ram to extend slowly.
- (3) Carry out the tests as applicable (para. 57 and 58).

Note . . .

In the following paragraphs, all removal operations are given in detail. Assembly operations are given only if they are not a simple reversal of the removal sequence.

MAIN UNDERCARRIAGE**Door removal and assembly**

60. Undercarriage door removal and assembly is given in Sect. 3, Chap. 2, para. 44 and 45, and in para. 50 of this chapter. On assembly, the outer door pre-straining and setting relates to undercarriage up and down lock operation and must therefore be followed closely.

Actuator removal (fig. 19)

61. To remove the main undercarriage actuator the following sequence should be adopted:—

- (1) Disconnect the electrical services from the actuator.
- (2) Attach the hoisting cable, Ref. No. 26SR/95137, to the actuator by passing the cable around the main motor and through the elongated hole in the casing between the motor and the ram casing. Attach the cable to the Minilift hoist Ref. No. 26SR/95134, and remove all slackness in the cable.

(4) Release the air pressure from the leg.

(5) Compress the shock absorber strut to approx. half its extension length, i.e., until the ram extension measured from the gland nut to the top of the axle is approx. 9 in.

(6) Tighten the 10 shimmy damper adjuster bolts to approx. 75 lb/in torque loading, taking care to tighten the bolts evenly. Measure the gap between the clamp ring flange and the gland nut. In the new condition this should be not less than 0.05 in. to allow for future adjustment, and

REMOVAL AND ASSEMBLY

◀ (3) Remove the split pin and shackle pin securing the swivel fitting connecting rod to the down lock operating rod.

Note . . .

The length of the down-lock operating rod must on no account be altered (para. 53).

(4) Remove the split pin, nut and washer from the bolt at the actuator trunnion attachment to the side-stay lever, and remove bolt complete with down-lock operating rod swivel fitting and connecting rod.

(5) Remove the split pin, nut, washer and bolt from the actuator attachment to the oleo lever. ▶

(6) The actuator is then free and can be removed. After removal it should be clearly marked indicating from which undercarriage it has been removed, i.e., port or starboard.

(7) Fit the jury cable, Ref. No. 26SR/95336, to lock the undercarriage in the down position.

Actuator refitting

62. Refitting the actuator to the undercarriage is the reverse of the removal instructions, with the following provisions:—

is obtained by inserting shims between the clamp ring and friction ring. On new components it may not be possible initially to obtain the correct torque loading; the adjuster bolts should be checked and tightened after initial use, wire locking being employed at all times.

(7) Pump air into the leg to 180 lb/in² and observe that the leg fully extends.

(8) Release the air pressure and service the leg as described in para. 45 and 46.

(1) When setting up a port or starboard replacement actuator, use is made of tool NT4774, in accordance with the procedure detailed in A.P.4343D, Vol. 1 and the precaution must be taken, when loosening the plug end to adjust the eye end, to insert a keeper bolt in the plug centre screw hole. The keeper bolt is to be long enough to pass through tool NT4774.

Note . . .

The thread is left hand.

(2) Where the actuators to be fitted are those removed previously, care must be taken to ensure that each is assembled to the undercarriage from which it was originally removed. Do not fit the port actuator to the starboard undercarriage or vice-versa.

(3) When replacing the bolt attaching the actuator trunnion to the actuator, ensure that the head of the bolt is on the underside ◀ **IT IS DANGEROUS TO DO OTHERWISE.** On assembly, the nut must be tightened to a torque loading of 20 lb/ft. ▶

Side stay removal (fig. 20)

