Chapter 4

EJECTION SEAT, TYPE 3CS

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LIST OF ILLUSTRATIONS

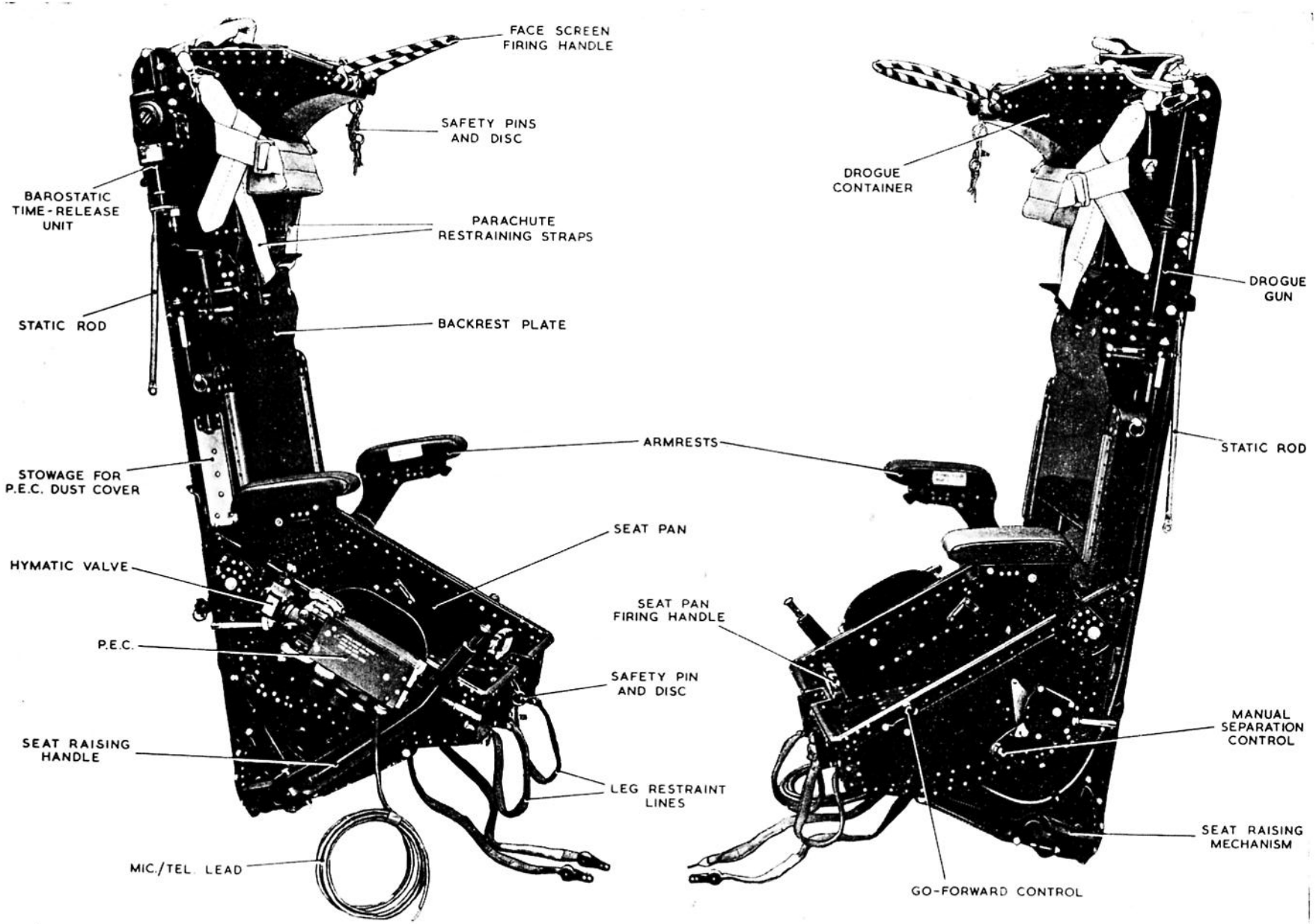

Fig. 1. Type 3CS ejection seat

Introduction

1. The Type 3CS ejection seat (Ref. No. 27L/50068) is installed in Canberra PR9 aircraft. The other crew member occupies a Type 4QS ejection seat, full details of which will be found in A.P.4288D, Vol. 1.

GENERAL DESCRIPTION

2. The seat structure complete with seat pan (fig. 1) slides during ejection on four rollers in a guide rail bolted to the aircraft structure. It is propelled by the cartridge-operated ejection gun which is located within the hollow guide rail.

3. The canopy is jettisoned and the ejection gun is fired by the action of pulling down the face screen firing handle situated immediately above the drogue container. This handle draws out from the drogue container a flexible screen which covers the occupant's face and protects it from the effects of the airstream. It also holds his head back against the headrest pad and so prevents it from jerking forward during ejection. Spring-loaded plungers prevent the face screen from being sucked out by its compartment by the airstream should the canopy be slid back during flight. Attached to the face screen is a bifurcated cable connected to the canopy jettison and time-delayed ejection gun firing unit. When the face screen is drawn right down over the face, the cable withdraws the sear from the firing unit and the canopy jettison cartridge is fired; at the same time the cable operates the time-delay mechanism trip lever and, after 1 sec., the ejection gun is fired. The face screen and firing cable are proportioned in such a manner that the firing unit will be operated whether the occupant is wearing a protective helmet or not.

4. The seat pan accommodates a personal survival pack containing a dinghy and other items of survival equipment and can be adjusted for height by a hinged handle on the starboard side of the seat structure. The seat pan moves relative to the headrest and can thus accommodate different body lengths, at the same time ensuring that the occupant's head is always correctly located whatever the position of the seat pan. The weight of the occupant is counterbalanced by two elastic cords (fig. 2). Borne on the front of the seat pan is the seat pan firing handle which is used only if it is impossible to reach the face screen firing handle, e.g., in conditions of high 'G'.

5. A leg restraining device is incorporated to ensure that the occupant's legs are drawn back automatically and restrained close to the seat pan. This provides leg clearance during ejection and also prevents injury from the legs being blown apart by the airstream after the seat has emerged from the cockpit.

6. A horseshoe-shaped parachute assembly is supported on a bracket immediately below the drogue container and is held in position by two restraining straps, integral with which is a wedge pad for the occupant's head. The straps terminate in metal end rings; the upper ones are held by pins in the fork ends on either side of the drogue container and the lower ones are located on a lug which engages with a plunger in the 25G beam.

7. The starboard side of the seat pan carries the seat portion of the personal equipment connector (P.E.C.), the Hymatic valve, the seat raising handle and the emergency oxygen manual control knob.

8. The automatic system comprises a barostatic time-release unit which controls the opening of the scissor shackle at the top of the seat structure and also operates the linkage which frees the harness, leg restraining device and the P.E.C.

9. The emergency oxygen bottle is held in a bracket on the starboard side of the seat structure at the rear of the seat pan. A safety pin (to which is attached a cable and a large red wooden block) is inserted in the operating head of the bottle to prevent inadvertent operation; this pin is removed before flight.

Safety precautions

10. A red warning disc carrying two safety pins is provided; when the aircraft is parked, one of the pins is passed down through a hole in the front of the drogue container to lock the face screen firing handle against any possibility of inadvertent withdrawal. Another pin and warning disc is provided to lock the seat pan firing handle in a similar manner. The static rods which operate the drogue gun and time-release mechanisms permit a limited amount of seat movement before the sears are withdrawn.

11. Before entering the cockpit, or before any servicing is commenced on or near the seat, the escape system is to be made safe in accordance with current instructions.

COMMON COMPONENTS

12. These components are fully described in A.P.4288A, Vol. 1, but the general details are being included in this chapter for reference.

Ejection gun

13. The Type 3C, Mk. 1 ejection gun has a stroke of 72 in., with an ejection velocity of 80 ft/sec., and consists of three telescopic tubes. The outer or cylinder tube is attached at its lower end to the bottom mounting block fitted in the guide rail and the inner or piston tube is attached to the upper end of the top cross-beam of the seat frame; the intermediate piston tube is situated between the other two and its purpose is to lengthen the stroke and to offer restraint against bending loads imposed on the gun by the airstream. The explosive is contained in five cartridges, a primary cartridge and four secondary cartridges.

