APPENDIX 2

CANBERRA B. MK. 15 AND B. Mk. 16 FITTED WITH EJECTION SEATS TYPE 2CA/1 AND 2

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

Introduction

1. Ejection seats Type 2CA/1 are being introduced to the pilot's position, and Type 2CA/2 to the navigator's position in Canberra B. Mk. 15 and B. Mk. 16 aircraft by aircraft modifications. Seat Type 2CA/2 is also being introduced to the bomb-aimer's position in the B. Mk. 15. When aircraft have been modified, the information dealing with the aircrew equipment assembly is contained in this appendix.

COMPOSITION OF THE ASSEMBLY

2. The aircrew equipment assembly consists of the following items :—

Ejection seat	Type 2CA/1 (Pilot) Type 2CA/2 (Navigator and bomb-aimer)
Safety harness	Type ZM
Parachute assembly	Seat Type Mk. 16
Personal survival pack	Type MA Mk. 1
Emergency oxygen set	Mk. 7J
Flying clothing	See Appendix 1

Ejection seat

3. The principal difference between the seats is that the 2CA/1 seat is provided with a canopy jettison system and the 2CA/2 is not. It is therefore necessary for rear crew members to initiate independent canopy jettisoning action before ejecting.

4. The Type 2CA seat, details of which will be found in A.P.4288B, Vol. 1 series, is ejected from the aircraft by a cartridge operated gun. During ejection the seat slides on a guide rail attached to the aircraft structure.

5. The seat pan is adjustable for height by a handle on the starboard side of the seat; the plunger in the end of the handle must be depressed before the height can be adjusted.

6. Mounted on the thigh guard at the same side of the seat pan is the harness 'go-forward' lever, which, when operated, permits the occupant to lean forward in the seat. When assuming the normal upright sitting position, the 'go-forward' mechanism is locked by its ratchet and prevents the occupant leaning forward again until the lever is operated.

Firing handles

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

8. Canopy breakers are fitted to the top of the seat and to the fixed thigh guards. This does not necessarily mean that ejection through the canopy can be resorted to in all instances. Refer to Emergency Drills in Pilot's Notes.

Leg restraint system

9. 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 in front of the seat pan and are then attached to the aircraft floor by shear rivets. The snubbing units allow the cords to pass freely down through the units but prevent the cords passing upwards except when released by pressing the spring button underneath each unit.

10. The leg restraint cords are threaded through rings attached to garters worn by the occupant just below the knees and are then looped around the shoulder strap lugs of the safety harness at the quick-release fitting. The rings are attached to the garters by small quick-release couplings, and can be released quickly by squeezing the triggers on each side of the couplings.

Automatic release

11. Fully automatic facilities are provided to separate the occupant from the seat and open his parachute after separation. A manual override 'D' ring on the parachute harness, enables the parachute automatic withdrawal device to be disconnected from the seat should the need arise to (a) make a manual bale-out or (b) make a manual separation from the seat after ejection.

Emergency oxygen

12. The emergency oxygen cylinder is mounted on the starboard beam of the seat and the supply is turned on automatically, during ejection by a static line. The static line is also connected to a yellow/black striped knob on a lever in the aircraft at the starboard side of the seat by an anchor hook; operation of the lever turns on the emergency oxygen supply manually. The static line runs in a conduit connected at one end to the head of the emergency oxygen cylinder and at the other to the anchor socket, which is held in a gate clamp also mounted on the seat beam.

13. The emergency oxygen supply tube is attached to the starboard side of the seat by another clamp. When the seat is fully equipped this tube is connected to an upper oxygen tube assembly which includes a stirrup quick-release fitting attached to the harness.

Parachute assembly

14. The Mk. 16 seat type parachute assembly fits into the pan of the ejection seat after coupling the withdrawal lines on the pack and the ejection seat apron. The latest type of inertia-proof quick-release fitting is provided on the parachute harness.

15. Two D-handles are provided on the parachute harness waistbelt. The first D-handle (nearer the quick-release fitting) disconnects the parachute withdrawal line; when pulled it exposes the second D-handle which may then be used to deploy the parachute independently of the seat automatic withdrawal device.

16. Information dealing with the parachute assembly will be found in A.P.1182A, Vol. 1 (2nd. Edition).

Personal survival pack

17. The personal survival pack Type MA Mk. 1 is placed on top of the parachute pack in the seat pan and serves as a cushion. It is provided with quick-release couplings attached to webbing straps on either side of the pack; these couplings are attached to corresponding fittings on the life-jacket worn by the seat occupant. A lanyard (which connects to another quick-release coupling on the life-jacket) is provided to prevent the pack being lost when discarding the parachute harness after a descent.