63. With the undercarriage lowered, the

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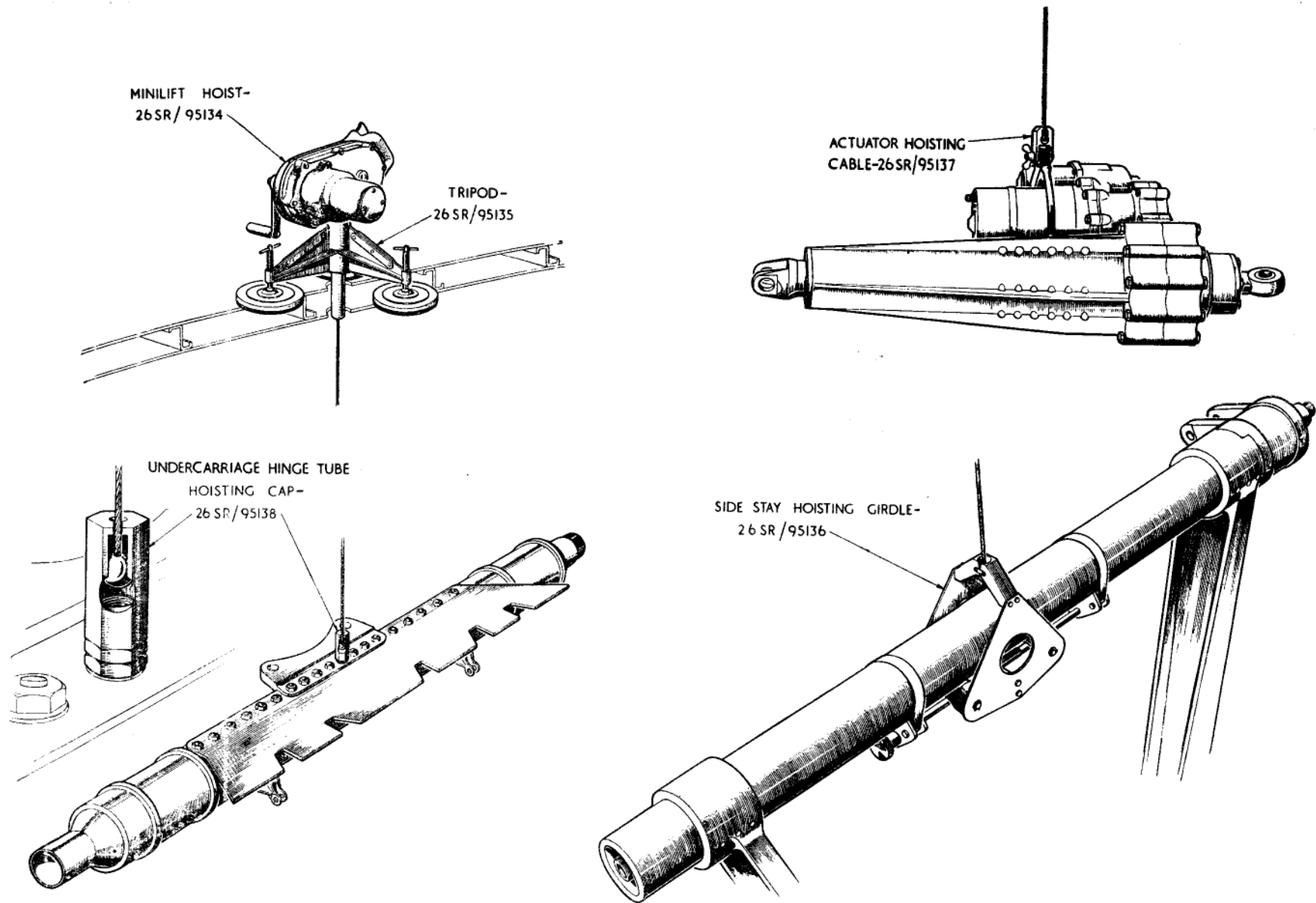


Fig. 18. Main undercarriage component hoisting

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aircraft jacked, the electrical services disconnected and the actuator removed (*para.* 61), remove the V-bracing stays by removing the bolts attaching the stays to their mounting lugs on the bay structure. Remove the cover plate over the hoisting hole in the wing, fit the tripod, Ref. No. 26SR/95135, and adjust the legs to suit the wing surface. Thread the cable of the Minilift hoist Ref. No. 26SR/95134, through the mounting tube of the tripod and fit the hoist to the tripod. Clamp the hoisting girdle, Ref. No. 26SR/95136, onto the side stay tube directly under the hoist cable, lower the cable and insert the ball end in the block of the girdle; raise the cable until the hoist is just taking the weight of the side stay tube and proceed as follows:—

(1) Remove the hinge bolt at the knee joint of the upper and lower side stays, taking care to prevent the side stays from swinging free under their own weight. The lower side stays, still attached to the undercarriage, must be lashed back to the undercarriage frame.

(2) Remove the nuts securing the hinge tube in the trunnion at the rear spar.

(3) Enter the undercarriage bay, and crawl through the hole in the span-wise bulkhead; reach down into the drag member and remove the split-pin securing the nut at the front trunnion attachment.

(4) Using the special spanner, Ref. No. 26SR/95051, unscrew the trunnion retaining nut. At this point in the operations ensure that the Minilift hoist is taking the weight of the upper sidestay.

(5) Withdraw the three taper pins securing the end attachment at the rear spar trunnion and slide the end fitting into the stay-tube until it is clear of the trunnion housing.

Note . . .

(1) *A ½ in. B.S.F. tapped hole in the end of each taper pin facilitates removal.*

(2) *When reassembling the taper pins securing the end fitting in the stay tube, the retaining nuts must be tightened to a torque loading of 15 to 20 lb/ft. This loading must not be exceeded.*

(6) Adjust the displacement screw on the girdle to lower the free end of the side stay hinge tube assembly until the forward end slides out of the trunnion at the span-wise bulkhead.

(7) Lower the side stay to the ground and remove the girdle.

Note . . .

The side stay end bearing pieces must be lightly smeared with grease XG-275, and wrapped with protective covering.

Adjustment of side stay assembly (fig. 20)

64. Adjustment of the upper side stay hinge tube in a fore-and-aft direction may be necessary in order to obtain clearance between the rear wheel and the undercarriage door. This adjustment is obtained as follows:—

(1) *Forward bearing adjustment:—*

The fitting of six shims, comprising two of Pt. No. 67450-627 and one each of Pt. No. 67450-629, 67450-631, 67450-633 and 67450-635, to the forward spherical bearing of the upper side stay hinge tube permits the adjustment of the upper side stay assembly in either a forward or rearward direction, depending upon which side of the forward spherical bearing they are fitted.