14. At the upper end of the inner piston tube is a breech containing the firing body and the primary cartridge. When the time-delayed firing unit operates, it withdraws from the firing body a wedge-shaped sear; the movement of the sear first compresses the firing pin spring and then

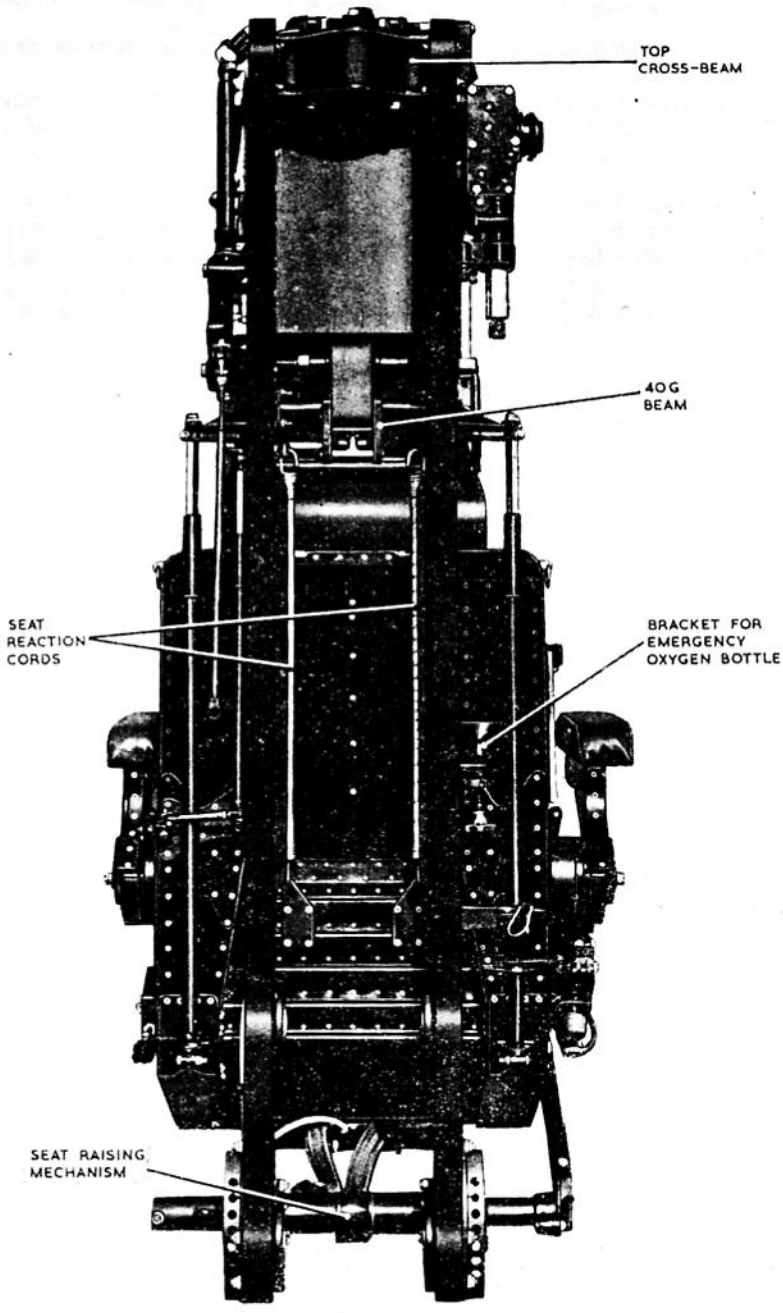

Fig. 2. Details at rear of seat

releases the firing pin to strike the percussion cap of the primary cartridge. The gas pressure frees a release piston, and the two piston tubes are propelled upwards, so uncovering two pairs of ports in turn so that the secondary cartridges are ignited by the flame of the primary cartridge.

Drogue gun

15. The Type 4, Mk. 1 drogue gun is bolted to the port side beam of the seat structure and consists of a time-delay mechanism, a barrel and a piston. As the seat ascends the guide rail during ejection, a static rod withdraws a sear and the time-delay mechanism is tripped. After 0·5 sec. delay, a small cartridge is detonated, the gas pressure shears a split pin which holds the piston in position in the barrel and the piston is ejected. Attached to the upper end of the piston is the drogue withdrawal line which deploys the drogues.

Time-delayed firing unit

16. This unit provides the power for jettisoning the cockpit canopy and incorporates a time-delay mechanism which fires the main ejection gun approximately 1 sec. after the canopy gun has fired. The gun and delay mechanism are contained in separate compartments within a casing which is mounted on the pilot's bulkhead.

17. The gun barrel embodies a breech and firing body similar to those of the main ejection gun and at its base is a threaded union which, with a soft metal washer, forms a gas-tight connection with a pipe which communicates with two piston-type jacks which jettison the canopy.

18. This mechanism consists of a spring-loaded rack (fig. 1) in engagement with a train of gears which is regulated by an escapement in the form of a star wheel and an oscillating pallet. The operating mechanism is mounted between two lugs integral with the casing and comprises two levers and a pawl free to rotate about shafts (in the uncocked condition). When the unit is cocked, the trip lever is held in an over-centre position, so restraining any movement of the rack and consequently of the gear train. The main sear release lever incorporates an articulated link which engages with the ejection gun sear. The main firing cable from the firing handle is bifurcated at the rear of the conduit; one cable is connected to the canopy gun sear and the other to the trip lever.

19. When the main firing handle is pulled for the purpose of ejection, the first part of the cable travel withdraws the sear from the canopy gun firing body, the cartridge is detonated and the gases pass through piping to the two piston-type canopy jettison jacks. The second part of the cable travel rotates the pawl which forces the trip lever from its over-centre position; this brings the roller on top of the rack and allows the time-delay mechanism to function. The rack rises under the action of its spring and a cut-away portion of the trip lever boss engages with a cut-away portion of the sear release lever boss. The last part of the lever travel withdraws the sear from the ejection gun firing body, the gun is fired and the seat and occupant are ejected from the aircraft immediately.

Barostatic time-release unit

20. The Type 5, Mk. 1 barostatic time-release unit is mounted at the top of the starboard seat beam and its purpose is to free the drogues from the scissor shackle and to release the harness. As the seat ascends the guide rail during ejection, a static rod withdraws a firing pin and a time-relay mechanism commences to function provided ejection has occurred below approximately 10,000 ft. Above this height a barostat remains in engagement with a train of gears and prevents the mechanism from operating until this height is reached. The mechanism provides a delay of 1·25 sec., but a G controller switch is incorporated which delays operation still further if the speed at the time of ejection is too high for safe parachute deployment.

Drogue assembly

21. This assembly when developed first checks the forward speed and then stabilises the seat and occupant. It consists of a controller drogue with a diameter of 22 in. and a main drogue 5 ft. in diameter. The controller drogue is connected to the main drogue by nylon tape and the main is connected to the drogue shackle by nylon shroud lines.

Personal equipment connector

22. This assembly is provided to couple and uncouple personal services such as oxygen, A.V.S., anti-g suit and Mic/Tel. to and from the appropriate aircraft supplies by a single action in each instance. On ejection, all services except the emergency oxygen are disconnected and sealed off automatically.

23. The assembly consists of three main parts—the aircraft component, the seat component and the personal component. At all times the seat component remains bolted to the starboard side of the seat pan and so, on ejection, the seat and aircraft components separate. Subsequent to ejection, after the time-release unit has operated, the personal and seat components separate and the leg restraint lines are freed.

Hymatic valve

24. The Hymatic valve, Type RV51/2 is provided to control the pressure of oxygen supplied from a continuous flow type of emergency oxygen system for pressure breathing. It performs this function by providing for the outward relief of excess pressure and inward venting when the pressure in the system drops. A non-return valve isolates the emergency oxygen system (when not in use) from the normal oxygen supply.

SEAT STRUCTURE

25. The seat structure is made almost entirely of light alloy. The main frame is built up from a pair

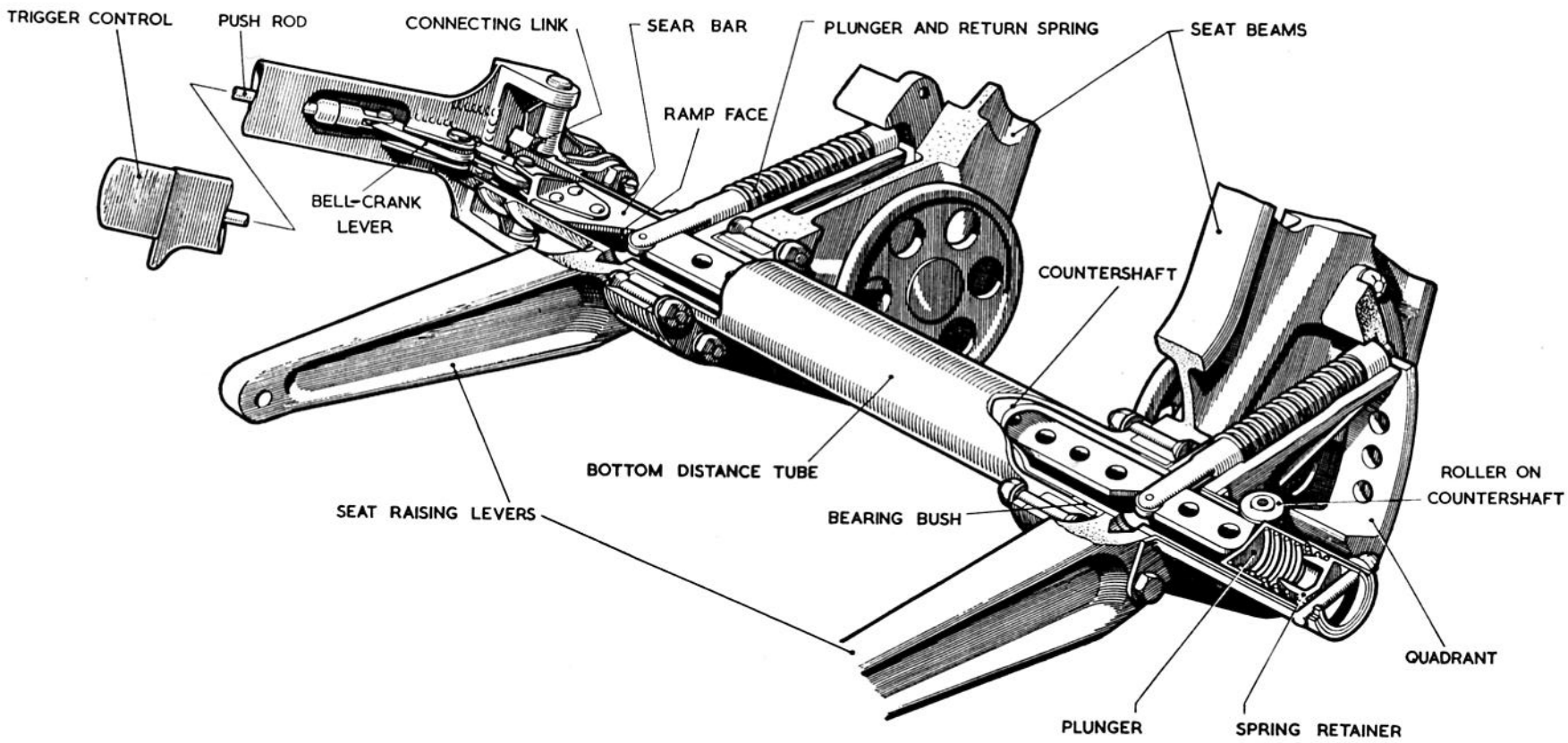

Fig. 3. Details of seat raising mechanism

of side beams connected at the top by a cross-beam which receives the thrust of the ejection gun piston, and at the bottom by a cross-shaft through which passes the countershaft carrying the seat raising levers and handle. Each side beam carries at its lower end two of the rollers which engage with the guide rail. The upper rollers leave the guide rail at the moment that the ejection gun intermediate piston tube reaches the end of its stroke.