18. The survival pack is formed with a central cut-out at the front to allow access to the seat pan firing handle and also the adjustable negative-G restraint strap, which is anchored to the ejection seat pan on the inside.

19. Information dealing with the personal survival pack will be found in A.P.1182C, Vol. 1, Book 2.

Sequence of events during ejection

20. As the Type 2CA/1 seat is provided with means for operating the canopy jettison system, there is a delay of one (1) second following the pulling of either firing handle before the firing of the ejection gun. With the Type 2CA/2 seat there is no delay, the ejection gun being fired immediately either firing handle is pulled. As the seat ascends the guide rail the following sequence occurs :—

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

(2) The barostatic time-release unit on the ejection seat is set in operation by the static rod.

(3) The emergency oxygen supply is turned on automatically by withdrawal of the static line.

(4) The main oxygen supply hose is disconnected from the aircraft connection. The supply hose to the A.V.S. (if used) is disconnected. The Mic/tel lead is disconnected at the push-pull connection.

(5) As the seat leaves the aircraft another static line pulls taut and fires the drogue gun. This deploys the drogues which first check the forward speed of the seat and then stabilize it in a slightly forward attitude.

(6) If ejection takes place above an altitude of 10,000 ft. a steadied free fall occurs until this altitude is reached, after which there is a further 1.25 sec. delay before the barostatic time-release unit operates. If below 10,000 ft. the barostatic time-release operates after a delay of 1.25 sec. only, subject, however, to the overriding influence of the G-controlier which will cause further delay until the speed has been reduced to that at which deployment of the parachute is safe.

(7) Operation of the barostatic time-release unit actuates the safety harness quick-release fitting, releases the drogues and opens the ejection seat scissor shackle. Straightening of the apron causes the occupant to pitch forward, withdrawing the main parachute by means of the withdrawal line attached to the apron.

EQUIPPING THE EJECTION SEAT

Connections to the aircraft

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

(1) *Port side of the seat :—*

(a) Mic/Tel lead push-pull connection.

(b) Static line from drogue gun.

(2) *Starboard side of the seat :—*

(a) Main oxygen supply hose. This is attached by a webbing strap to the starboard lap strap of the safety harness.

(b) Static rod from the barostatic time-release unit.

(c) Static line and manual control knob to the anchor hook of the emergency oxygen supply.

(d) A.V.S. air supply hose (if used).

(3) *Underneath the seat :—*

(a) Leg restraint cords.

Equipping the seat

22. The following procedure is to be used when equipping the seat: refer to fig. 1 to 3 for detail as necessary :—

(1) Ensure the seat is safe for servicing in accordance with current instructions.

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

(3) Pass the emergency oxygen supply tube through the retaining ring on the side of the seat and clamp the end into the gate clamp on the starboard side of the seat pan.

(4) Connect the nipple on the end of the emergency oxygen cylinder operating cable to the anchor section of the static line mounted on the seat beam.

Note . . .

Operations 2, 3 and 4 may be more conveniently carried out before the seat is installed in the aircraft.

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

(6) Unfasten the safety harness and clear the straps from the seat pan.

(7) Place the parachute pack in the seat pan with the closure flaps upwards. Tension the apron against its clips and connect the two halves of the parachute withdrawal line coupling.

(8) Re-arrange the parachute pack in the seat pan correctly (with the flaps downwards) and ensure that the webbing strap of the upper oxygen tube stirrup quick-release fitting is correctly attached to the parachute harness. Raise the safety harness shoulder straps off the back of the seat and place the parachute harness back pad against the seat backrest.

(9) Insert the sticker strap lugs in the spring clips on each side of the seat.

(10) Insert the upper oxygen tube into the stirrup of the quick-release fitting and engage the fitting with the emergency oxygen supply tube at the clamped end.

(11) Place the personal survival pack on top of the parachute pack with the lanyard towards the starboard side. Arrange the survival pack side quick-release couplings to drape over either side of the seat.

(12) Draw the leg loop of the parachute harness out from under the survival pack so that it lies on the seat cushion. Arrange the parachute harness waist belt and leg straps on the seat, together with the safety harness lap straps and upper oxygen tube assembly. Drape the negative-G restraint strap OVER the seat pan firing handle.

(13) Restore the seat to the safe for parking condition.

STRAPPING-IN PROCEDURE

23. The strapping-in procedure is as follows; refer to fig. 4 to 6 for detail as necessary :–

(1) Ensure the seat has been made safe for parking in accordance with current instructions.

(2) Sit in the seat. Fit the leg restraint garters, if this has not already been done (the garters may be stitched to the flying suit, or fitted before entry to the aircraft).