Usually the shims 627, 629, 631 and 635 are assembled in rear of the bearing and shim 633 forward. Shims 627, 629 and 631 only may be transferred to the forward side according to the amount of movement required but they must always be assembled behind shim 633 which in turn must always be assembled under the front end nuts. For adjustments in a rearward direction the forward spherical bear-

ing is reversed in its housing, this being done by loosening the 22 housing bolts and turning the bearing through 180 deg. With the exception of shim 635, all shims must now be fitted on the forward face of the bearing to give a basic position of the assembly. The shims are repositioned fore-and-aft of the bearing according to the amount of movement required, the housing bolts being tightened and locked after final assembly.

Note . . .

At all times, shim 633 must be assembled under the front end nut and shim 635 must be assembled under the shoulder of the front end, but ALL SHIMS MUST BE USED IN THE FINAL ASSEMBLY. The fitting of shims 627, 629, and 631, relative to each other is not important.

(2) *Rear bearing adjustment:—*

The screwed adjustment on the rear spherical bearing allows for variation in the distance between centres of the front and rear bearings. The fitting of eight shims, comprising four of Part No. 67450-637, two each of Part Nos. 67450-639 and 67450-641, equally disposed on each side of the bearing, and two locking plates 67450-643 and 67450-645, allows the assembly to follow the adjustments made to the forward bearing. The locking plate 643 is always fitted under the shoulder of the rear end piece and locking plate 645 is fitted adjacent to the rear nut. The placing of the shims fore-and-aft of the bearing depends only on adjustments made at the forward bearing. The position of the shims relative to each other is not important, but ALL SHIMS MUST BE USED ON FINAL ASSEMBLY. The locking plates on each side of the rear spherical bearing must be adjusted to give 0.002 in. clearance, taking care that there are no gaps between the shims. This clearance is obtained by tightening the

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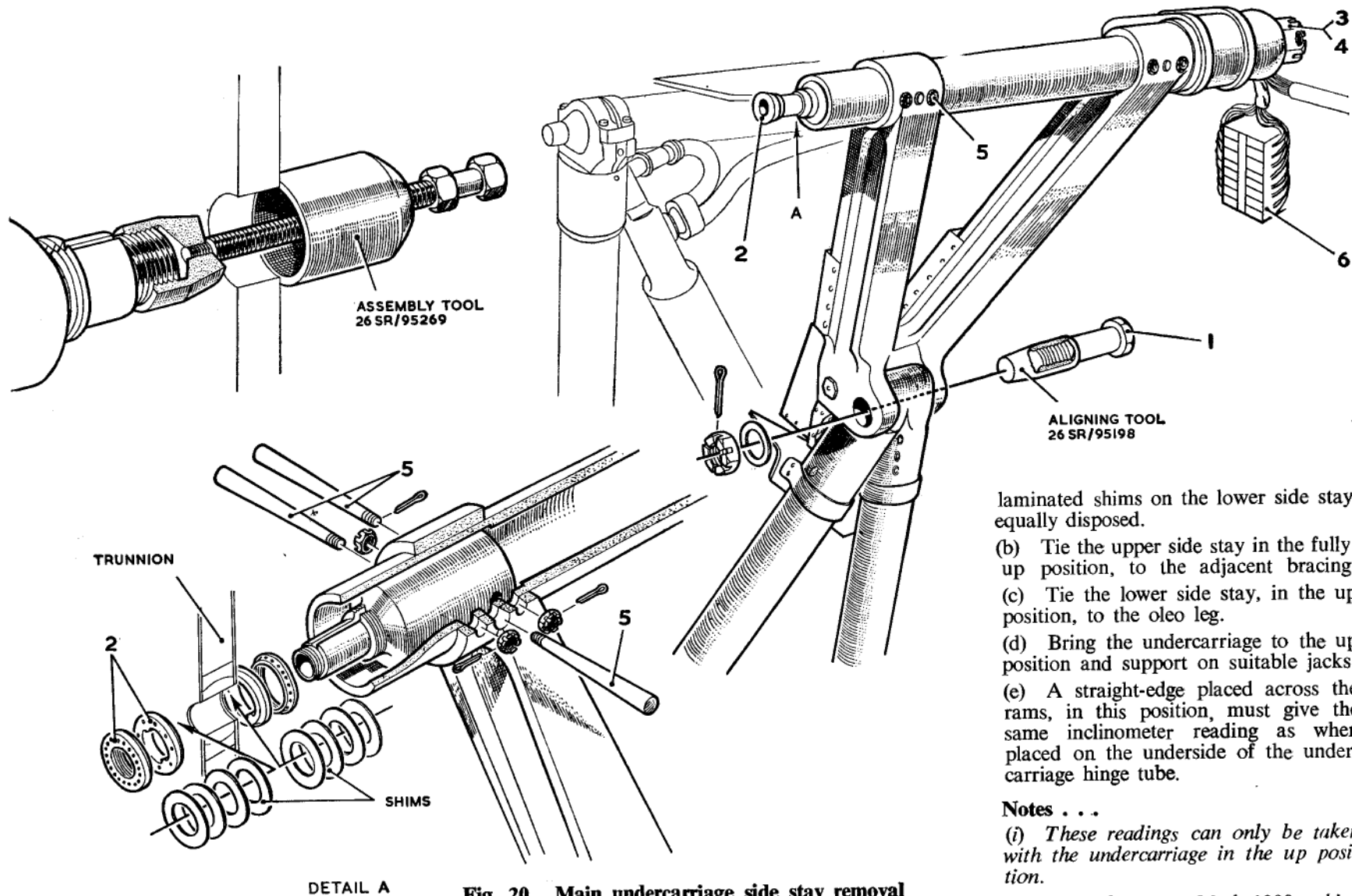


Fig. 20. Main undercarriage side stay removal

nuts and then slackening off the rear nut until it is just possible to insert a 0.004 in. feeler gauge between the rear nut and the locking plate. Each nut must be wire-locked to the locking plate in two places approx. 180 deg. apart.