26. The seat raising mechanism (fig. 3) is operated by the seat raising handle; this is hinged and spring-loaded sideways against the side of the seat to reduce the overall width. Depression of the trigger control, through the sear lever and connecting link, displaces axially the sear bar. This causes rollers on the pair of spring-loaded plungers to ride up the ramp faces and withdraws the plungers from engagement with the quadrants. Rotation of the countershaft by the handle then raises or lowers the seat, the weight being counterbalanced by the elastic cords. Release of the trigger control allows the plungers to engage the nearest holes in the quadrant and so locks the mechanism in the desired position. Five positions are provided, with a total adjustment of 4 in. The seat pan is supported on the seat raising levers and restrained at its upper corners by two blocks which slide in guides machined in the side beams.

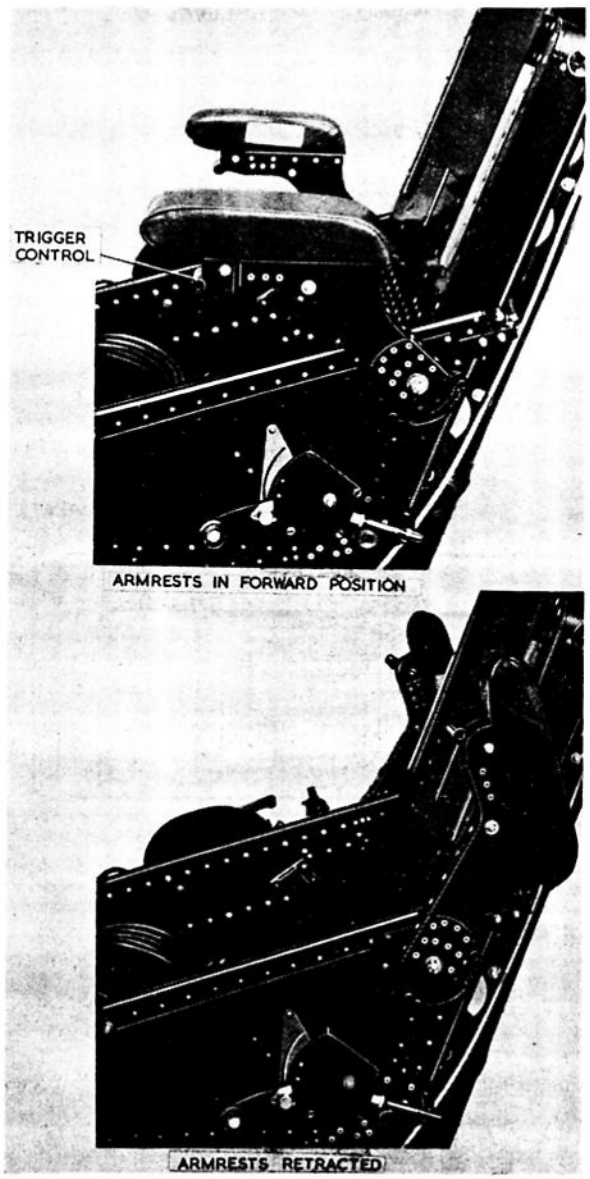

Fig. 4. Retraction of armrests

27. Two armrests are mounted at the rear of the seat pan. Each armrest can be retracted freely (fig. 4) but, by operating the lever (fig. 5), any one of four forward positions can be selected. Movement of the trigger is transmitted by a tension link to the bell-crank lever and thence by the operating rod to the spring-loaded plunger which can engage one of four segments machined on the inside face of a semi-circular quadrant on the seat structure.

28. The drogue container is a riveted sheet metal box mounted at the top of the seat structure. The face screen firing handle is fitted to the front edge of the container and is retained by two spring-loaded plungers. The face screen is retained in its own compartment in the container by two nylon cords which pass through conduits and are secured at the rear by two pins. These pins are withdrawn by a lifting line after the scissor shackle has opened, so freeing the face screen, firing handle and parachute restraining straps. The drogues and shroud lines are stowed in a separate compartment at the rear of the face screen.

29. The top of the drogue container is closed by four fabric flaps which normally retain the drogues in their stowage. They are threaded on to a cone in a pre-determined order and locked by a pin which is fitted part-way along the drogue withdrawal line. A No. 8 cord safety tie prevents inadvertent withdrawal of the locking pin, and a further No. 8 cord tie is secured between the drogue shackle and the cone on the underside of the pin. This tie is introduced to prevent any movement of the scissor shackle in an upward direction if the canopy is opened for any reason during flight.

Important . . .

The drogue withdrawal line MUST *pass over the white shroud lines and the black P.V.C. lifting line so that the drogues can be withdrawn by the drogue gun piston without entanglement.*

Release linkage

30. When the time-release unit is tripped by the static rod (fig. 6) the descending harness release plunger strikes a pad at the end of the harness release lever which, in swivelling downwards, operates the linkage; simultaneously the scissor shackle is freed and so releases the lifting line which in turn frees the parachute restraining straps and the face screen. The vertical link of the mechanism embodies a slot and, as the link descends, it