(3) Connect the personal survival pack lanyard to the quick-release coupling on the right of the life-jacket so that the lanyard lies across the right thigh.

(4) Connect the side quick-release couplings of the personal survival pack to the two corresponding fittings on the life-jacket.

(5) Connect the parachute harness shoulder straps to the quick-release fitting. The shoulder straps are to lie under the life-jacket stole.

Note . . .

When an inertia-proof quick-release fitting is incorporated in the parachute assembly it is necessary to turn the disc knob slightly towards the unlock position before the harness lugs will clip into the fitting.

(6) Pass the parachute harness leg straps through the leg loop and couple the lugs to the quick-release fitting.

(7) Adjust the quick-release fitting so that it lies centrally with the waistbelt close to the body.

(8) Tighten the shoulder straps first so that the parachute harness quick-release fitting will lie above and clear of the safety harness quick-release fitting when assembled.

(9) Tighten the parachute harness leg straps. When tightening harness straps, pull on the running end with one hand and push on the standing end with the other hand to relieve the tension on the buckles.

(10) Connect the air supply hose to the air ventilated suit (if worn).

(11) Fasten the lap straps of the safety harness but do not tighten.

(12) Draw the negative-G restraint strap up between the legs and tuck the V-shaped end under the safety harness. Ensure that the negative-G restraint strap is clear of the seat pan firing handle.

(13) Thread the leg restraint cords through the quick-release coupling rings on the garters as follows :—

(a) Pass the cord emerging from the snubbing unit behind the left leg through the garter ring on the right leg and UNDER the safety harness lap strap. Insert the lug of the safety harness right shoulder strap through the loop at the end of the leg restraint cord and also through the loop at the end of the right branch of the negative-G restraint strap. Secure the lug in the quick-release fitting (*see inset of fig.* 4) .

(b) Pass the cord emerging from the snubbing unit behind the right leg through the garter ring on the left leg, and UNDER the safety harness lap strap. Insert the lug of the safety harness left shoulder strap through the loop at the end of the leg restraint cord and also through the loop at the end of the left branch of the negative-G restraint strap. Secure the lug in the quick-release fitting.

(14) If there is insufficient leg restraint cord, press and hold the plunger under the snubbing unit and draw the cord upwards; if there is too much, draw any excess downwards through the unit (it is unnecessary to press the plunger in this instance).

(15) Tighten the safety harness lap straps first, then tighten the shoulder straps and tension the negative-G restraint strap.

Note . . .

Ensure that the quick-release fitting is as low as possible to expose the parachute harness quick-release fitting and and that the emergency oxygen supply tube (upper oxygen tube assembly) is is routed over the parachute harness but under the safety harness.

(16) Connect the main and emergency oxygen supply to the mask tube assembly and the locating chain to the life-jacket.

(17) Connect the Mic/Tel lead.

(18) Adjust the height of the seat. Ideally, the head is to be located in the centre of the headrest cushion.

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

(20) Ensure that the chin straps of both helmets are fastened, fit the oxygen mask and perform pre-flight oxygen checks.

Note . . .

If the chin straps are not fastened the helmets may be wrenched off during ejection. At high altitude this may result in loss of vital oxygen supply.

(21) Remove the safety pins from the firing handle safety locks and place them in their stowages.

EMERGENCIES

24. For drill and procedure to be taken in emergencies refer to Pilot's Notes, A.P.4326Q – P.N.

LEAVING THE SEAT AFTER LANDING

25. Proceed as follows :–

(1) Remove the firing handle safety pins from their stowages and fit through the safety straps on the face screen and seat pan firing handles (assistance should be obtained from a member of the ground crew, but if this is not possible the occupant fits the pins).

(2) Disconnect the main and emergency oxygen supply and the Mic/Tel lead.

(3) Disconnect the air ventilated suit, if worn.

(4) Release the safety harness; release the parachute harness.

(5) Disconnect the personal survival pack from the life-jacket and allow the lanyard to drape over the starboard side of the seat pan.

(6) Remove the leg restraint cords and negative-G restraint strap.

(7) Leave the seat.

