APPENDIX 2

PILOT'S STATIONS
(Type 3KS Mk. 2 Seats)

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

Introduction

1. Ejection seats Type 3KS Mk. 2 are being installed in the 1st. and 2nd. pilots' positions by aircraft modifications. When aircraft have been modified, information in this appendix dealing with these aircrew equipment assemblies is to be employed.

2. The seats for the 1st. and 2nd. pilots are almost identical; they differ only in regard to the position of the seat height adjustment levers which are on the outboard side of each seat. The principal difference between the Mk. 1 and Mk. 2 seats is that the Mk. 2 seat incorporates a guillotine which severs the parachute withdrawal line when manual separation is employed.

COMPOSITION OF THE ASSEMBLY

3. The assembly for the 1st. and 2nd. pilots consists of the following items :–

Ejection seat	Type 3KS 1 Mk. 2 1st. Pilot
	Type 3KS 2 Mk. 2 2nd. Pilot
Parachute assembly	Back type Mk. 42
Personal survival pack	Type R, complete with cushion (27C/2428)
Emergency oxygen	Mk. 8D
Flying clothing	See Appendix 1

Ejection seat

4. The Type 3KS Mk. 2 seat is ejected from the aircraft by a cartridge-operated gun; during ejection, the seat slides on a guide rail attached to the airframe structure.

Firing handles

5. Two firing handles are fitted to each seat. The face screen handle has an integral face screen and projects from the front of the drogue container; the seat pan handle is located at the front of the seat pan and is for use when the occupant is unable to reach the face screen handle, e.g. when subjected to high G forces.

6. The firing handles of both ejection seats are coupled to the canopy jettison mechanism. If either the 1st. or 2nd. pilot pulls one of the firing handles, a time delay mechanism at the back of the seat is set in motion at the same time as the canopy is jettisoned; after one second the time delay unit fires the ejection gun. There will also be a one second delay after pulling either of the firing handles of the other seat before the second ejection takes place, even though the canopy may already have been jettisoned. The canopy can also be jettisoned manually, independently of the seat, by operating a black and yellow striped handle, at either side below the cockpit rail.

Leg restraint system

7. Leg restraint cords are provided to ensure that the legs are drawn back and held close to the seat pan during and after ejection. The cords pass through snubbing units below the front of the seat pan and are then attached to the aircraft floor with shear rivets. The snubbing units allow the cords to pass freely downwards, but prevent the cords passing upwards except when released by the spring loaded toggle at the front of each unit. An interconnection between the taper plug assemblies on the front of the seat pan and the P.E.C. releases the leg restraint cords when the personal component of the P.E.C. is disconnected.

Armrests and seat raising gear

8. Adjustable armrests are controlled by either of two levers on each armrest; one at the forward end, and one at the rear. The seat pan is adjustable for height by means of a handle on the outboard side of each seat; the plunger in the end of the handle must be depressed before the height can be adjusted.

Combined harness

9. Provision is made on the seats for attachment of the combined harness of the parachute assembly at three points, one centrally just below shoulder level and one on each side at the back of the seat pan. These three anchorages are released automatically in the normal ejection sequence, by the operation of a barostatic time-release unit. A manual separation lever is provided at the rear port side of the seat pan, so that the occupant can release himself from the seat should the automatic device fail to operate.

10. The upper anchorage for the harness embodies a 'go forward' spring roller mechanism which permits the occupant to lean forward when required. This is controlled by a spring loaded 3 position lever situated at the forward end of the port side of the seat pan. Movement of the lever to the fully forward position followed by release to the centre position, permits the occupant to lean forward and back at will. Movement of the lever to the rear position prevents any further forward movement and the harness remains locked when the occupant leans back again. Should a crash landing or an ejection occur whilst the lever is in the centre position, an automatic inertia device brings a snubber into action to prevent the occupant being thrown forward.

Automatic equipment

11. Fully automatic facilities are provided to withdraw the parachute canopy and separate the occupant from the seat after ejection. The automatic equipment includes a drogue gun and drogues and a barostatic time-release unit. The drogue gun is operated by a static rod which initiates a time delay of ½ sec. and then fires out a heavy bullet to open the drogue container and extract the drogues, which develop and stabilize the seat. The barostatic time-release unit is also initiated by another static rod. If ejection takes place at or below a predetermined height, and the forward speed is compatible with safe parachute opening, the time-delay mechanism starts and runs for 1¼ sec. After this delay, the mechanism initiates the following sequence:–

(1) Releases the drogues from the top of the seat. The pull of the drogues now withdraws the pins securing the rear anchorages of the face screen and the parachute restraining straps, and removes the parachute withdrawal line

from the guillotine. The pull is then transferred to the parachute withdrawal line which is attached to the apex of the parachute canopy.

(2) Releases the harness from the seat.

(3) Releases the personal component of the P.E.C., and the leg restraint cords.

12. In the event of malfunctioning of these automatic arrangements, a manual separation lever is provided at the port side of the seat pan which, when operated, releases the harness from the seat, and simultaneously releases the parachute restraining straps, the personal component of the P.E.C., and the leg restraint cords. The manual separation lever is held in a gate to reduce the risk of accidental operation and requires pulling outwards against a spring before it can be released.

Guillotine

13. As the occupant separates from his seat after operation of the manual separation lever, a static line attached to the rear of the parachute pack withdraws the sear from the guillotine gun, causing the guillotine to operate and sever the parachute withdrawal line and separate the seat structure from the parachute. The canopy is then deployed by pulling the D-handle of the parachute rip cord attached to the waistband of the harness.

Personal equipment connector

14. The personal equipment connector (referred to as the P.E.C.) is fitted to the starboard side panel of the seat pan. It enables the main oxygen, emergency oxygen, air-ventilated suit, and Mic/Tel leads to be connected or disconnected in one action. It is also linked to the leg restraint (para. 7) so that the legs are released when the P.E.C. is disconnected. The connector comprises three components :–

(1) *Aircraft component.* Connected to the cockpit structure by a telescopic static rod, and to the personal supply systems in the aircraft.

(2) *Seat component.* Bolted to the seat pan, and connected to the emergency oxygen system (see para. 20). This component has an operating linkage from the main barostatic time release unit and another linkage to the leg restraint system.

(3) *Personal component.* Attached to the flying clothing.