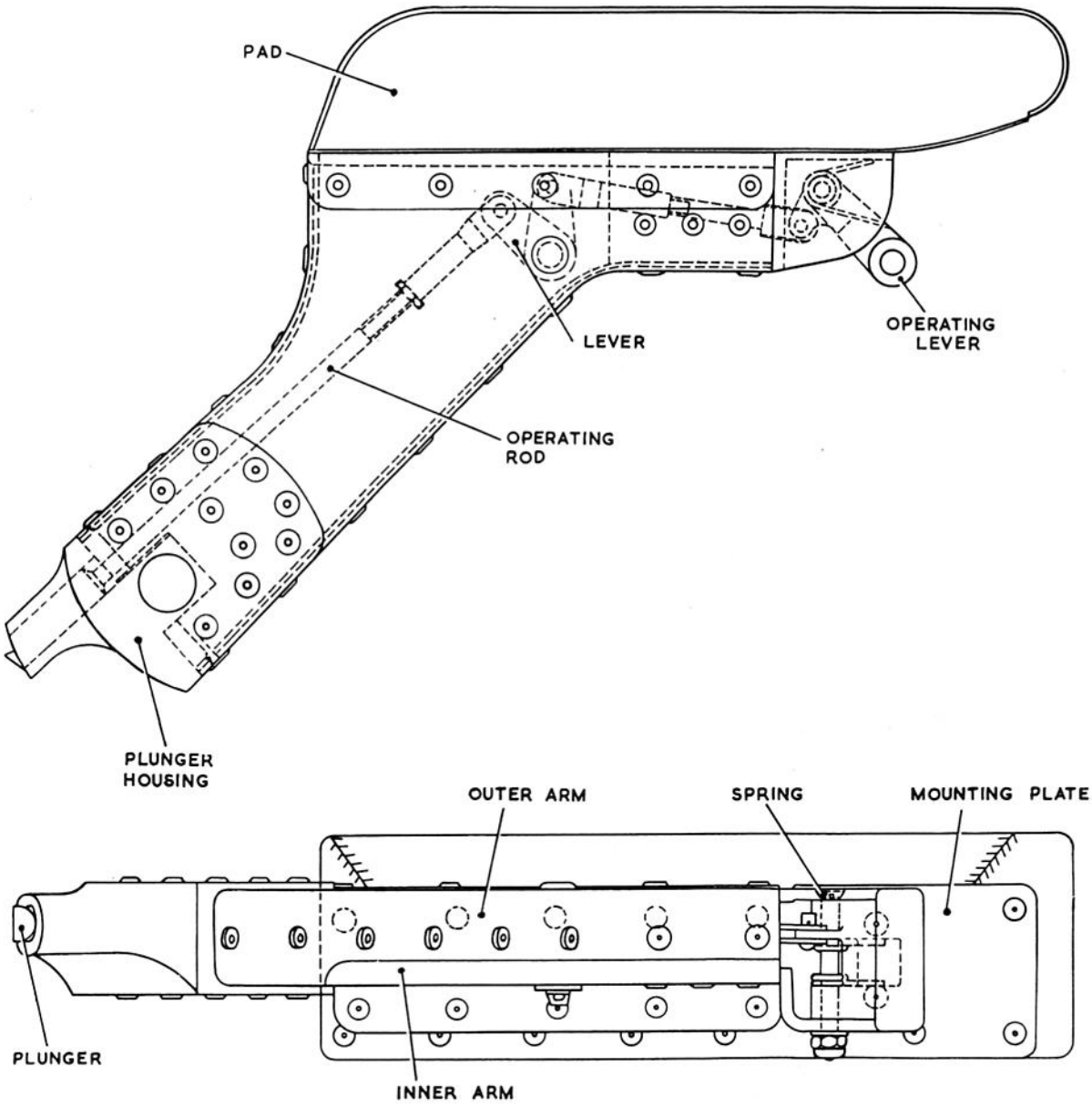

Fig. 5. Details of armrest

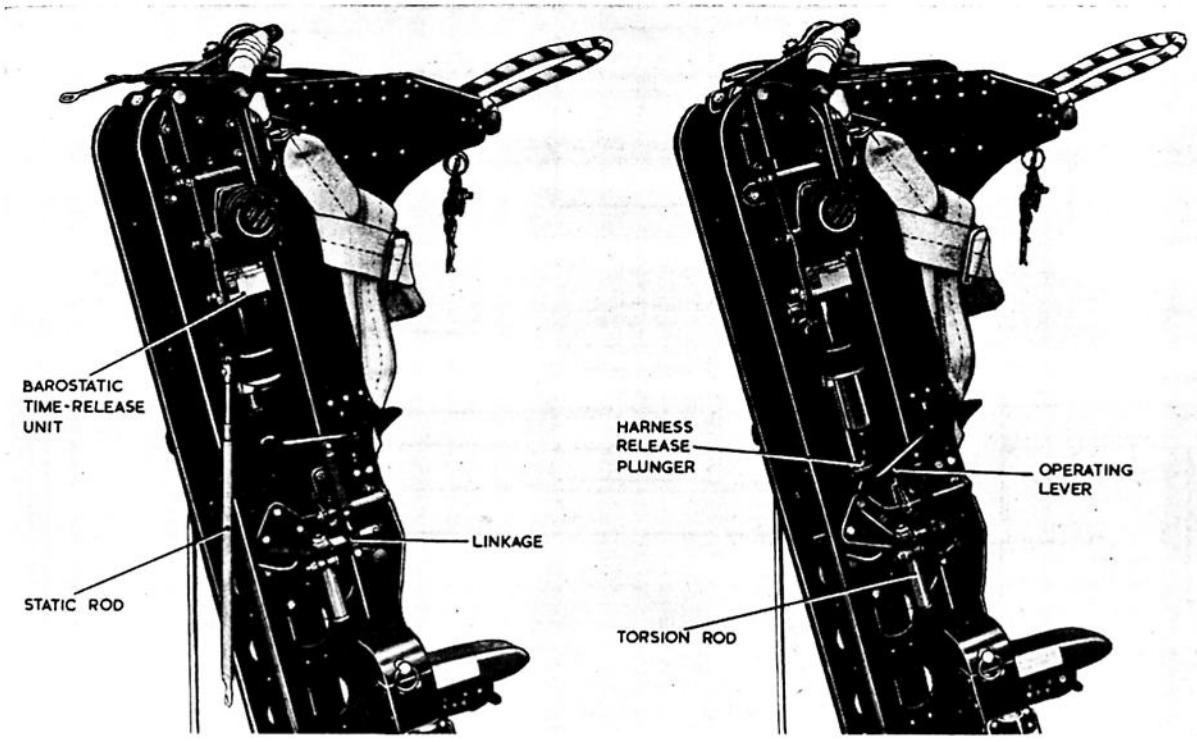

Fig. 6. Action of time-release unit

withdraws the harness restraining plunger and also actuates a bell-crank lever which transmits the motion to a pair of torsion rods which free the leg restraining cords. A manual separation control on the port side of the seat pan is coupled with this linkage, so that the occupant can free himself without ejection (for ditching, for example).

31. The safety harness release mechanism with some details of the linkage is shown in fig. 7. The end of the harness with its lug is held by a locking plunger and the other end of the strap passes over a roller, over a snub lever and round a spring-loaded drum. Reference to the centre diagram of fig. 7 shows how the harness strap is locked by the radiused top of the spring-loaded snub lever in the forward direction, but is free to pass to the rear under the action of the spring-loaded drum. A manually-operated lever (called the 'Go forward' lever) on the port side of the seat pan enables the occupant to free the snub lever and to lean forward in the cockpit; the harness returns automatically to the rearmost position and remains locked when the occupant leans back again.

32. The release linkage is connected to the seat portion of the P.E.C. in such a manner that whenever the manual separation lever is used (or the linkage is operated by the time-release unit after ejection) the personal portion of the P.E.C. and the leg restraining cords are freed automatically.

Leg restraining device

33. The leg restraining cords pass through snubbing units on the underside of the seat pan (fig. 8). The lower ends of the cords are anchored to the aircraft floor in the normal manner, but the upper ends of the cords terminate in fittings which engage in two taper plug assemblies. Each assembly contains a spring-loaded plug or plunger specially shaped to retain the fittings at the ends of the cords. A torque tube assembly carried in bearings on the front of the seat pan has two small levers to raise the plugs against the spring tension to free the ends of the leg restraining cords. The torque tube assembly is interconnected with the release mechanism by a rod connected to a bell-crank; it is also connected with the seat portion of the P.E.C.

GUIDE RAIL

34. The guide rail (Ref. No. 27L/50069) consists of a single extrusion bolted to the aircraft structure and normally it should not be necessary to remove it. Built into it towards its lower end is a block which receives the thrust of the ejection gun cylinder and incorporates the bottom latch which retains the cylinder tube. The slots in the upper end of the guide rail receive the seat cross-beam and restrain the forward impulse of the seat in the event of a crash landing. The upper rear face of the guide rail is shaped and drilled to accommodate the canopy jettison and time-delayed ejection gun firing unit.