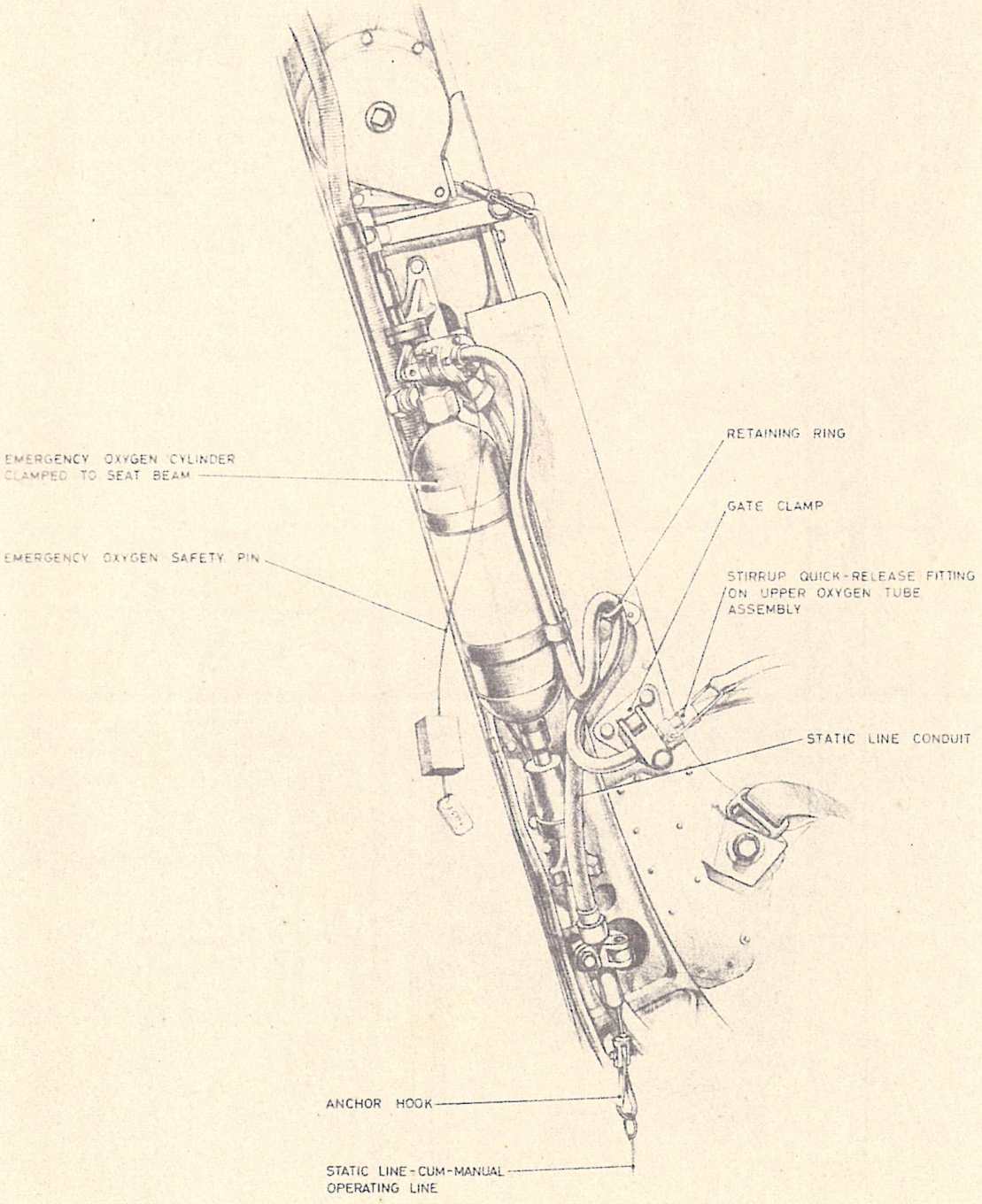

Fig. 1. Arrangement of emergency oxygen supply