15. As the seat ascends the guide rail during ejection, the aircraft component of the P.E.C. is detached from the seat component when the static rod becomes fully extended, thus severing and sealing off the connections between the seat and the aircraft. At the same time the emergency oxygen supply is turned on automatically. Later, when the harness is released from the seat, the personal component is also automatically detached from the seat component.

16. A full description of the personal equipment connector will be found in Sect. 1, Chap. 5. The P.E.C. fitted is the 'Bomber' type having two passages; one for the air-ventilated suit supply (forward) and one for the oxygen hose (rear).

Personal survival pack

17. The personal survival pack is housed in the seat pan and serves as a cushion. It is attached to the lower harness straps by two side quick-release couplings and to the life jacket or jerkin by a lowering line stowed in the left-hand attachment flap on the pack. The harness attachments are connected when the equipment is installed in the seat, and the lowering line by the occupant when strapping-in. The lowering line, being attached to the clothing, enables the side quick-release couplings to be released during a parachute descent so that the pack falls and hangs 15 ft. below the body. On alighting, this enables the harness to be immediately discarded without losing the pack.

Note . . .

The quick-release couplings have two plungers which must be squeezed simultaneously to effect release.

18. A thin cushion is provided with the pack to cover the underleg straps of the harness, both in normal use and during parachute development. It is attached to the harness by press studs.

Emergency oxygen

19. The emergency oxygen cylinder is mounted on the starboard beam of each seat; the supply is turned on automatically during ejection by a static line attached to the aircraft structure. This static line is also connected to a yellow/black striped knob on a lever in the aircraft at the rear inboard side of each seat; operation of this lever turns on the emergency oxygen supply manually during normal flight.

20. The oxygen is fed to the rear end of the seat component of the P.E.C. (see para. 14) through the inward relief and excess pressure valve (RV/51). This valve allows excess of oxygen, during the early stages of discharge of the cylinder, to spill out to atmosphere and also permits inward inhalation of ambient air when the supply of oxygen has dropped below demand. To prevent dilution of oxygen under normal conditions however, and to ensure recognition if a 'no-flow' failure of the main oxygen regulator should occur, the inward relief element is spring-loaded so that breathing through it demands a noticeable effort. The excess pressure relief element is barometrically controlled to give pressure breathing above 40,000 ft., but is only very lightly spring loaded below this altitude. A full description of the valve will be found in Sect. 1, Chap. 6. When the emergency oxygen is turned on automatically during ejection it feeds oxygen through the seat component of the P.E.C., until automatic separation from the seat occurs at a predetermined height where an oxygen supply is no longer needed.

21. The emergency oxygen set provides a steady flow of oxygen but the rate of flow diminishes gradually as the pressure in the cylinder falls. The initial flow is more than is needed for breathing but the surplus is not sufficient to inflate the high altitude pressurized garments with the rapidity necessary in an emergency (the emergency oxygen set can maintain the garments at the correct inflated pressure, but cannot supply the initial flow required to inflate them). Garment inflation on loss of cabin pressure is therefore provided from the aircraft main oxygen system which has the necessary flow characteristics; this is an important factor in high altitude escape drills (see Pilot's Notes) otherwise ejection could take place with an inadequate oxygen supply.

22. Information concerning the Type 3KS ejection seats will be found in A.P.4288C, Vol. 1. Information concerning the parachute assemblies will be found in A.P.1182A, Vol. 1 and the survival packs in A.P.1182C, Vol. 1. Information concerning flying clothing will be found in A.P.1182E, Vol. 1, and in Appendix 1 of this chapter, together with information on dressing and testing.

SEQUENCE OF EVENTS DURING EJECTION

23. The following is the normal sequence of events after the firing handle has been pulled. The canopy is jettisoned. There is a delay of one second before the ejection gun fires. As the seat ascends the guide rail, the following sequence occurs :—

(1) The leg restraint cords tighten until the rivets shear in their floor anchorages.

(2) The time-delay mechanism for the drogue gun is actuated, the gun being fired after ½ second.

(3) The time-delay mechanism for the barostatic time-release unit is tripped. The delay is variable depending upon aircraft height and speed at the time of ejection.

(4) The aircraft component of the P.E.C. is separated from the seat component, disconnecting the oxygen and A.V.S. hoses and the Mic/Tel leads between the aircraft and the seat.

(5) The emergency oxygen supply is turned on. After the seat leaves the aircraft the following events occur:—

(6) After ½ sec. the drogue gun fires and the two drogues stabilize the seat. If the ejection occurs at high altitude the seat will eventually fall nearly vertical, with the occupant restrained by his combined harness from falling forwards. At low altitudes there may not be time for the seat to attain the near vertical position. During this phase the occupant will be breathing emergency oxygen from the cylinder carried on the seat.

(7) After an appropriate delay (1¼ sec.) the occupant is released from the seat and his parachute canopy opens automatically; the personal component of the P.E.C. is released from the seat component, detaching the personal services from the seat and enabling ambient air to be inhaled. At high altitude the 1¼ second delay does not start until the seat has descended to a predetermined height. At high speeds, at the predetermined height, or below, delay does not start until the seat has decelerated to a safe speed for parachute canopy opening.

EQUIPPING THE EJECTION SEAT

Connections to the aircraft

24. When the seat is installed in the aircraft and is properly equipped, the following items are connected to the aircraft:—

(1) *Port side of seat*:—

(a) Static rod to drogue gun.

(2) *Starboard side of seat*:—

(a) Static rod to barostatic time-release unit.

(b) Static line to emergency oxygen cylinder operating head.

(c) The aircraft component of the P.E.C. is locked to the underside of the seat component. The aircraft component has a static rod to the aircraft structure, and an oxygen supply hose, an A.V.S. supply hose and a Mic/Tel lead from the appropriate systems, which will normally already be connected.

(3) *Underneath the seat*:—

(a) Leg restraint cords.

(4) *Top of seat*:—

(a) One leg of the bifurcated face screen firing cable to the trip lever pawl, and the other to the lock operating lever on the time-delayed ejection gun firing unit.

(b) Articulated sear linkage from the time-delayed firing unit to the ejection gun sear.

Equipping the seat

25. Before equipping the seat, ensure that it has been made safe for servicing in accordance with current instructions.

26. The following procedure is to be used when installing the equipment in the seat; refer to fig. 1 to 8 for detail, as necessary:—

(1) Fit the emergency oxygen cylinder into its clamping brackets on the seat beam ensuring that the loop of the supply tube at the top of the cylinder faces forward (*fig.* 1).