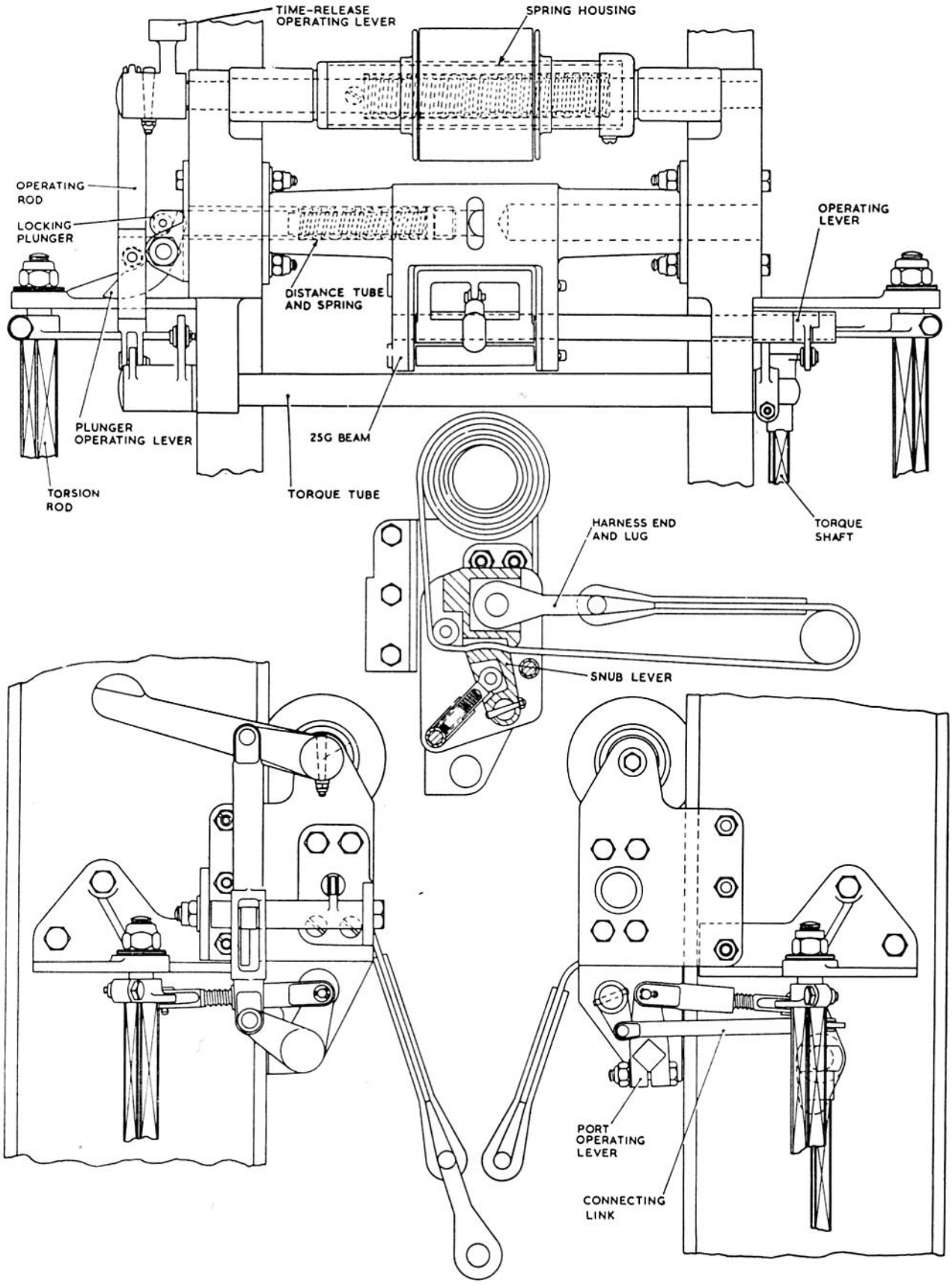

Fig. 7. Details of harness release mechanism

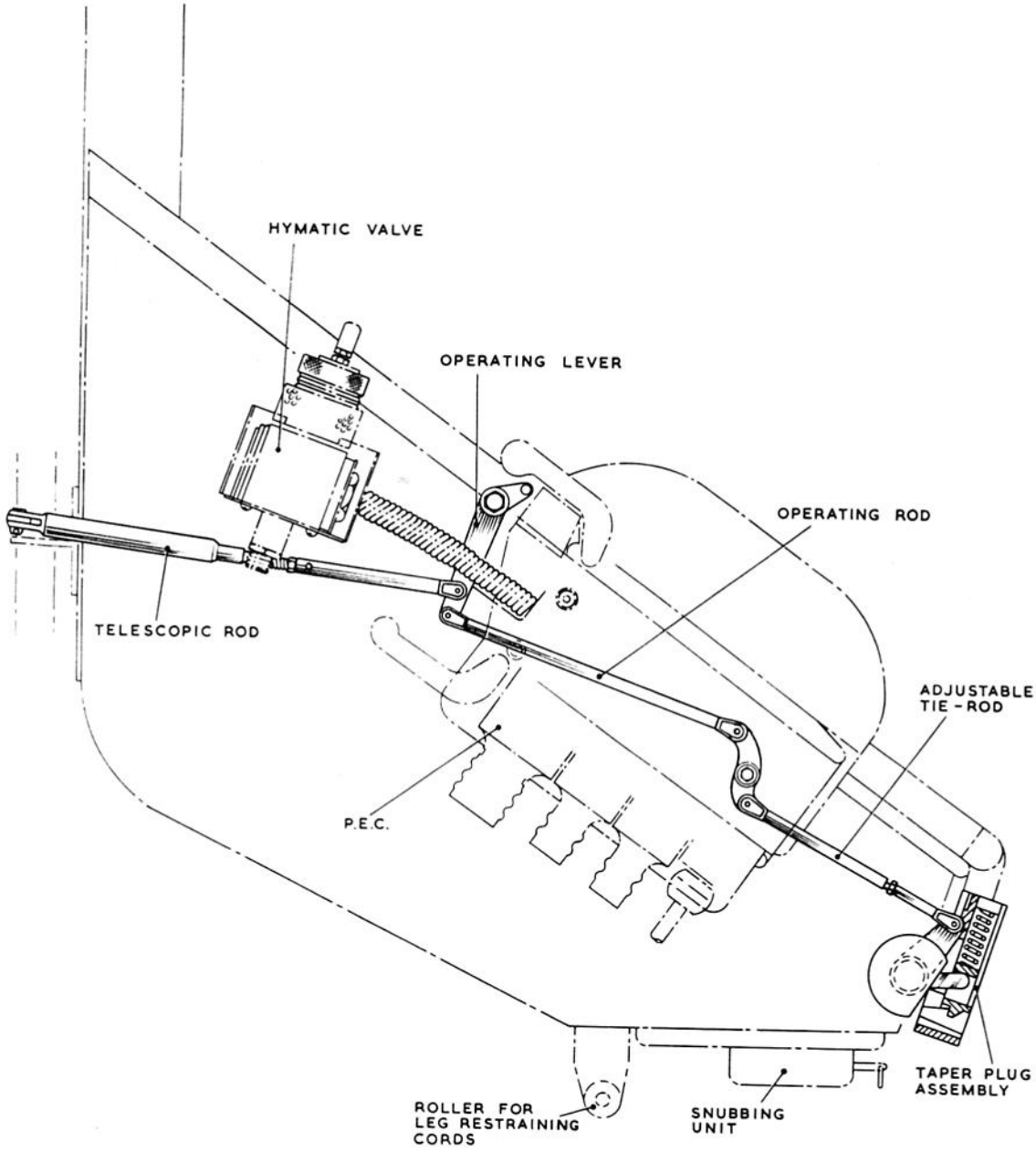

Fig. 8. Details of leg restraining cord release mechanism

SERVICING

Common components

35. At the six-monthly and annual servicings of the ejection seat, service the ejection gun, drogue gun, time-delayed firing unit, barostatic time-release unit, drogue assembly and P.E.C. in accordance with the instructions given in A.P.4288A, Vol. 1 and Vol. 5.

Servicing the seat structure

To remove the seat pan

36. (1) Raise the seat to the top position and and release the elastic reaction cords.

(2) Remove the bolts which secure the top of the backrest plate.

(3) Lower the seat pan to the bottom position and slide out the backrest plate.

(4) Disconnect the harness release torque tube on the port side.

(5) Remove the seat pan firing handle, remove the cable clamp and pull the cable free from the seat pan.

(6) Disconnect the parallel motion from the starboard main beam.

(7) Remove the locking wire from the two spring-loaded plungers at the top of the seat pan. Pull the plungers outwards simultaneously and hinge the seat pan forwards.

(8) Remove the two bolts from the ends of the seat raising levers and remove the seat pan.

(9) If necessary, separate the armrests from the seat pan by removing the circlips with the special pliers and withdrawing each armrest from its respective stub-shaft.

To dismantle the seat raising mechanism

37. (1) Remove the 2 B.A. lock-nut and tap out the taper pin from the port end of the countershaft. Remove the roller from the countershaft fitting. Do *not* remove the $\frac{1}{4}$ in. B.S.F. bolts from the faces of the seat raising lever bosses.

(2) Remove the two quadrants by removing the four lock-nuts on each quadrant and depressing the trigger control on the seat raising handle to free the plungers as the quadrants are withdrawn; the four bolts remain in position.

(3) Remove the seat raising handle by removing the split pin and tapping out the seat raising handle hinge pin.

(4) Push up the two plungers simultaneously and pull out the sear bar from the starboard side.

(5) Remove both plungers and springs and withdraw the countershaft to starboard out of the port seat raising lever and countershaft bearings. Remove the spring retainer, spring and plunger from the end of the countershaft and, if necessary, the starboard seat raising lever.

To examine the seat raising mechanism

38. (1) Check that all components are free from corrosion and that all rollers rotate freely without excessive slackness on their pins.

(2) Check that the seat bar is straight in both planes and that it is free from wear on the ramp faces.

(3) Check that the locking plungers and springs move freely in their housings in the seat raising levers.

To assemble the seat raising mechanism

Note . . .

Lubricate all parts during assembly with grease XG–275.

39. (1) Pass the countershaft (with the seat raising lever attached) through the bearings in the side beams, and pass the port seat raising lever (with the countershaft end fitting attached) on to the shaft. Assemble the roller and split pin.

(2) Insert the locking plungers and springs into the seat raising levers and, whilst depressing each plunger in turn, insert the sear bar into the countershaft (passing it through the slots in the locking plungers). *Ensure that the end of the sear bar engages the port countershaft roller.*

(3) Insert the plunger, spring and spring retainer into the end of the countershaft; insert the taper pin and lock-nut.

(4) Fit the quadrants and the seat raising handle.

To fit the seat pan

40. (1) If the armrests have been removed for servicing, fit them by sliding each one over its respective stub-shaft and inserting the circlips (using the special pliers).

(2) Fit the two bolts which connect the seat pan into the seat raising levers.

(3) Hinge the seat pan backwards into position, insert the two spring-loaded plungers into the guides in the side beams and lock with 20 S.W.G. non-corrodible steel locking wire.

(4) Connect the parallel motion on the starboard main beam.

(5) Fit the cable clamp and the seat pan firing handle.

(6) Connect the harness release torque tube on the port side.

(7) With the seat pan in the bottom position, slide the backrest plate into position and fit the securing bolts.

(8) Raise the seat pan to the top position and fit the two seat reaction cords.

(9) Check (by operation) that the seat locks in all positions.

Important

The seat raising mechanism must NOT *be operated with the manual separation lever in the* UP *(operated) position.*

To examine the parallel motion linkage and harness release locks

41. (1) Examine the parallel motion linkage, levers and torque tubes for damage, bowing and security of attachment.

(2) Examine for freedom of movement by depressing the 'go forward' lever and manual separation lever in turn.

(3) Lightly lubricate all moving parts with oil OM-13.

Servicing the face screen

To examine the face screen

42. (1) Pull out the main firing handle to its full extent (left-hand diagram, fig. 9) and examine the fabric of the face screen for damage and deterioration.

(2) Check for security of attachment of the front edge to the firing handle and of the nylon tapes at the rear. Check the security of attachment of the eye ends at the rear of the tapes.

(3) Examine the attachment of the firing cable to the face screen for security, and the cable itself for damage from kinking or broken strands.