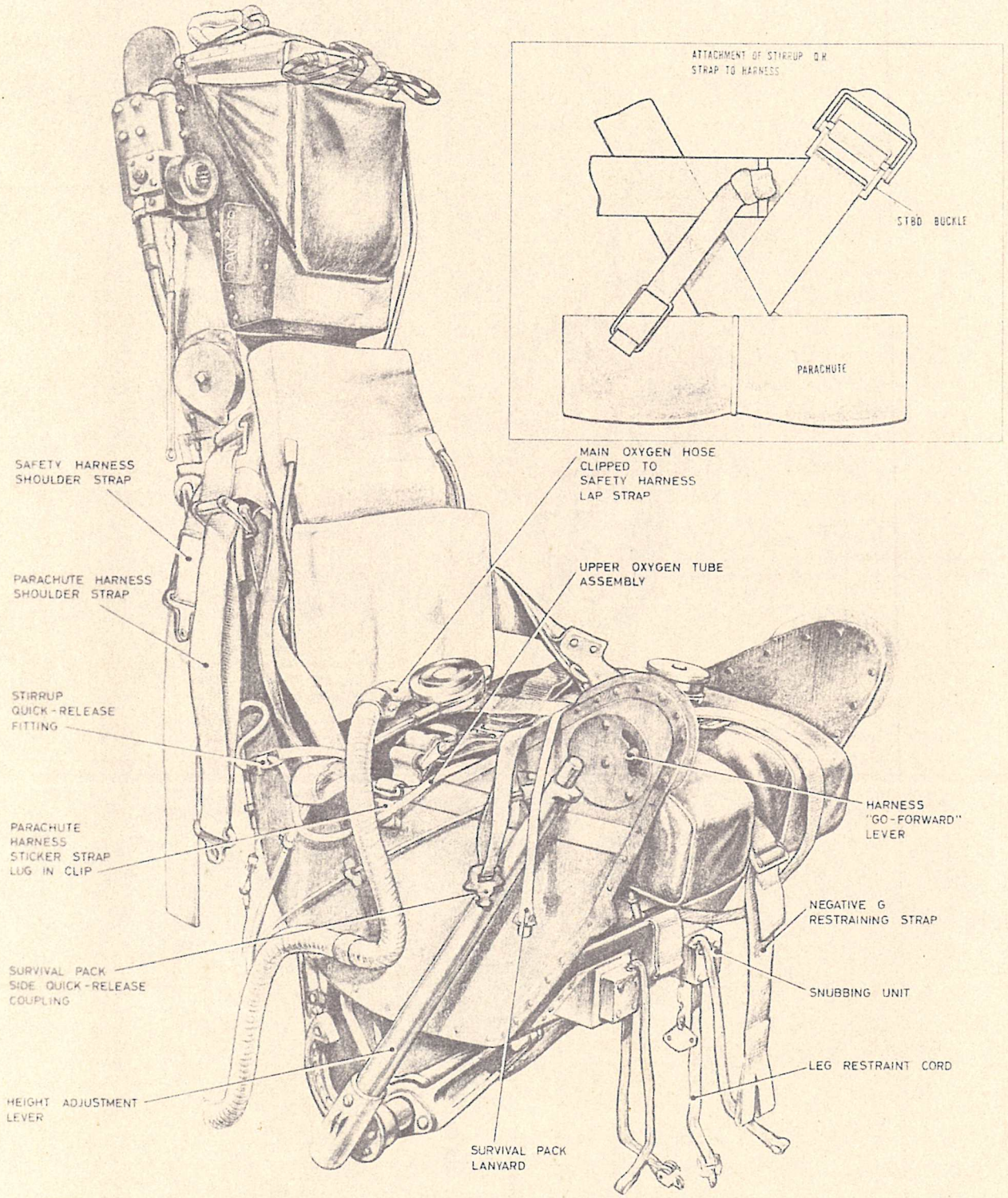

Fig. 2. The ejection seat Type 2CA equipped (1)