(2) Connect the emergency oxygen supply tube to the underside of the inward relief and excess pressure valve. Arrange the tube to form an easy sweep and then insert it into the clips on the back and on the side of the seat pan. Wirelock the tube connector to the valve mounting bracket.

(3) Connect the nipple of the emergency oxygen cylinder operating cable to the anchor section of the static line and engage the end fitting of the cable housing in the anchor socket.

(4) Connect the anchor hook to the static line-cum-manual operating cable.

(5) Open the paddle spreaders situated in front of the top harness lock and pass the 'O' rings of the two parachute pack restraining straps over the paddle spreaders (one over each spreader). Ensure that each 'O' ring is pushed well back towards the pivot end of its spreader paddle, and close the paddle spreaders inwards towards each other as far as they will go (*fig.* 2).

(6) Place the parachute pack in position on its support bracket, ensuring that the harness straps are not twisted and that the guillotine static line is correctly

positioned, i.e. draped over the back rest of the seat and not trapped between the parachute pack and the backrest.

(7) Push the harness 'go forward' lever fully forward, release it to its centre position, and pull out the webbing strap from under the parachute support bracket; hold it against the spring tension.

(8) Pass the webbing strap downwards through the 'D' shackle attached to the harness shoulder straps, and insert the lug fitted to the end of the webbing strap between the inner extremities of the paddle spreaders and into the attachment point in the back of the seat; push the lug in until it locks into position. Check by pulling on the webbing strap, then allow the strap to wind back (*fig.* 3).

(9) Holding the pack in position, connect the two halves of the parachute withdrawal line/link line coupling. Open the yellow gate on the top of the guillotine and route the parachute withdrawal line through the aperture on the guillotine. Close the yellow gate and ensure that it correctly retains the parachute withdrawal line.

(10) Draw the free ends of the parachute restraining straps forwards through the arch of the parachute pack, over the pack and towards the rear of the seat on either side of the drogue container.

(11) Pass the port restraining strap over the parachute withdrawal line and insert its end through the buckle in the short strap on the port side of the drogue container from the outside inwards. Ensure that the drogue link line which is now connected to the parachute withdrawal line is positioned OUTSIDE the short strap, (*fig.* 4).

(12) Insert the end of the starboard restraining strap through the buckle on the short strap on the starboard side of the drogue container from the outside inwards.

(13) Position the wedge pad on the top of the parachute pack between the pack and the drogue container. Pass the ends of the parachute restraining straps through the buckles on each side of the wedge pad so that the ends emerge on the outside of the buckles.

(14) Work the straps back and forth in the self-locking buckles on the wedge pad until the parachute pack and wedge pad are strapped tightly to the seat. Neatly stow the free ends between the drogue container and the strap (*fig.* 4).

(15) Check that the drogue withdrawal line has been routed OVER the link line (*fig.* 4).

(16) Attach the guillotine static line to the sear of the guillotine gun (*fig.* 4).

(17) Push each bottom harness attachment lug on the back of the combined harness into its respective seat pan lock so that it locks into position. Check for security in the locks by pulling on the lugs (*fig.* 5).

(18) Lift the combined harness and hold in the stowed position by pushing the lugs on the harness shoulder straps between the headrest restraining straps and the side of the drogue container.

Note . . .

This operation is for stowage purposes only, to keep the harness straps suspended out of the way until the seat is ready for occupation.

(19) Clear the seat pan. Place the survival pack in position, lowering line to port. Ensure that the transverse seat strap of the harness crosses OVER THE TOP of the pack at the back.

(20) Connect the quick-release couplings on each side of the survival pack, to the combined harness (*fig.* 6).

(21) Insert the harness sticker strap lugs into the clips on the inside of the seat

pan; ensure that the sticker straps pass outside the personal survival pack quick-release couplings (*fig.* 6).

(22) Arrange the harness and auxiliary cushion on the personal survival pack, pass the leg loops of the harness through the slot in the centre of the cushion and secure the cushion to the seat strap of the harness with the press fasteners provided. Ensure that no straps are twisted; extend the lap and shoulder straps to their full extent (*fig.* 7 *and* 8).

(23) Remove and retain the safety pin from the emergency oxygen cylinder operating head.

(24) After equipping the seat restore it to the 'safe for parking' condition in accordance with current instructions.

STRAPPING-IN PROCEDURE

27. The strapping-in procedure is as follows; refer to fig. 9 to 11 for detail as necessary:—

(1) Ensure that the seat has been made safe for parking and that harness straps have been fully extended.

(2) Remove the dust cover from the seat component of the P.E.C. and fit it into the stowage.

(3) Sit in the seat.

(4) Press the front end of the personal component (attached to clothing) of the P.E.C. into the front end of the seat component in an inclined attitude, and press down with a hinging motion until it clips into place. Test by inserting one or two fingers under the handle and attempting to lift it.

(5) Thread the leg restraint cords through the quick-release couplings on the garters as follows. Thread the cord from the starboard snubbing unit under the seat pan, through the garter coupling of the left leg and then plug the end fitting of the cord into the starboard taper socket on the front of the seat pan (*fig.* 9).

Note . . .

(1) *If there is insufficient length of cord, pull forwards on the ring in the front of the snubbing unit and withdraw more cord.*

(2) *Unless the personal component of the P.E.C. is mating correctly with the seat component, the plug will not lock in its socket.*

(6) Similarly thread the port cord through the right garter and back to the port taper socket, thus crossing the cords. It does not matter which loop is in front, but do not interlace them.

(7) Pull back any excess cord through the snubbing units leaving enough slack to enable the occupant to operate the rudder fully.

(8) Adjust the height of the seat until a satisfactory position for flying is obtained, ideally with the head positioned centrally against the headrest cushion. Stretch the arms upwards towards the firing handle to ensure there is no restriction to firing handle access by the clothing.

(9) Connect the survival pack lowering line on the left side to the quick-release coupling on the life jacket or pressure jerkin. The line is to lie across the left thigh (*fig.* 10).

(10) Bring the harness waistbelt across the body and adjust the quick-release fitting so that it lies centrally with the waistbelt close to the body. Ensure that the quick-release fitting is in the locked position.

(11) Connect the lugs on the lap straps to the quick-release fitting (the hoses to the P.E.C. pass under the right lap strap). The back pad is to be drawn up by a ground crew member and the lumbar

cushion adjusted to suit. Sit well back in the seat. Any slack in the hoses to the P.E.C. is to lie below the right lap strap to allow body movement without straining the hoses.