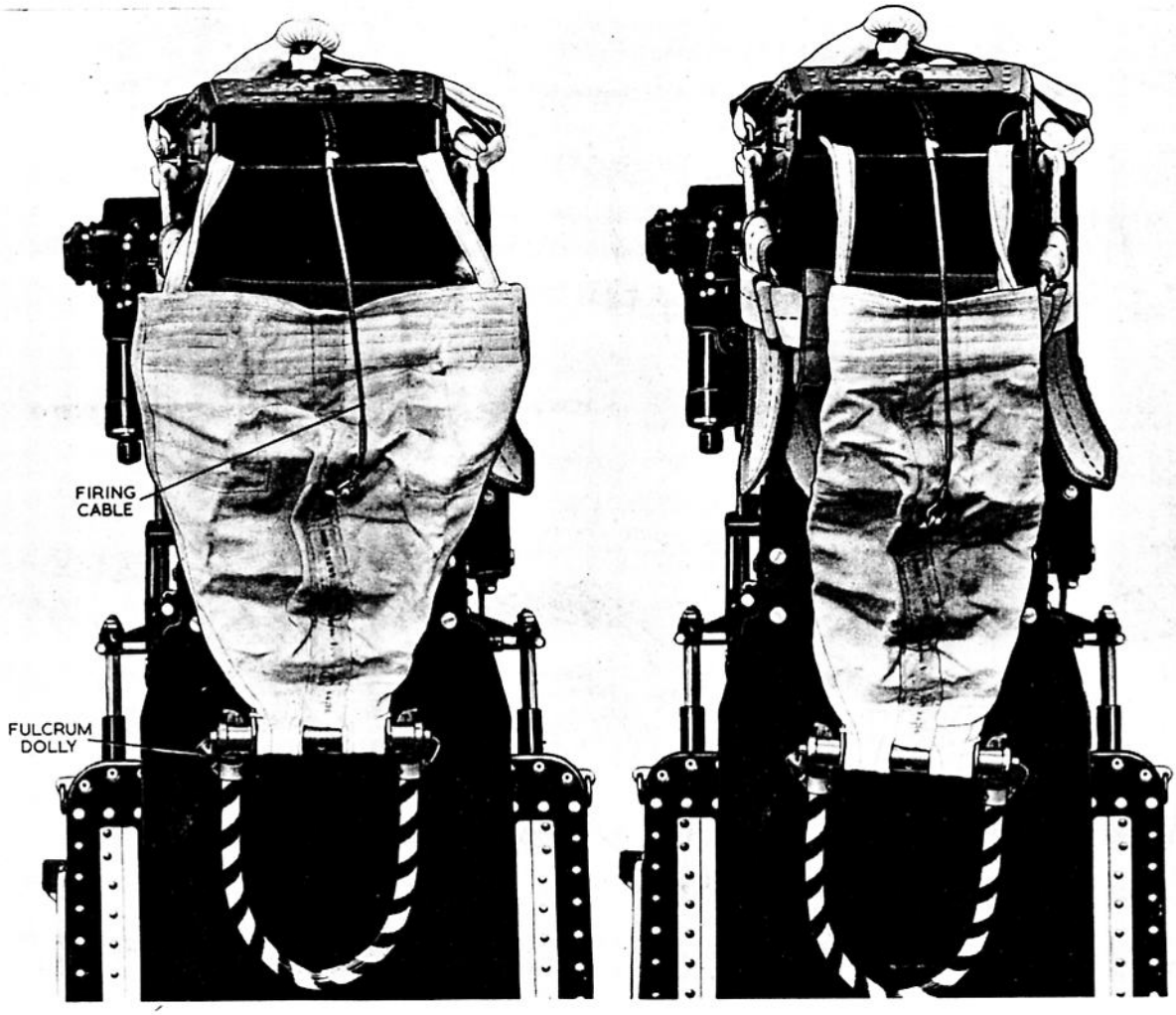

Fig. 9. Folding the face screen

To pack the face screen

43. (1) Fold the face screen into two double folds (one each side) to reduce the width so that the fabric will pass through the slot in front of the drogue container (right-hand diagram, fig. 9).

(2) Insert the face screen into the container and, if the firing cable has been removed from the container, thread it through the aperture in the front flap, pass it (together with the alternative firing cable) over the rear flap and over the lines and then connect it to the ejection gun sear (Action 4, fig. 10).

(3) Pack the face screen into its compartment in a series of double folds approximately the width of the slot. Press well to the rear all the time.

Warning

Whenever a face screen is re-packed (or the firing cable is connected to the ejection gun sear) ensure that the exposed firing cable is kept as short as possible between the sear and the drogue container, i.e., only leave sufficient cable to reach the sear. If not, there is a serious danger of snagging when the firing cable is pulled, possibly resulting in non-firing of the ejection gun.

(4) Press the folds well into the housing and ensure that the forward outer edges of the face screen are pressed behind the plunger housings; *this is most important.*

(5) Insert the locking plungers into their socket and press home the plungers until they lock in position.

(6) Check that the rear ends of the nylon tapes are correctly secured by the retaining pins.

Note . . .

The eye ends of the tapes are placed on top of those for the parachute harness straps.

Firing control operating loads

44. The current maximum pull-off loads for the firing controls are 45 lb. and 65 lb. for the face screen and seat pan firing handles. The lower limit for both firing controls is 20 lb.

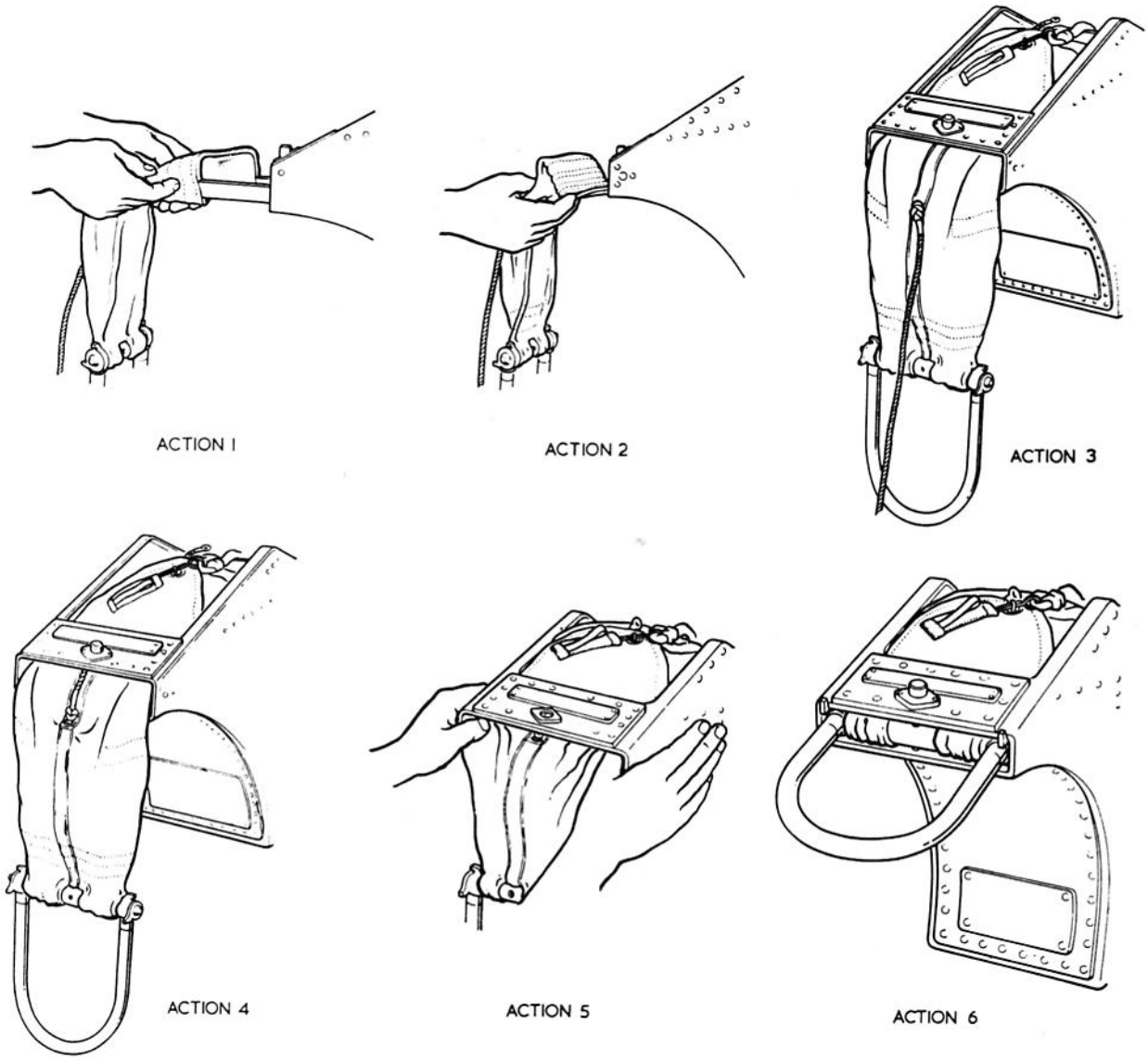

Fig. 10. Packing the face screen

45. Having attached the spring balance, the following precautions are to be taken:—

(1) Care is to be taken that the load is measured by a steady pull in a direct line with the run of firing cable.

(2) The load is to be obtained by taking the average of three successive tests on each firing handle.

(3) The tests are to be carried out in the aircraft with the firing controls operating the complete escape system each time the ejection seat is installed after a bay servicing, or whenever a modication is embodied which affects the operation of the controls. Care is to be taken that the tests are phased in to the installation or modification procedure before any explosives (which are initiated by the controls) are loaded into the firing units or, where appropriate, connected to electrical firing circuits.

Concessions

46. Additional escape devices have been progressively coupled to the seat firing controls by modification action, consequently the pull-off loads have steadily increased until now they border on the upper permissible limits. As an interim measure it has been decided to raise the maximum limits to 65 lb. and 85 lb. for the face screen and seat pan firing handles respectively. This concession is only to be applied after genuine efforts have been made during servicing operations (*without resort to unauthorised lubrication or modification*) to achieve the current standards. For both handles the lower limit remains at 20 lb.

Examining the leg restraining device

47. (1) Ensure that the leg restraining cords are securely attached to the floor brackets by their quick-release pins (when the seat is installed in the aircraft).

Fig. 11. Safety tie

(2) With the personal equipment connector (P.E.C.) dust cover fitted, ensure that the cones on the ends of the leg restraining cords lock into their housings at the front of the seat pan.

(3) Ensure that the cones disengage when the P.E.C. dust cover is removed.

(4) Examine the cords for fraying or deterioration, particularly at the ends.

(5) Check the cords for freedom of movement through the snubbing units in a downward direction but complete restraint in the upward direction.

(6) Check the release buttons for correct operation.

(7) Fit the P.E.C. dust cover and engage the leg restraining cord cones in their housings.

Servicing the locking cone housings

48. (1) Remove the locking cone housing assemblies by removing the four nuts and bolts.

(2) Remove the springs and plungers from the housings.

(3) Clean and examine the assemblies for damage and corrosion. Lightly lubricate with grease XG-275.