(3) *Upper and lower side stays adjustment.*—

It is necessary to obtain a built-in malalignment of the upper side stay in relation to the lower side stay, with the undercarriage in the up position. This is achieved as follows:—

(a) Assemble the side stays unconnected at the knuckle joint and with the

laminated shims on the lower side stay equally disposed.

(b) Tie the upper side stay in the fully up position, to the adjacent bracing.

(c) Tie the lower side stay, in the up position, to the oleo leg.

(d) Bring the undercarriage to the up position and support on suitable jacks.

(e) A straight-edge placed across the rams, in this position, must give the same inclinometer reading as when placed on the underside of the undercarriage hinge tube.

Notes . . .

(i) *These readings can only be taken with the undercarriage in the up position.*

◀ (ii) *Embodiment of Mod. 1300, which facilitates adjustment of the side stay relative to the main undercarriage, makes it easier to obtain clearance between the undercarriage wheel and the door when the undercarriage is retracted. Provided that such clearance is adequate the limits of malalignment specified in sub-para. (h), though desirable, are not absolutely essential.* ▶

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(f) Bring the lower and upper side stays together and measure the malalignment; should the lower side stay enter the upper side stay easily in the initial stage of this operation, check that there is no foul at full engagement. If there is foul at full engagement, or definite malalignment, this must be measured and taken into account when carrying out operation (h).

(g) Lower the undercarriage.

(h) Shim the upper side stay bearings as described in sub-para. (1) and (2) to give a forward malalignment of the upper side stay of from 0.04 to 0.06 in. after correcting or allowing for any initial malalignment discovered at operation (f).

(j) Complete the assembly of the undercarriage and doors and check that there is clearance between the door and the rear wheel when the undercarriage is locked up and the door closed tight.

Undercarriage frame removal (fig. 21 and 22)

65. At least two men are required for this operation. With the undercarriage lowered and the aircraft jacked, proceed as follows:—

- (1) Release the air pressure in the oleo struts (Sect. 2, Chap. 2).
- (2) Release all pressure in the hydraulic system (Sect. 3, Chap. 6).
- (3) Remove the clamp plate and disconnect the piping to the wheel brakes where the flexible piping attached to the rear oleo connects to the rigid piping on the under-surface of the undercarriage bay skin. A suitable receptacle must be kept in readiness to collect the fluid which will drain from the system during this operation. Blank off the pipe ends.
- (4) Remove the wheel (para. 69).
- (5) Remove the fixed door and flap from the undercarriage frame.

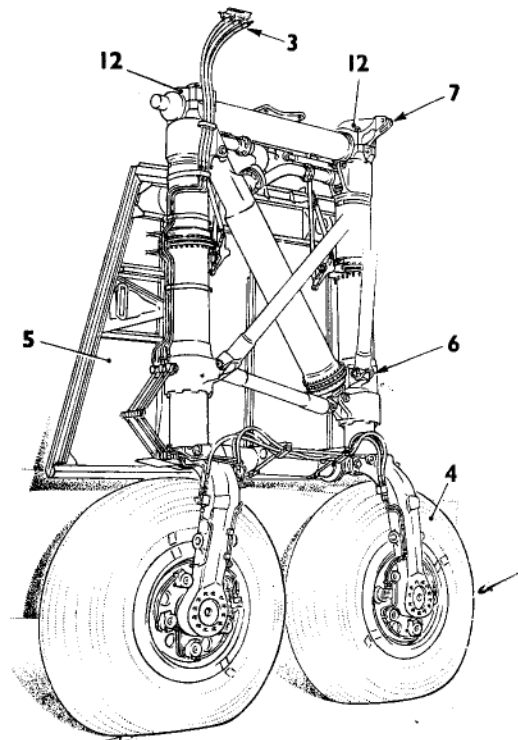


Fig. 21. Main undercarriage frame removal

- (6) Disconnect the lower side stays at their attachment to each oleo strut by removing the split pin, nut, shim and special pin. Let the side stays hang free.
- (7) Disconnect the actuator from its attachment to the oleo cap bracket by removing the split pin, nut and special pin, and lash the actuator to the structure.
- (8) Remove the U-bolt from the slinging beam, Ref. No. 26SR/95084, by undoing the securing nuts. Place the other end of the beam on the top surface of the undercarriage hinge tube, the protruding bolt (at the centre of the hinge tube) locating in the beam end block. Place the U-bolt over the side stay mounting tube and anchor it

to the slinging beam by the nuts previously removed (fig. 22).

(9) Fit the hoisting bar, Ref. No. 26SR/95165, across the side stay mounting lugs on each oleo strut. Secure the bar with the pins attached.