Note . . .

When connecting the first lug of the inertia-proof quick-release fitting, turn the disc knob anti-clockwise until the yellow line on the knob co-incides with the dots on the body and insert the lug. The remaining lugs can be fitted without further manipulation of the disc knob.

(12) Tighten the lap straps. When tightening straps, pull on the running end with one hand and push the standing end towards the buckle with the other hand to relieve the tension on the buckles. After the first tightening, move the body about inside the harness and then re-tighten, repeating this process until the straps are really tight. It is most important that the lap straps are tight, since they provide the principal restraint under all stress conditions.

(13) Bring the leg loops up between the legs and thread the left one through the metal D-ring on the left lap strap. Repeat on the right side. If twisted correctly the leg loops will lie flat on the inside of the thighs (*fig.* 9).

(14) Remove the ends of the shoulder straps from the stowed position. Arrange them under the life jacket or jerkin stole, thread the end fittings through the leg loops and connect them to the quick-release fitting. Engage the harness leg loops over the metal lugs, so that they will disengage freely on operating the quick-release fitting. To facilitate this engagement it is essential that the shoulder straps are fully extended (*fig.* 9).

(15) To tighten the harness, first take-up the slack on the blue inner (underneath) shoulder straps of the harness and then take up the slack in the brown outer (top) shoulder straps. When tightening harness straps, pull on the running end with one hand and push the standing end towards the buckle with the other hand to relieve tension on the buckles. Do not however, overtighten the shoulder straps as this causes the back to arch, which is a bad attitude for ejection.

(16) This tightening will ruck that part of the lift-webs lying between the inner and outer straps. Obtain the assistance of a member of the ground crew to pull back the lift webs through the metal runners on the shoulders and then stow the excess length neatly (by lengthening the loops in the lift webs) behind the back (*fig.* 11).

(17) Put on the flying and protective helmets (if this has not already been done) and fasten the chin straps. Fit the oxygen mask.

Note . . .

If the chin straps are not fastened, the helmets may be wrenched off during ejection. At high altitudes, this would mean the loss of vital oxygen supply.

(18) Connect the Mic/Tel lead and oxygen mask tube. In the low altitude role (pressure jerkin not being worn) connect the mask tube spring clip to the D-ring on the life jacket stole.

(19) Reach upwards and check that the face screen firing handle is within reach; DO NOT PULL.

(20) Conduct pre-flight oxygen checks (see Pilot's Notes).

(21) With assistance from a ground crew member, ensure that the various safety pins are correctly repositioned and stowed.

EMERGENCIES

28. For drill and procedure to be taken in emergencies refer to Pilot's Notes, A.P.4504B–P.N.

LEAVING THE AIRCRAFT AFTER LANDING

29. When leaving the aircraft after landing, the following procedure should be used :—

(1) Remove the safety pins from their stowages and fit them to the face screen firing handle, the seat pan firing handle, and the guillotine sear. Obtain the assistance of a member of the ground crew to insert the safety pins in the face screen firing handle and the guillotine sear.

(2) Disconnect the personal component of the P.E.C. by pulling upwards on the handle (this will also free the leg restraint cords).

(3) Operate the harness quick-release fitting, free the straps, and return the quick-release fitting to the locked position.

(4) Disconnect the lowering line to the survival pack.

(5) Leave the seat.

(6) Fit the dust cover to the P.E.C.