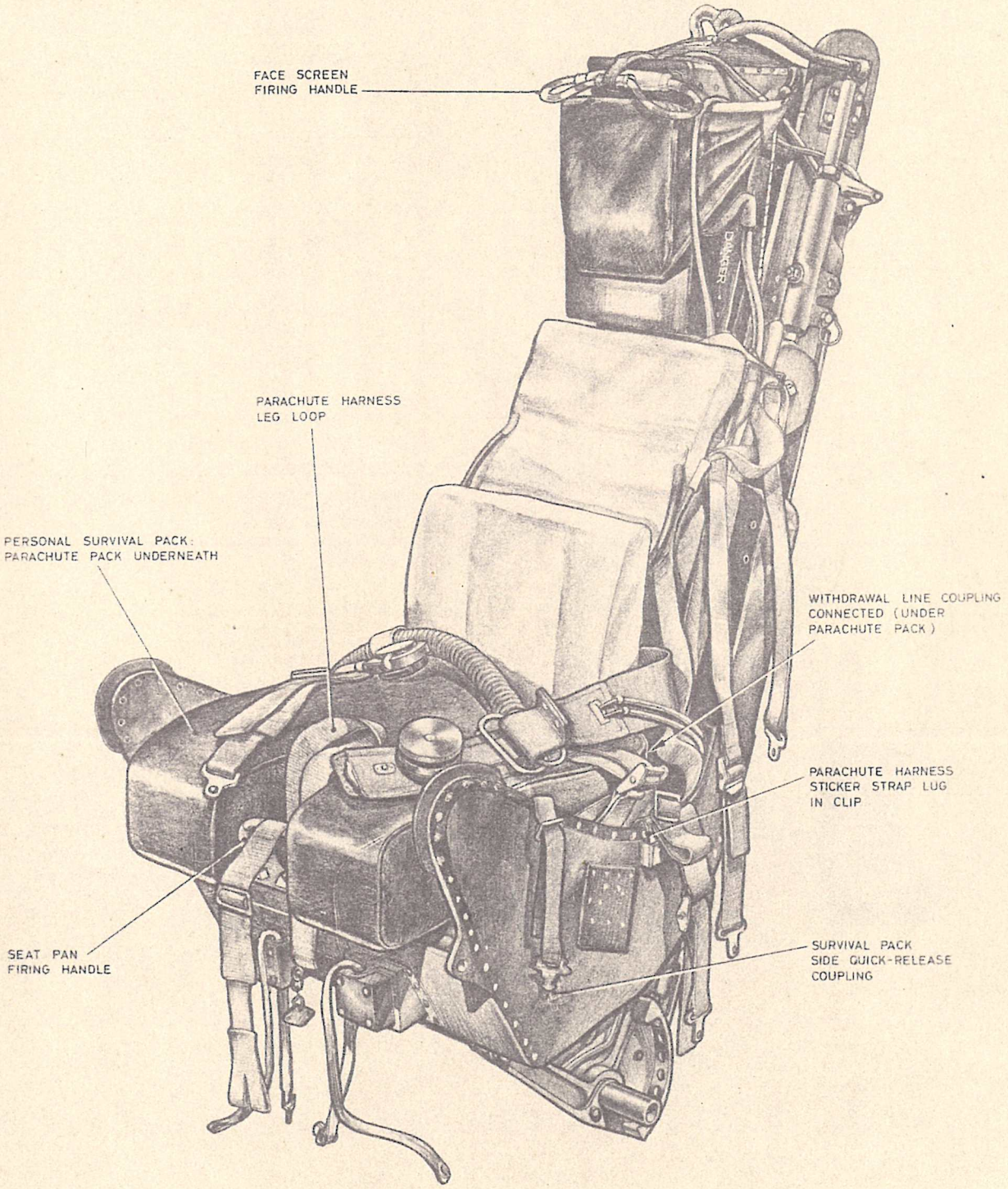

Fig. 3. The ejection seat Type 2CA equipped (2)