(10) Attach the main hook of a 30 cwt. pulley block and tackle to the slinging beam shackle.

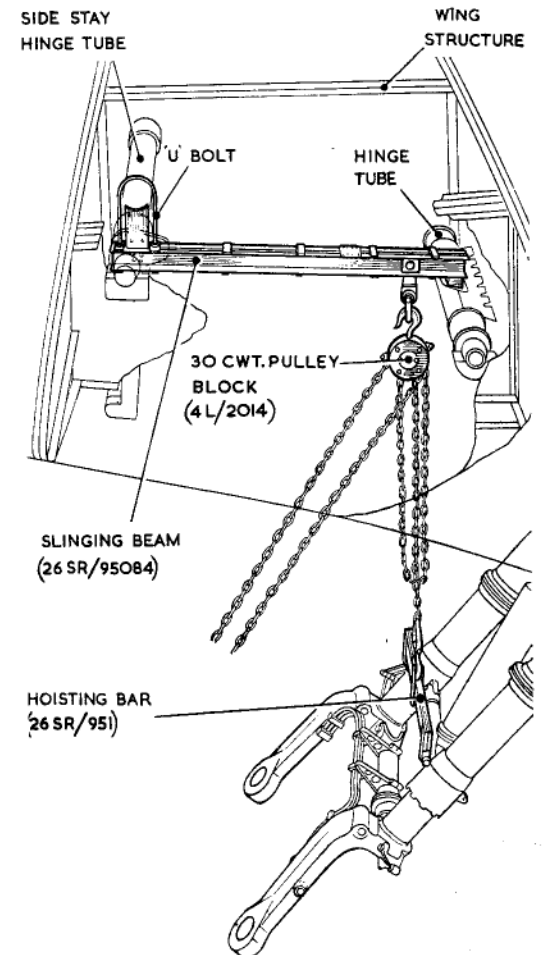


Fig. 22. Main undercarriage frame hoisting

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(11) Attach the lower hook to the hoisting bar lifting shackle and pull on the hoisting chain until the hoist is taking the weight of the undercarriage.

(12) Remove the caps securing the oleo struts to the hinge tube.

(13) Slowly lower the undercarriage onto a suitable trolley.

Undercarriage frame assembly

66. Before assembling the undercarriage to the aircraft the rubber bushes, bolt and washers securing the jury strut to the forward oleo must be removed and the jig pin, Ref. No. 26SR/95216, inserted in the vacated hole and secured. This is to ensure that the oleo strut centres do not vary when the undercarriage is assembled. The undercarriage can now be assembled to the aircraft, reversing the procedure given in para. 65. After assembly, the jig pin must be withdrawn and the bolt, washers and rubber bushes replaced.

Manual retraction of main undercarriage

(fig. 23)

67. After assembly, it will be necessary to raise and lower the undercarriage in order to effect adjustments and carry out checks. Raising and lowering for this purpose is done manually, using a 30 cwt. pulley block, Ref. No. 4L/2014, a special lifting bracket, Ref. No. 26SR/95440, attached to the inner plane structure at the chassis door jack fitting and centre hinge fitting at rib Stn. 240 and a lifting beam, Ref. No. 26SR/95441,

secured to the main wheel axles. The attachment of the lifting bracket at Stn. 240 is by means of special bolts, retained with the bracket by chandelier chain, whilst the lifting beam has suitably shaped plugs at its extremities that are inserted into the bores of the axles and retained in position by means of special bolts passing through the full length of the axles.

Hinge tube removal

68. With the undercarriage and main actuator removed proceed as follows:—

(1) Unbolt the stabilizer from the aft V-brace.

(2) Disconnect the front and rear stabilizers by removing the attachment bolts at the V-brace mounting plate on the hinge tube and at the corresponding corner brackets. Remove the stabilizers.

(3) Position the Minilift hoist on the top surface of the wing (fig. 18) and pass the hoist cable through the aperture until it aligns with the pickup bolt on the hinge tube.

(4) Screw the hoist cap, Ref. No. 26SR/95138, on to the protruding bolt at the V-brace mounting plate attachment to the hinge tube.

(5) Locate the ball-end of the hoist cable in the body of the hoist cap, and operate the Minilift until it takes the weight of the hinge tube.

(6) Remove the twenty 2 B.A. bolts secur-

ing the hinge tube web plate at its attachment to the cleats on the rib at Stn. 93.

(7) Remove No. 1 flap (Sect. 3, Chap. 2).

(8) Remove the outboard jet pipe (Sect. 4, Chap. 1).

(9) Remove the landing flap auxiliary gearbox (Sect. 3, Chap. 14).

(10) Remove the box bracing from the front of the auxiliary gearbox mounting bracket. This is secured by bolts and anchor nuts.

(11) Remove the bolt locking the trunnion nut to the hinge tube bearing.

◀ (12) Using the special spanner, Ref. No. 26SR/95047, remove the trunnion nut. ▶

(13) Remove the four countersunk-head bolts positioned approximately $8\frac{1}{2}$ in. from the rear spar trunnion forward face.

(14) Insert a box spanner in the end of the hinge tube until it locates on the extractor end nut. Turn the spanner clockwise until the rear trunnion end bearing slides into the hinge tube sufficiently to clear the trunnion housing.