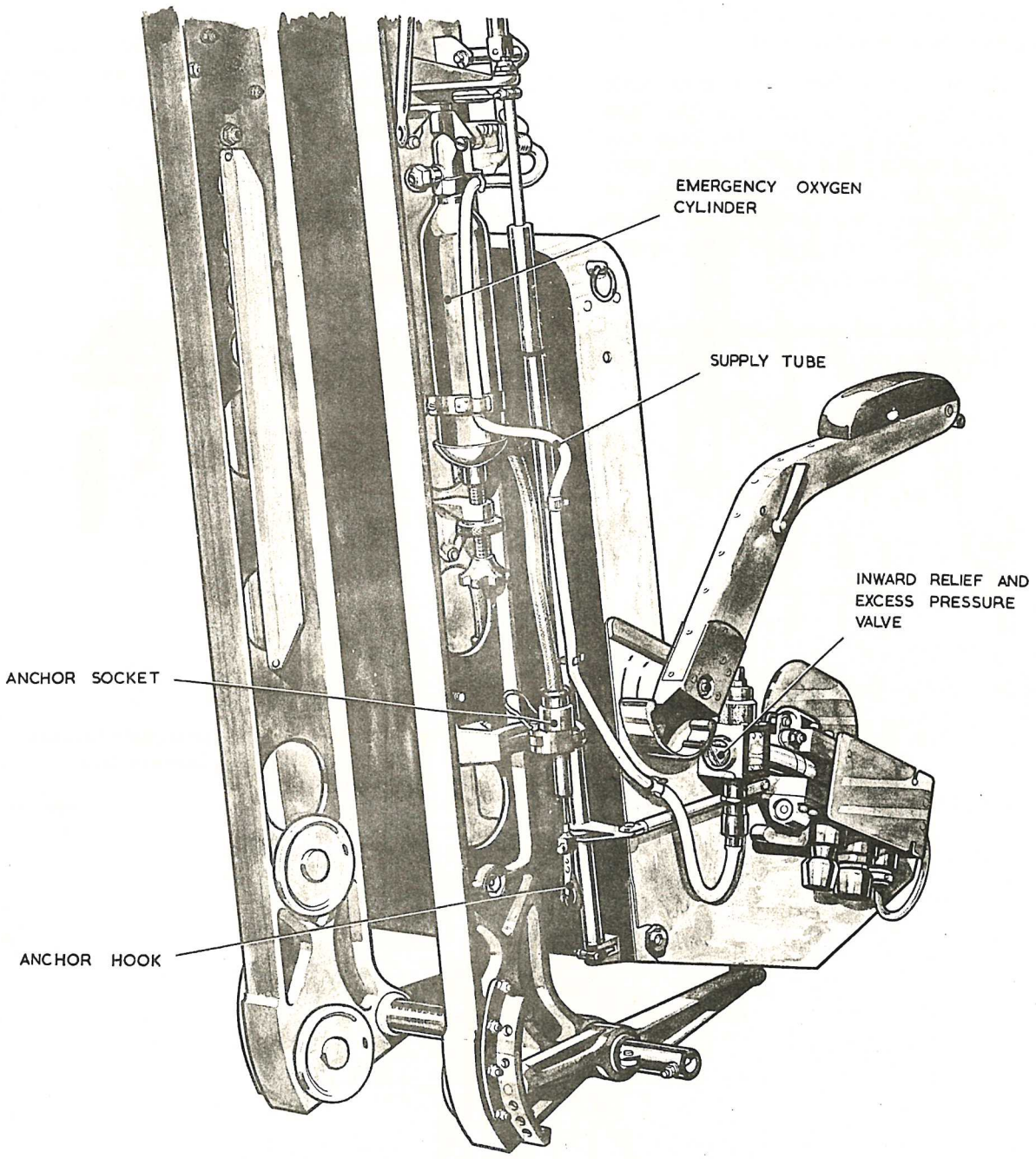

Fig. 1. Arrangement of emergency oxygen supply

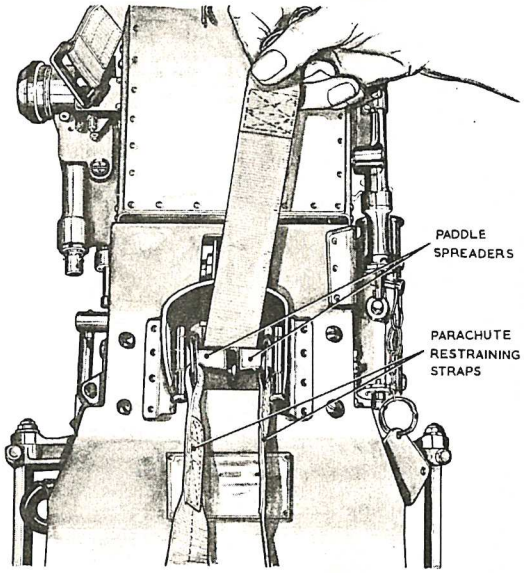

Fig. 2. Top harness lock

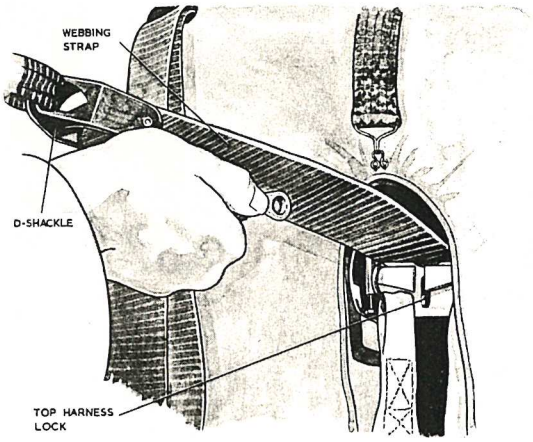

Fig. 3. Attaching the parachute harness to the top harness lock

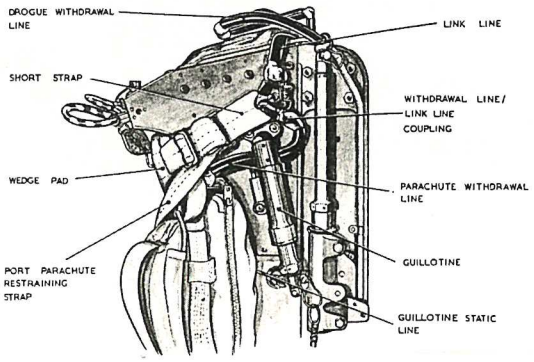

Fig. 4. Arrangement on port side of drogue container

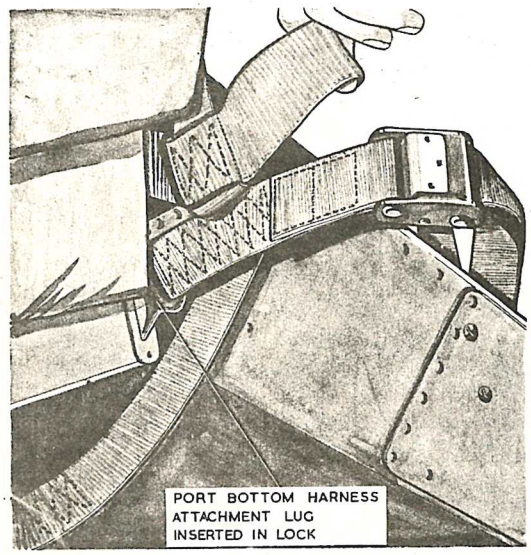

Fig. 5. Port bottom harness lock
(starboard similar)