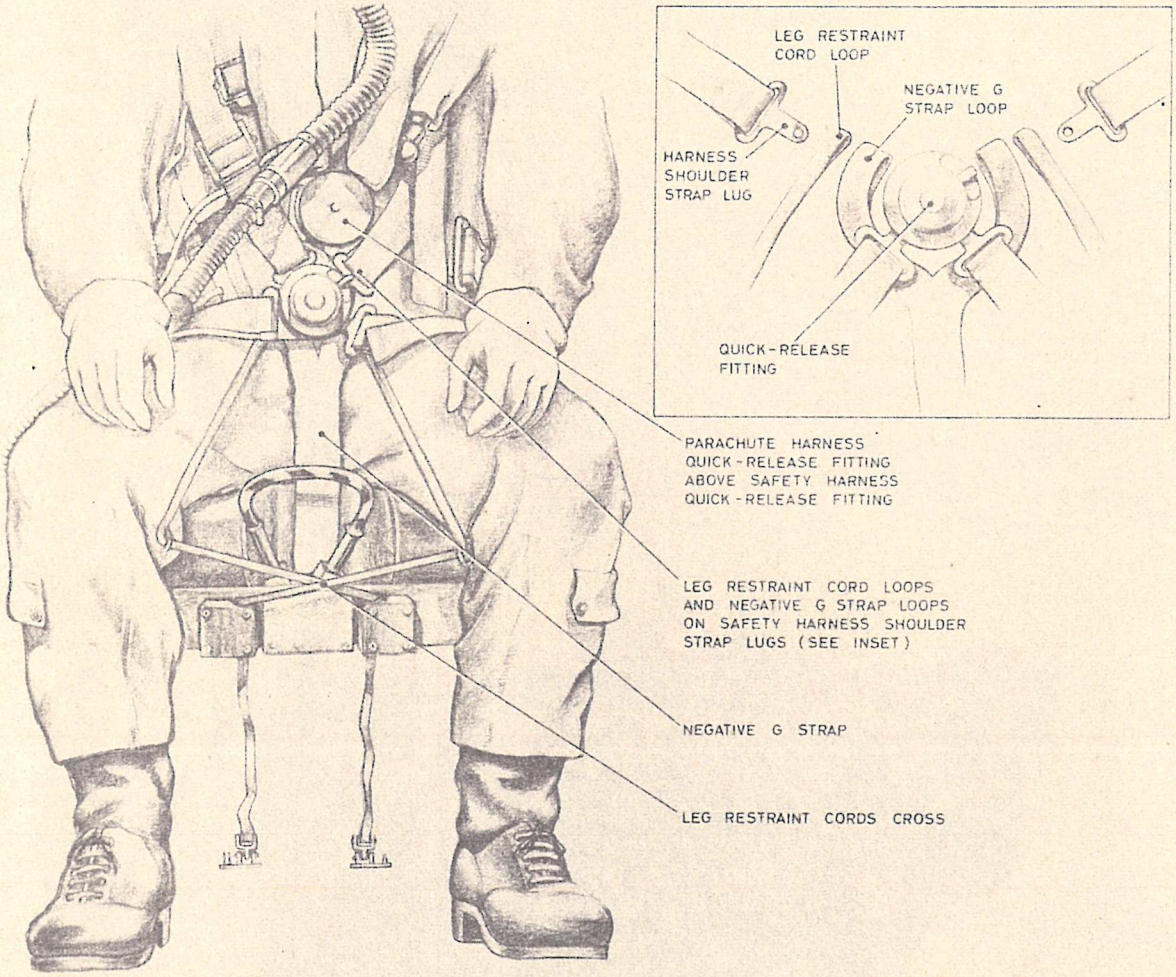

Fig. 4. Arrangement of leg restraint cords (inset: Assembly to quick-release fitting)

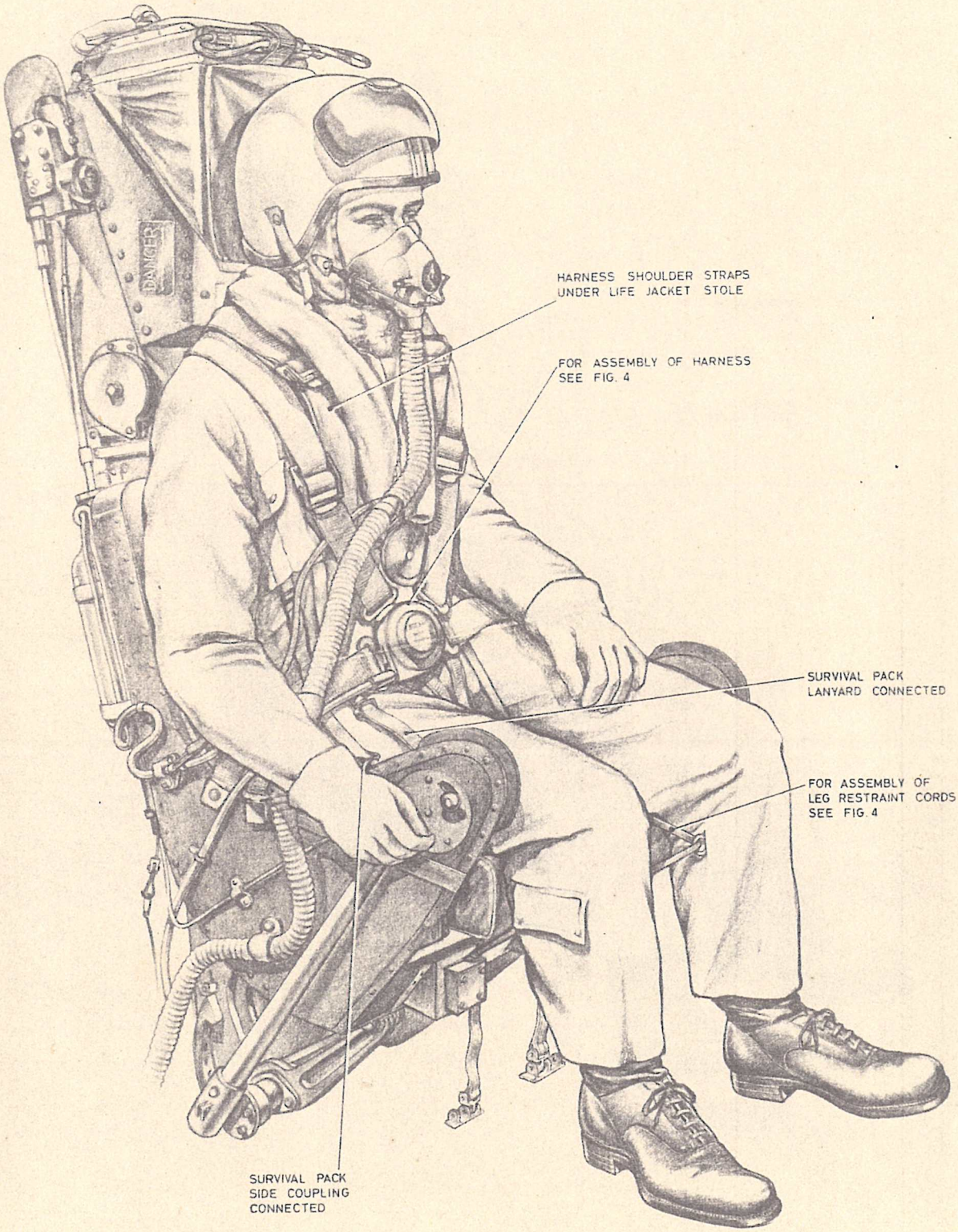

Fig. 5. The ejection seat Type 2CA occupied (1)