(15) Slowly lower the free end of the hinge tube until the other end slides free of its housing.

(16) Continue lowering the hinge tube until it can be easily man-handled into a desired position. Protect the end bearing pieces by lightly smearing with grease, XG-275, and wrapping a rag around each.

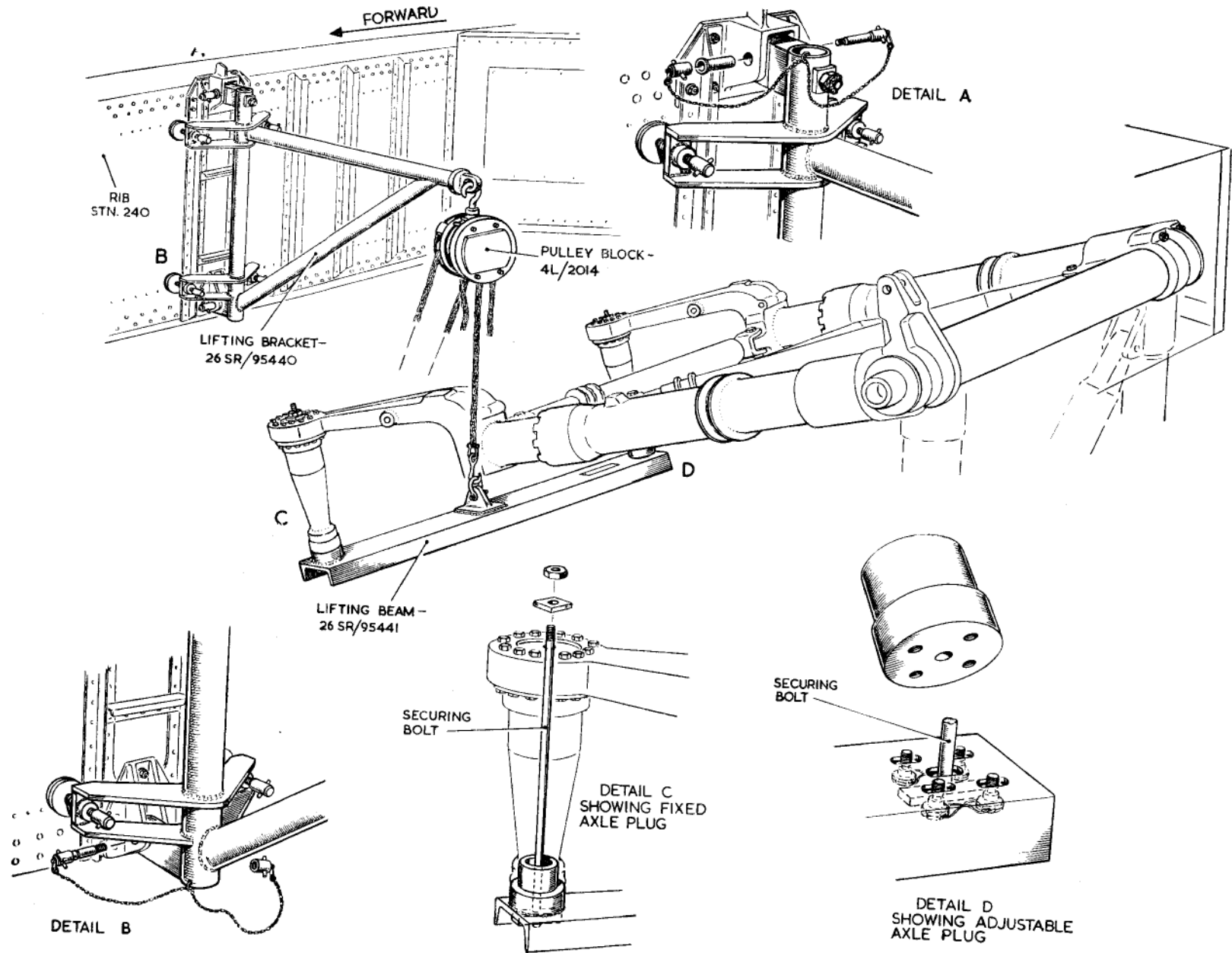


Fig. 23. Manual retraction of main undercarriage

Main wheel removal

69. By using the special equipment referred to in Sect. 2, Chap. 4, and in the table at the end of this Chap. 5, a main wheel may be removed without jacking the complete aircraft. A special jacking bracket, Ref. No. 26SR/95300, is attached to the main wheel half fork, and, by using a base plate and pillar jack, a wheel may be lifted clear of the ground. It is essential that all wheels are chocked before attempting wheel removal. With the wheel raised on the jack (max. lift $1\frac{1}{2}$ in. between tyre and ground if the bracket is used), remove the axle nut locking bolt, axle nut and washer, and withdraw the wheel, using extractor Ref. No. 26SR/95104.

70. In order to hold the brake discs in position during removal or replacement of a wheel, the adjusting screw at the end of each hydraulic cylinder should be tightened. After a wheel has been replaced, the adjusting screws must be slackened back $1\frac{1}{2}$ complete turns, i.e., 6 flats, before checking or adjusting the wheel for end float.