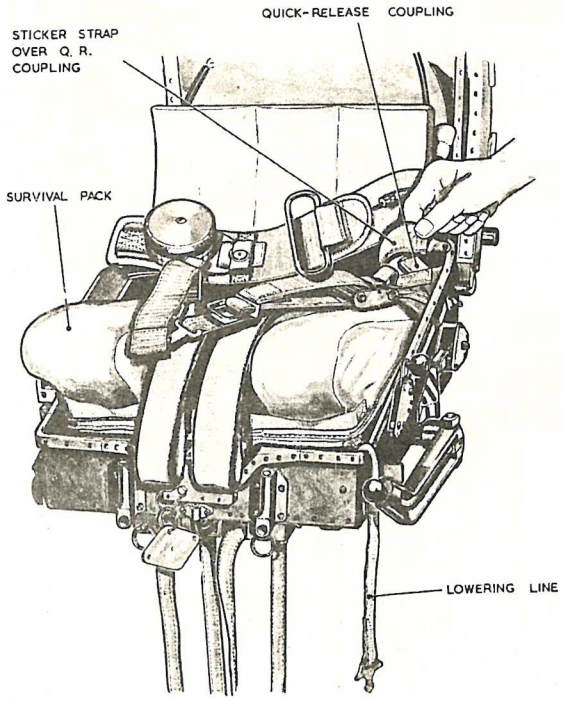

Fig. 6. Inserting the sticker straps

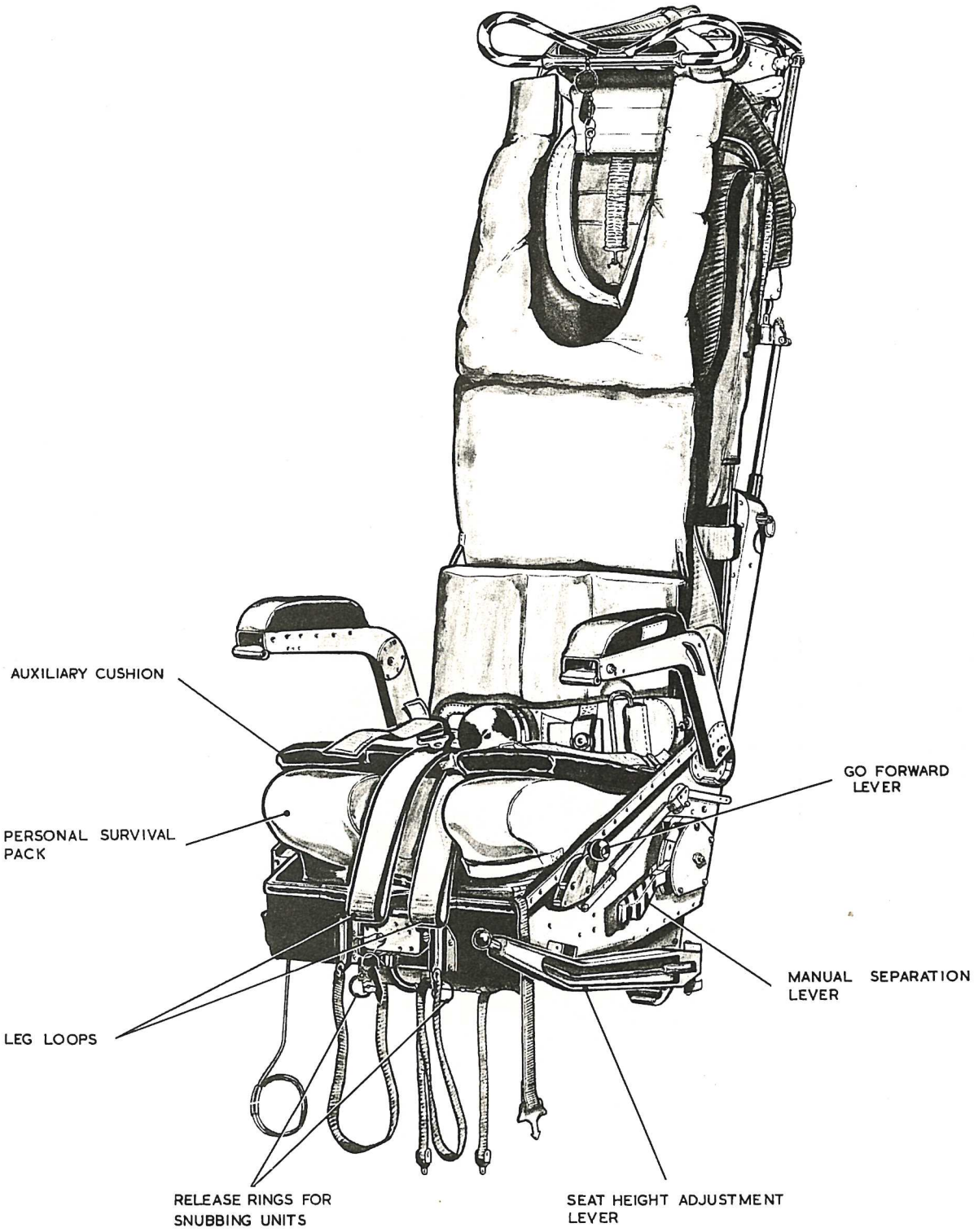

Fig. 7. The seat equipped (port side)