(4) Replace the springs and plungers.

(5) Coat the bearing surfaces using pigmented varnish (Ref. No. 33C/1264) and refit the housing assemblies to the seat pan.

Testing the leg lines

49. Suspend the leg line by one end and attach a dead weight of 5 lb. to the other, taking care that

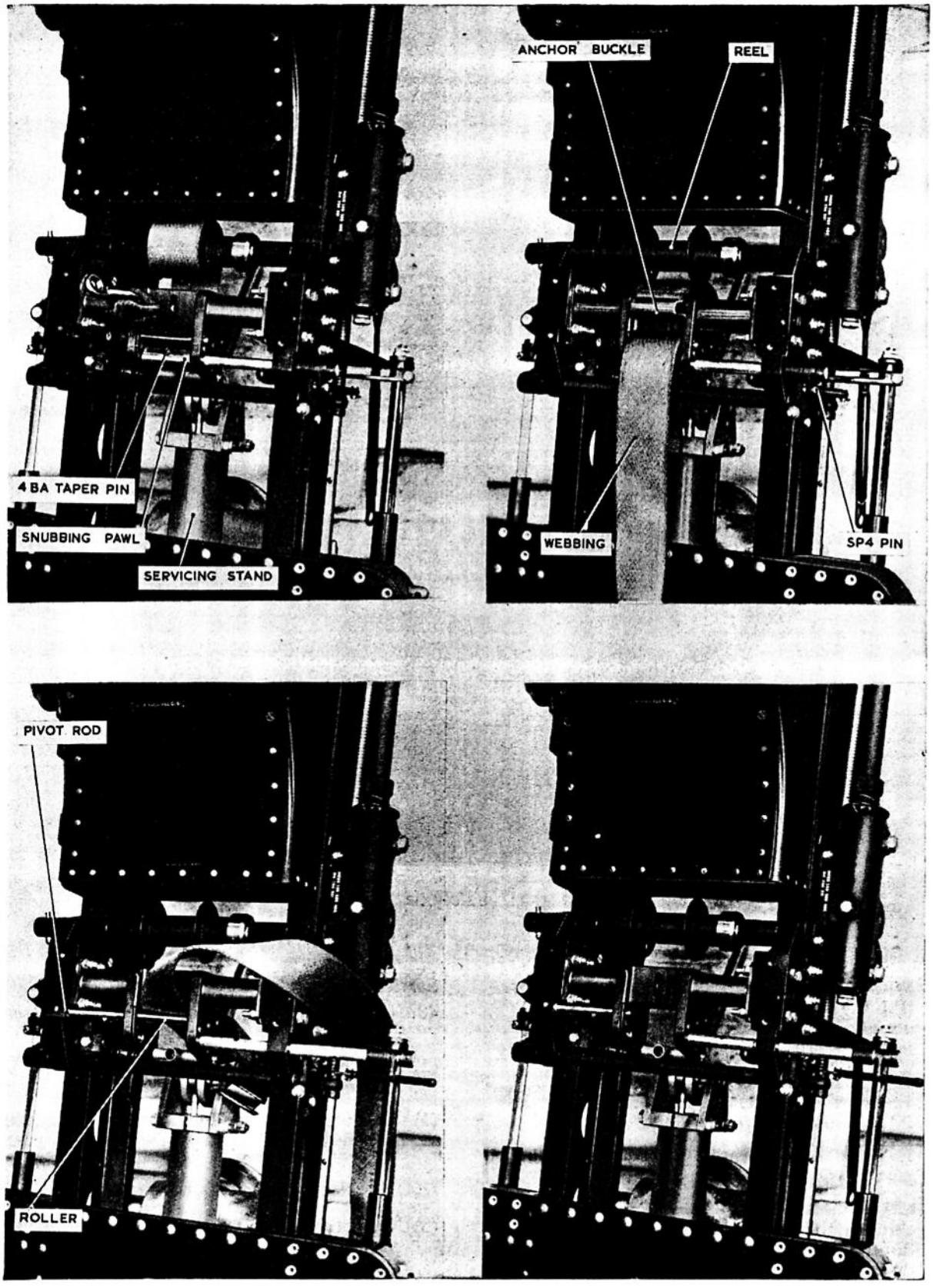

Fig. 12. Changing harness webbing

the load is applied without producing a snatch on the line. Measure the length of the line whilst it is still under load from the centre of the shear rivet at one end of the line to the centre of the fabric loop by which the taper plug fitting is attached at the other end of the line. ◀ The length should be 38 in. ± 2 in., and any cords exceeding the upper limit are to be renewed. ▶

Locking the scissor shackle in the stowed position

50. After the drogues have been packed, lower the scissor shackle to the stowed position and secure it by a length of No. 8 cord passed *through* the drogue shackle and *under* the flap securing pin (fig. 11); tie off with a reef knot and two or three half-hitches. It is of the utmost importance that the cord passes under the securing pin, otherwise the drogues could not be withdrawn without obstruction.

Changing harness webbing in the 25G beam

51. (1) Lower the seat and remove the backrest plate.

(2) Operate the 'go forward' lever and pull the webbing out to its full extent. Release the anchor buckle (fig. 12).

(3) Remove the 4 B.A. taper pin and the SP.4 pin.

(4) Slide the pivot tube and rod to the side and remove the snubber and roller.

(5) Remove the unserviceable webbing and insert the new one.

(6) Reverse the operations given in sub-para. (1) to (4).

Connecting the drogue withdrawal line

52. When aircraft servicing is completed and the seat is re-armed, *make absolutely certain* that the drogue withdrawal line passes OVER the link line (fig. 13). This is vital to enable the drogue gun piston to withdraw the drogues without obstruction or entanglement.

Testing the harness release and leg restraining cord release mechanism

Note . . .

(1) *The following equipment will be required:— Two harness buckles attached one at each end*

Fig. 13. Connecting drogue withdrawal line

of a 3 ft. length of suitable cord or tape. If spare buckles are not available, two copies of the appropriate buckle are to be locally manufactured to a reasonable degree of accuracy.

(2) *It may be found that there are no markings on the quadrant as referred to in sub-para.* (1) *and elsewhere. If the marks are missing, proceed as follows:—*

(a) *Remove the four screws securing the manual release lever quadrant from the* INSIDE *of the seat pan.*
(b) *Remove the nut and shakeproof washer securing the manual release lever.*
(c) *Refer to fig.* 14 *and, using a pencil, mark a line through the centre line of the lever axis hole at right-angles to the edge of the quadrant A-A*
(d) *Mark a second line* 1 *in. from, and parallel to, the first line.*
(e) *Make V-notches as shown and mark with suitable white paint.*
(f) *Refit the quadrant to the seat pan.*

53. The test for release sequence is done from the manual release lever and, due to the loss of motion in the various linkages, the stage of the mechanism farthest from the manual release lever is at a mechanical disadvantage. The last stage of the mechanism is the leg restraining cord release and under ideal conditions this release should occur first. This condition is always to be aimed for when testing and adjusting the mechanism, but it may not always be possible to obtain. It should, however, be always possible to obtain the release of the leg restraining cords at the same time as the release of the port seat buckle. A light pull only is to be exerted on the port seat buckle otherwise a false "reading" may be obtained. The testing of the mechanism is to be done as follows:—

(1) Ensure that the manual release lever is in the fully down position and that the gauging lines on the quadrant are clearly visible.
(2) Fit the harness buckles to the seat pan locks and ensure that they are securely held.
(3) Fit the dust cover to the seat portion of the P.E.C., insert the cones of the leg restraining cords into their housings on the front of the seat pan and ensure that they are securely held.
(4) Operate the manual release lever slowly and at the same time exert a LIGHT pull on the port harness buckle.
(5) When the port buckle has been released, check that the cones of the leg restraining cords are disengaged and that the leading edge of the manual release lever is within the gauging lines on the quadrant.
(6) Continue operating the release lever slowly and at the same time exert a LIGHT pull on the starboard harness buckle.
(7) When the starboard harness buckle is released, check that the upper seat lock is withdrawn and that the leading edge of the manual release lever is within the gauging lines on the quadrant.
(8) Continue to operate the manual release lever slowly until the P.E.C. dust cover disconnects from the seat portion, then check

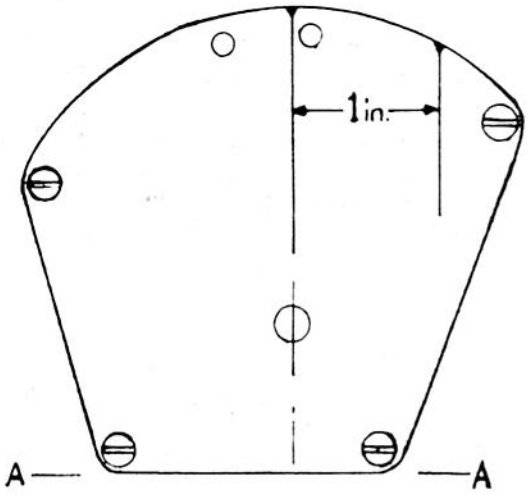

Fig. 14. Marking the quadrant

that the leading edge of the manual release lever is within the gauging lines on the quadrant.
(9) Check that all releases have occurred with the manual separation handle in the position shown in fig. 15 (post-Mod. No. E.S.2598).
(10) Position the manual release lever in the fully down position, fit the P.E.C. dust cover and refit the cones of the leg restraining cords into their housings.
(11) Press upwards on the cones and observe that the tension of the locking plunger springs can be felt.
(12) Remove the dust cover and check that the cones have been released.
(13) With the dust cover removed, refit the cones into their housings and attempt to engage the locking plungers by pulling the cones out in an upward direction.

Note . . .