Main wheel assembly

71. The assembly of the main wheel to the undercarriage is a reversal of the removal operations except that, on fitting the axle nut, an end float has to be established under the nut. Proceed as follows:—

- (1) Fit the wheel into position and refit the axle nut and washer.
- (2) Free the brake discs by slackening the screws of the hydraulic cylinders and spin the wheel to ensure free rotation.
- (3) Fully tighten the axle nut to ensure positive seating of the wheel assembly.
- (4) Slacken the nut until the second pair of locking holes are aligned. This will ensure axial clearance of 0.005 to 0.008 in.
- (5) Fit the axle nut locking bolt and secure with a split pin.
- (6) Fully tighten the brake hydraulic cylinder

adjusting screws and slacken them back $1\frac{1}{2}$ turns.

Setting up the main undercarriage (fig. 2 and 3)

72. The upper and lower side stays are jig set, and must be retained in pairs. When they are fully extended, with knuckle joint closed and stop faces in contact, a geometrical lock is formed by the knuckle joint pin passing beyond a straight line joining the centres of the upper and lower side stay outer attachment bolts by a maximum of 0.10 in., and minimum 0.005 in. (fig. 2).

73. Before setting the down-lock micro switches, ensure that the control rod swivel fitting at the actuator trunnion retaining bolt on the driving sleeve will turn freely and that, with the main latch in the down-locked position, undercarriage actuator fully retracted and the dog faces on the side-stay tube assembly butting, the shackle pin securing the swivel fitting connecting rod to the down-lock operating rod is only just free to rotate or, in the worst conditions involving wear, has a clearance not exceeding 0.010 in. To set the undercarriage proceed as follows:—

- (1) Bench set the actuator as nearly as possible to the length of the actuator removed, and fit to the aircraft.
- (2) Inch the actuator until the dog-faces at the driving sleeve are butting. This can be checked by inserting a No. 30 drill shank (0.1285 in. dia.) into the setting hole (0.75 in. deep) in the reinforcing ring and driving sleeve dog.

Note . . .

Owing to a tendency for the reinforcing ring, through which the setting hole is drilled, to move relative to the cross-tube, a $\frac{1}{8}$ in. wide witness line is painted across the ring and tube adjacent to the setting hole.

- (3) Adjust the down-lock operating rod so that the main and emergency latches are

fully engaged and the shackle pin securing the operating rod link to the swivel link is free, with a maximum clearance of 0.010 in.

(4) Adjust the undercarriage indicator lamp microswitches so that they operate when the latches have a minimum of 75 per cent engagement. This position can be predetermined with the leg fully down, and a locally-made gauge inserted between the latch and the side stay, to retain the latch in position whilst the adjustment is made. All microswitch settings must be checked by lamp and battery.

(5) Adjust the knuckle joint microswitch operating the horn by inserting a shim (0.080 in.) between the switch plunger and stop, and adjusting the operating screw until the horn just operates. Lock the adjuster screw and remove the shim.

(6) Adjust the MAIN and EMERGENCY down-lock microswitch clearances, on the forward upper side stay, to 0.050 in. and 0.025 in. respectively.

Note . . .

It is particularly important that these clearances are correctly set and that, in doing so, the gauge must be inserted at 90 deg. to the switch striker rod.

(7) Using an electrical test box, Ref. No. 26SR/95290, inch up the undercarriage for approx. one-third of its travel and then select DOWN on the actuator main motor, and 'power down' into the locked position. (For the description and method of using the test box see A.P.4377A, Vol. 1, Book 2, Chap. 2, App. 1).

Note . . .

If the test box is not available, inching up the undercarriage should be done manually (fig. 23).

During the test, check that the correct clearance is obtained between wheel and bay structure and between wheel and outer door (para. 50).