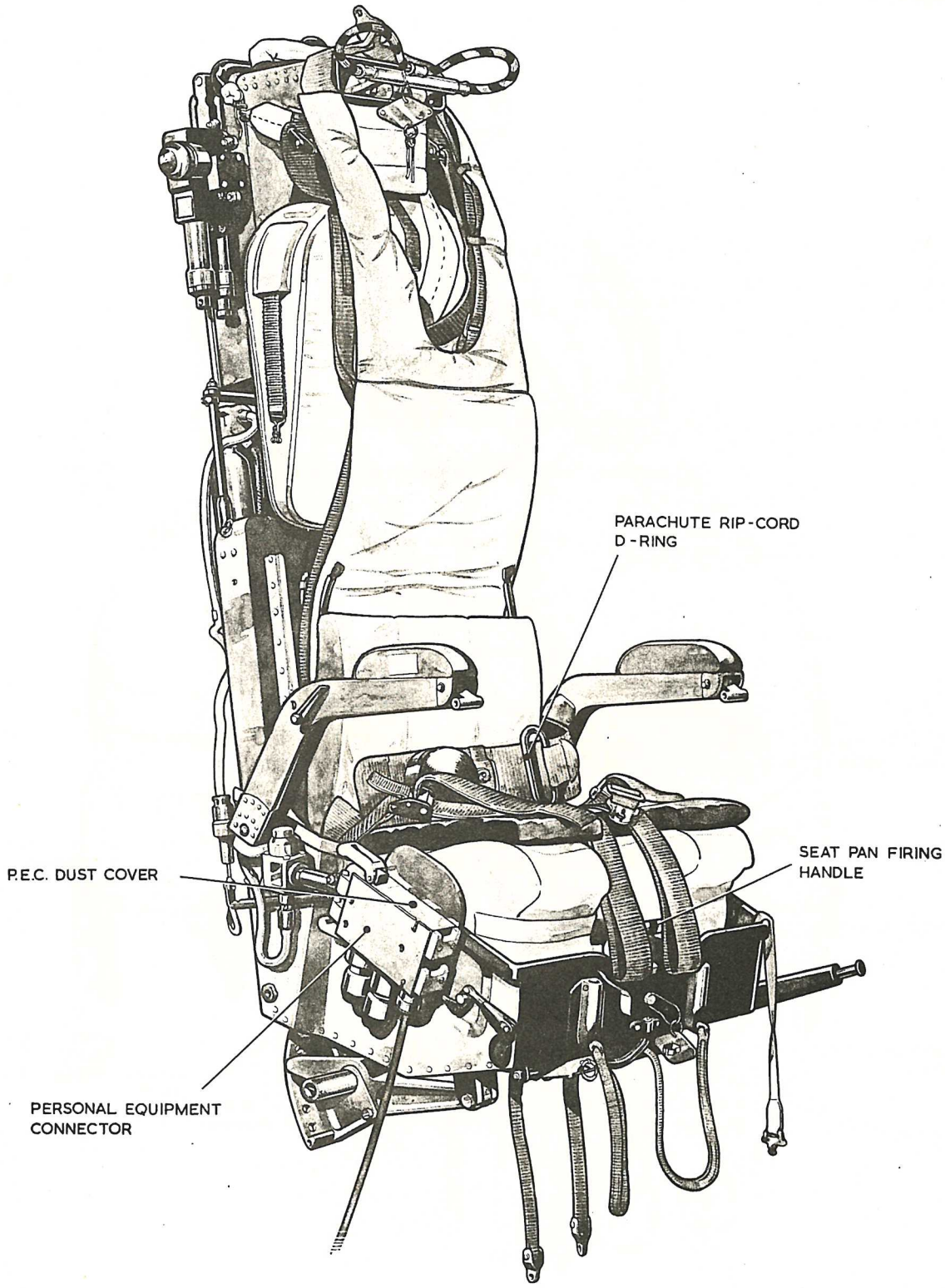

Fig. 8. The seat equipped (starboard side)