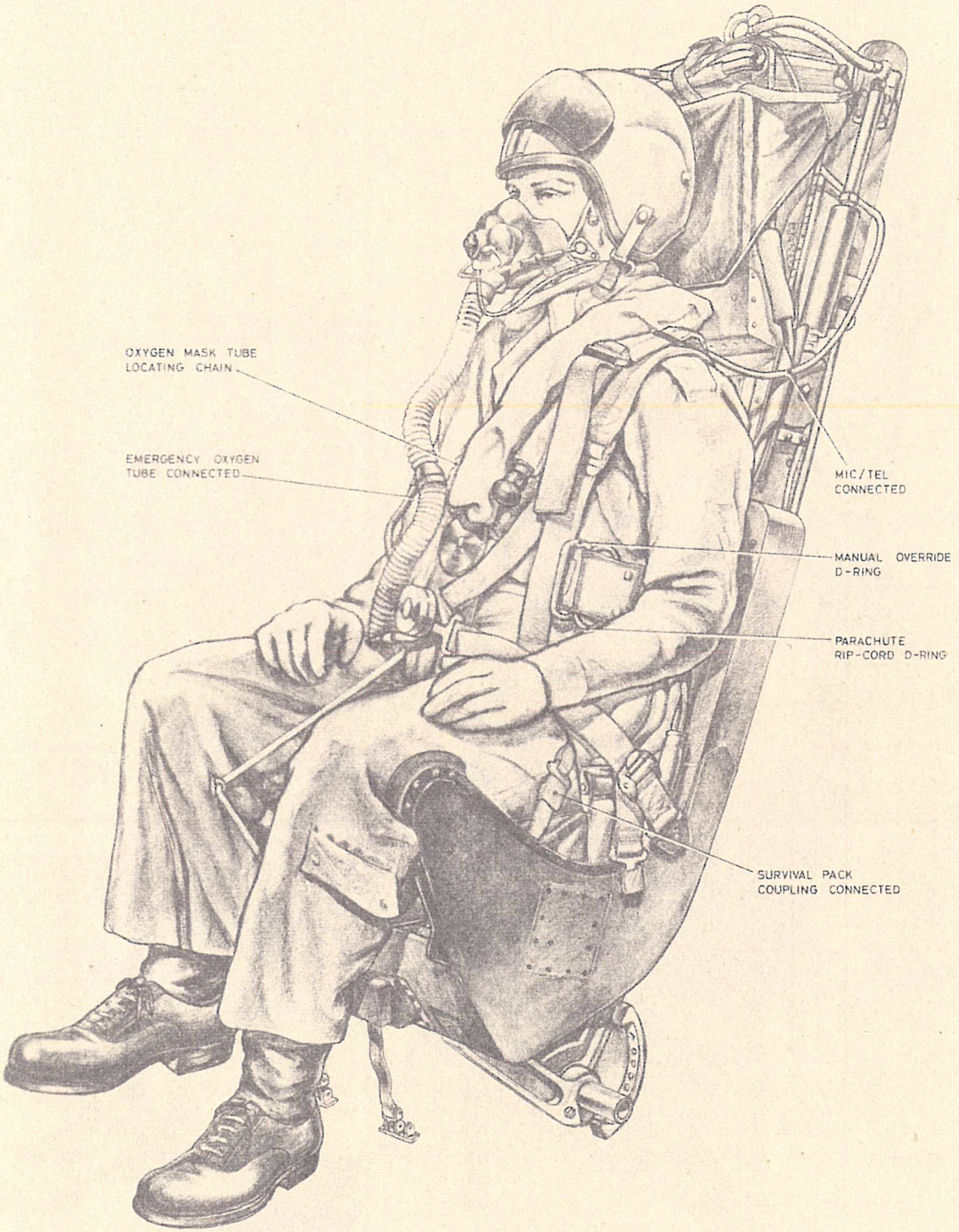

Fig. 6. The ejection seat Type 2CA occupied (2)