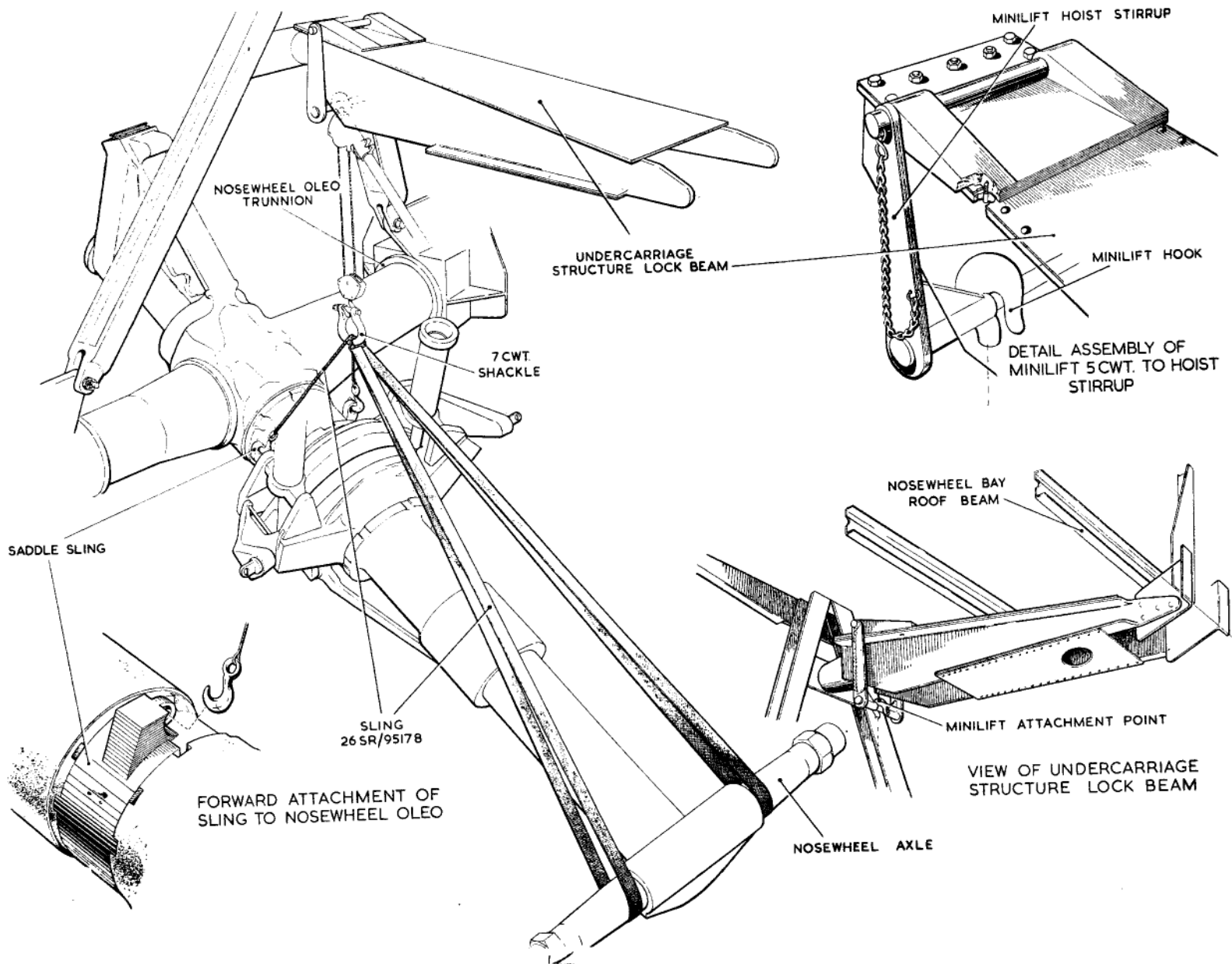


Fig. 25. Slinging the nose-wheel oleo

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Table 1
Special and standard tools and equipment

Ref. No.	Part No.	Description	Remarks
26SR/95290	67479-Sht. 663	Box, electrical and function testing	
26SR/95440	67479-Sht. 939	Bracket, lifting	
26SR/95165	67479-Sht. 255	Bar, hoisting, main undercarriage	} Manual retraction of main undercarriage
26SR/95084	67479-Sht. 53	Beam, slinging, main undercarriage	
26SR/95136	67479-Sht. 687	Girdle, hoisting	Main u/c side stay tubes
26SR/95137	67479-Sht. 99	Cable, hoisting	Main u/c actuators
26SR/95138	67479-Sht. 787	Cap, hoisting	Main u/c hinge tube assy.
26SR/95178	67479-Sht. 643	Sling, nose undercarriage	
26SR/95135	67479-Sht. 93	Tripod, hoist mounting	
26SR/95134	A/21/61/2	Hoist, Minilift, 450 lb.	
26SR/95336	67479-Sht. 733	Cable, jury, main undercarriage	
26SR/95337	67479-Sht. 735	Strut, jury, nose undercarriage	
26SR/95149	67479-Sht. 207	Spanner, main u/c axle nut	
26SR/95159	67479-1691	Spanner, nose wheel axle nut	
26SR/95205	67479-2147	Spanner, box	Main u/c hinge tube rear nut
26SR/95051	66079-1561	Spanner	Forward nut on main u/c side stay tubes
26SR/95311	N.T.4774	Spanner, key	Rotax actuator tension pin
26SR/95269	67479-Sht. 633	Tool, aligning and assembly	Side stay hinge tube, rear end
26SR/95198	67479-1973	Tool, assembly	Main u/c side stay hinge pin
26SR/95199	67479-1975	Tool, assembly	Bolt of diagonal stay above undercarriage
26SR/95200	67479-1977	Tool, assembly	Bottom bolt of u/c side stay
26SR/95216	67479-2179/81	Pin jig	Assy. main u/c frame to main hinge tube
26SR/95163	67479-Sht. 223	Pad, jacking, nose	Use at Stn. 370
26SR/95070	66079-Sht. 11	Plates, base	
◀ 26SR/95475	67479-Sht. 1047	Block, base, for nose jack at Stn. 370 ▶	} Jacking at Stn. 370 and wheel changing
4Q/2624	—	Jack, pillar, hydraulic, 25 ton	
4Q/2663	—	Adapter head Mk. 104	
26SR/95300	67479-Sht. 631	Bracket, jacking	Wheel changing
26SR/95104	A.5671	Extractor, main wheel	
26SR/95107	A.5660	Extractor, nose wheel	
7G/5083	A.10055	Fixture, brake alignment	
4L/2014	—	Blocks, pulley, 30 cwt.	Hoisting main undercarriage
◀ 26SR/95047	66079-2017	Spanner, special	For removing trunnion nut ▶

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