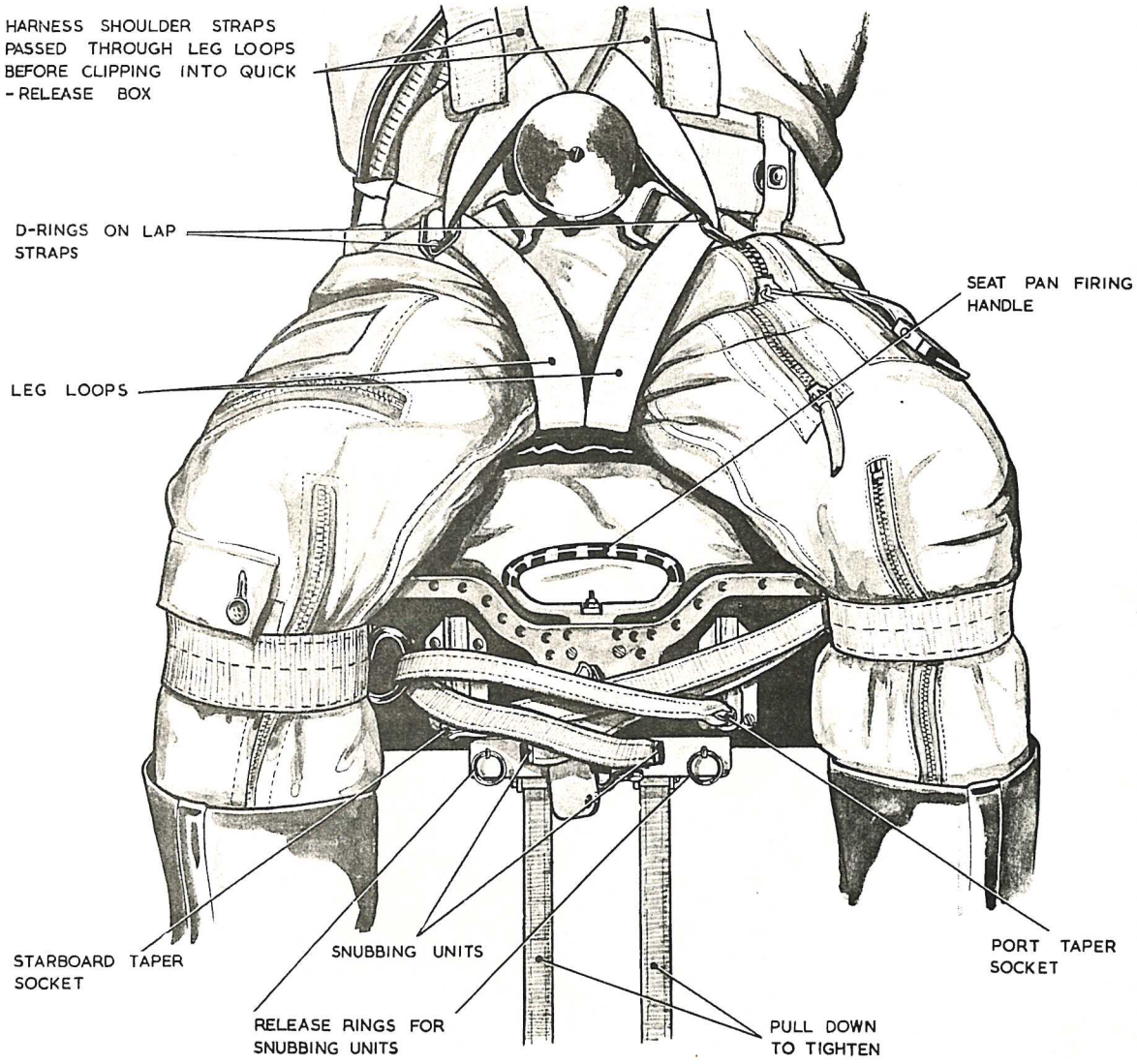

Fig. 9. Arrangement of leg restraint cords and parachute harness straps

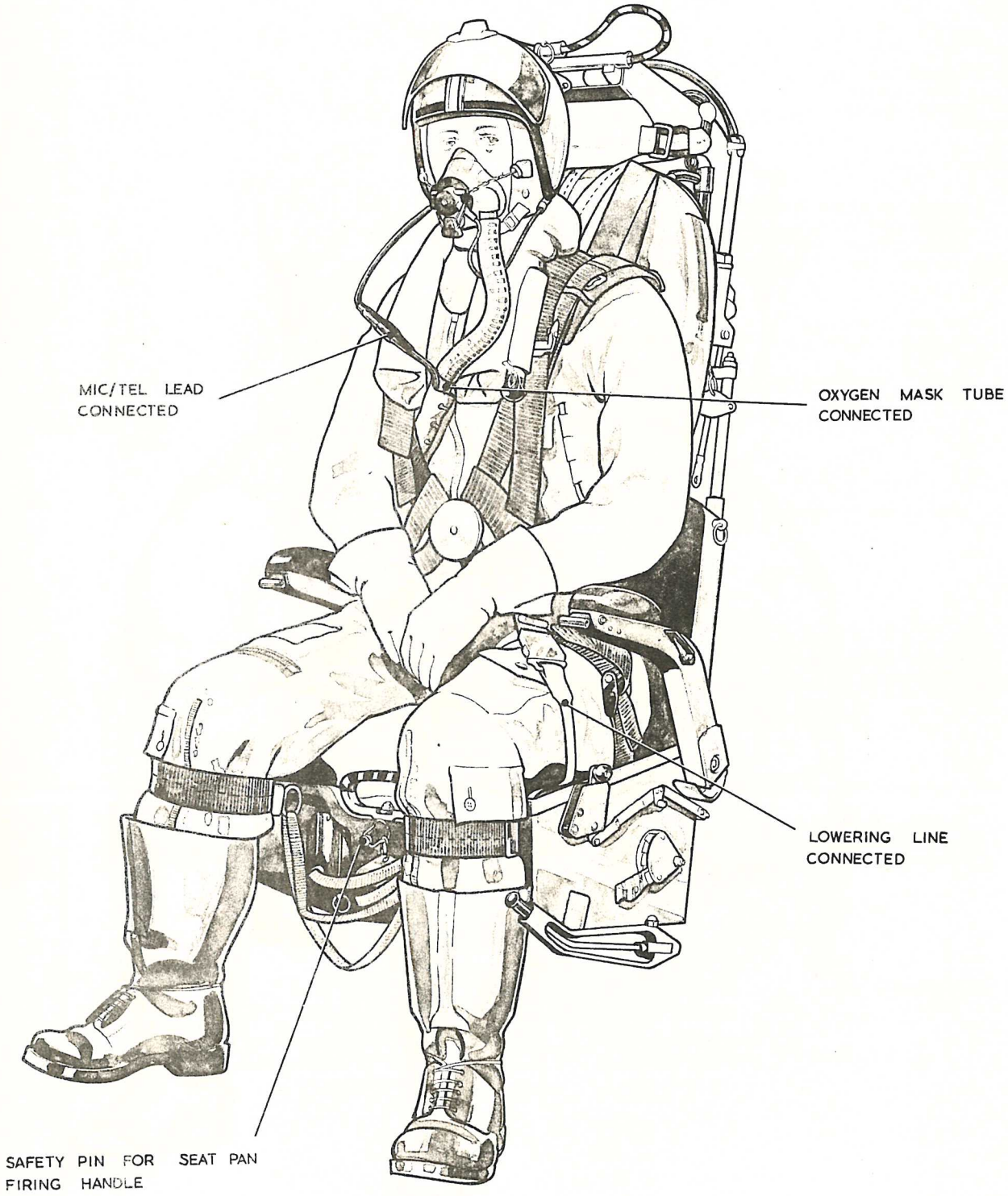

Fig. 10. The seat occupied (port side)

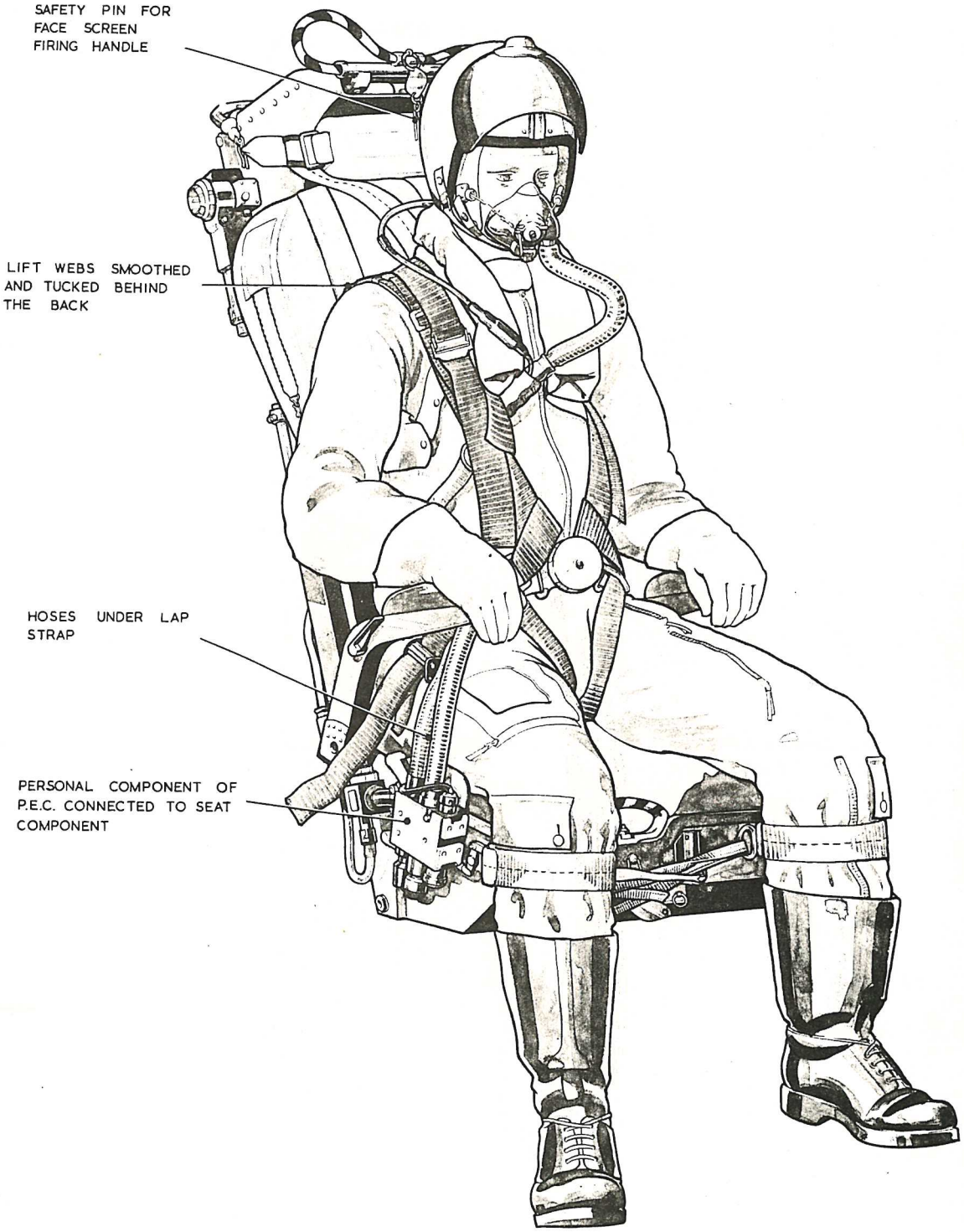

Fig. 11. The seat occupied (starboard side)

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