The cones may catch on the inside edge of the housings when they are pulled out at this angle and, to establish the cause of any catch felt during this test, push the leg restraining cord release rod to the rear; if this action eliminates the catch the mechanism requires adjustment.

Adjusting the harness release and leg restraining cord release mechanism

WARNING . . .

Great care must always be exercised when making the adjustments detailed in the following paragraphs. Maladjustment could result in a serious accident.

54. The mechanism is a series of easily defined stages and the following paragraphs are in the sequence which is to be followed when the complete system is to be adjusted. It is, however, most likely that the last two stages, i.e. the P.E.C. release and the leg restraining cord release, are the only stages that will require adjustment. The principle of adjusting in sequence still applies and it is important to note that:—

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MINISTRY OF DEFENCE

Air Publication 109B-0102-1

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AIRCRAFT ASSISTED ESCAPE SYSTEMS
TYPE 3 SERIES EJECTION SEATS

ADVANCE INFORMATION LEAFLET NO. 7/68

Insert this leaflet in A.P.109B-0102-1, Chap. 4, to face para. 53.

TESTING THE HARNESS RELEASE AND LEG RESTRAINING CORD RELEASE MECHANISM

Note . . .
This A.I.L. supersedes A.I.L. 3/68 which is to be removed and destroyed.

1. Para. 53 refers.

2. When carrying out the tests detailed, the P.E.C. gauge top limit, Part No. MBEU/32942 is to be used in lieu of the P.E.C. dust cover. The complete test of the mechanism is to be carried out with the seat pan in the top position and repeated with the pan in the bottom position. Repeat the tests using the P.E.C. gauge, bottom limit, Part No. MBEU/32941. Ensure in each case that the release mechanism operates smoothly and without any signs of binding.

3. On complete of the tests, the release mechanism is to be checked for correct operation by using the barostatic time-release unit as follows:-

(1) Ensure manual separation control is fully down and P.E.C. gauge (top limit) fitted to P.E.C.

(2) Place the seat pan in the bottom position.

(3) Fit a cocking tool to the time-release unit, withdraw the firing pin and allow the mechanism to run out whilst controlling the descent of the harness release plunger with the cocking tool. Ensure that all releases have occurred. Repeat the tests using P.E.C. gauge (bottom limit). Both tests are to be repeated with the seat pan in the top position.

Note . . .
The testing of the release mechanism using the time-release unit is done to ensure that all releases have occurred automatically and NOT to check that actual release sequence which is applicable to manual operation.

(4) On completion of the adjustments to the harness release and leg restraining cord release and leg restraining cord release mechanism as detailed in para. 54, the seat pan is to be checked for complete freedom of operation including locking of the pan in the top, centre and bottom positions. Any restriction of movement of the seat pan may be caused by over adjustment of the release linkage resulting in over-tension of the vertical torsion rods within the torsion tube.

Notes
(1) The information contained in this leaflet will be incorporated by normal amendment list action in due course.

(2) If, after receipt of this leaflet, an amendment list with a prior date and conflicting information is received, the information in the leaflet is to take precedence.

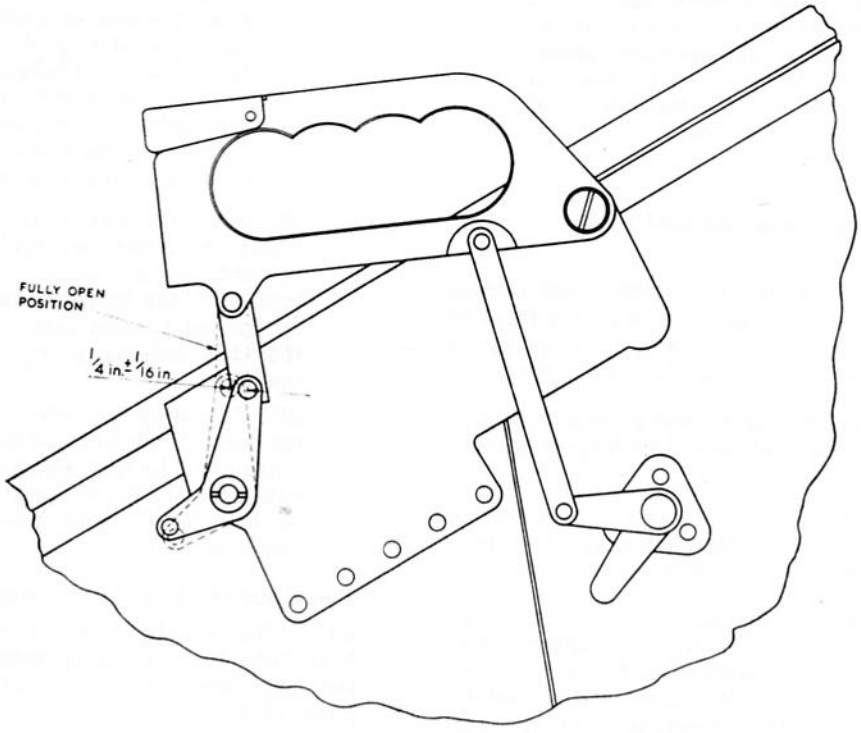

Fig. 15. Manual separation handle linkage clearances

(1) When a stage of the mechanism requires adjustment the stages following must be disconnected, i.e. when adjusting the P.E.C. release the leg restraining cord release rod must be disconnected.

(2) The preceding stage in the mechanism must be fully adjusted before attempting to adjust a later stage, i.e. it is useless to attempt to adjust the leg restraining cord release until all play has been eliminated from the P.E.C. release.

Initial adjustment of the lower seat pan locks

55. (1) Disconnect the manual release lever assembly link, the P.E.C. release rod, the leg restraining cord release rod and the tie rods connecting the torsion rods to the torque tube.

(2) Rotate the vertical torsion rod at each side of the seat until the seat pan lock lever is on the point of actuating the locking plunger.

(3) Secure the torsion rod by adjusting and connecting the tie rod from the lever at the upper end of the torsion rod to the lever on the torque tube.

Adjusting the manual release lever

56. With the lever in the fully down position, adjust the assembly link at the slotted end until only slight play is felt.

IMPORTANT . . .

Slight play is necessary when making this adjustment. Should all play be eliminated, the manual release lever when fully operated would cause excessive distortion of the port torsion bar support bracket, and the lever itself may be difficult to operate.

Synchronising the seat locks

57. (1) Fit the test buckles into the lower seat pan locks and the end fitting of the 25g beam webbing strap into the upper seat lock.

(2) Operate the manual release lever and exert a LIGHT pull on the port harness buckle; at the point of release, check that the leading edge of the release lever is within the gauging marks on the quadrant.

(3) Continue to operate the lever slowly and exert a LIGHT pull on the starboard buckle; at the point of release ensure that the upper seat lock is withdrawn and that the leading edge of the release lever is within the gauging lines on the quadrant.

(4) Adjust the seat pan locks as detailed in paragraph 55, sub-para. (2) until the port lock releases slightly ahead of the starboard and upper locks.

(5) Adjust the manual release lever assembly link as necessary.

Adjusting the P.E.C. release

58. Adjust the P.E.C. release rod to connect the lever at the lower end of the starboard torsion rod to the P.E.C. operating lever and unscrew the rod one turn to eliminate play.

IMPORTANT . . .

Over-lengthening of the rod may create a condition where the P.E.C. release will start to operate before the mechanism has been operated; under-adjustment, however, may cause an unacceptable delay in the release of the leg restraining cords.

Adjusting the leg restraining cord release mechanism

59. (1) Adjust the leg restraining cord release rod to connect the torque tube on the front of the seat pan with the intermediate lever, screw up one turn to eliminate play and connect up.

(2) Ensure that the manual release lever is in the fully-down position and fit the port harness buckle.

(3) Fit the P.E.C. dust cover and insert the locking cones of the leg restraining cords into the housings on the front of the seat pan.

(4) Operate the manual release lever slowly and observe that the leg restraining cords release at the same time as, or before, the port seat lock. Adjust the release rod to obtain this condition without losing the tension of the locking plunger springs (see sub-para. (8)).

(5) Replace the manual release lever in the fully-down position, fit the P.E.C. dust cover and refit the locking cones of the leg restraining cords into their housings.

(6) Remove the dust cover and check that the locking cones have been released.

(7) With the dust cover removed, push the cones into their housings and attempt to engage the locking plungers by pulling the cones out in an upward direction.

NOTE . . .

The cones may catch on the inside edge of the housings when they are pulled out at this angle and, to establish the cause of any catch felt during this test, push the leg restraining cord release rod to the rear; if this action eliminates the catch, the mechanism requires adjustment. Adjust by screwing up the fork end of the release rod a half-turn at a time and re-check.

(8) Refit the dust cover to the P.E.C. and insert the cones into their housings. Press upwards on the cones and ensure that the tension of the locking plunger springs can be felt; if the tension cannot be felt it indicates that the locking plungers have started to operate.

(9) Adjust by unscrewing the fork end of the release rod a half-turn at a time until the spring tension can be felt. Re-check for the complete withdrawal of the locking plungers on removal of the P.E.C. dust cover as detailed in sub-para. (7).

Functional check of the mechanism

60. Whenever the harness release mechanism has been disturbed, e.g. on replacement of the seat pan, the mechanism is to be checked as detailed in para. 53. ▶

Shimming of P.E.C. latch plungers

61. When the latch plunger is assembled to the P.E.C. body by the manufacturer, the height of the plunger may be adjusted by using shims, so that it will correctly accept and release the man portions which are on top or bottom manufacturing limits. The shims also cater for a small allowance for wear.

62. The basic setting achieved by using these shims should not be altered in service; any necessary adjustments should be made elsewhere in the system.

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