

Chapter 2

EJECTION SEAT, Mk. 2D (Sea Hawk aircraft)

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Introduction

1. The Mk. 2D ejection seat (Ref. No. 27L/50,003) embodies the following items of standard equipment which are described elsewhere in this book:—

- (1) Type 3 ejection gun
- (2) Type 2 drogue gun
- (3) Drogues and apron
- (4) Barostatic time-release unit

GENERAL DESCRIPTION

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

3. The ejection gun is fired by the action of pulling out a large, horizontal handle, situated immediately above the headrest pad. This handle draws out from the headrest a flexible screen which covers the occupant's face and protects it from the effects of the airstream. It also holds his head against the headrest pad and prevents it from jerking forward during ejection. A restraining plate is incorporated to prevent the face screen from being sucked out of its compartment by the airstream. Attached to the screen is a cable which is connected to a sear in the firing body of the ejection gun. When the screen is pulled out and right down over the face, the cable withdraws the sear and the gun is fired. The face screen and firing cable are proportioned in such a manner that the ejection gun will be fired whether the seat occupant is wearing a protective helmet or not.

4. The seat pan is provided with retractable thigh guards and accommodates a K dinghy pack, Type J. It can be adjusted for height by means of a handle on the starboard side of the seat structure. The seat pan moves relative to the headrest and footrests and thus can accommodate different body lengths, at the same time ensuring that the occupant's head will always be correctly located on the headrest pad whatever the position of the seat pan.

5. The footrests on which the occupant's feet are placed during the ejection are hinged to the seat frame, and spring-loaded so that they remain at floor level independently of the seat pan adjustment. This arrangement enables the feet to be slid back from the rudder pedals without being raised from the floor, as raising the feet would be difficult or impossible if the aircraft were subjected to high "g" loads at the moment escape became necessary.

6. A Mk. 8A back-type parachute is carried and supported in a metal container hinged at its lower edge to the seat pan and attached at its upper edge to the seat frame by telescopic radius arms. A back pad fits into the angle made by the container and the back of the seat pan. The dinghy pack, parachute and back pad are all attached to the parachute harness.

7. Type ZF safety harness is provided and has the two shoulder straps attached to the parachute container at the radius arms. The arms may be freed in flight by the movement of a lever projecting from the starboard side of the seat pan, thus permitting the occupant to lean forward when required. The arms can also be locked in intermediate positions.

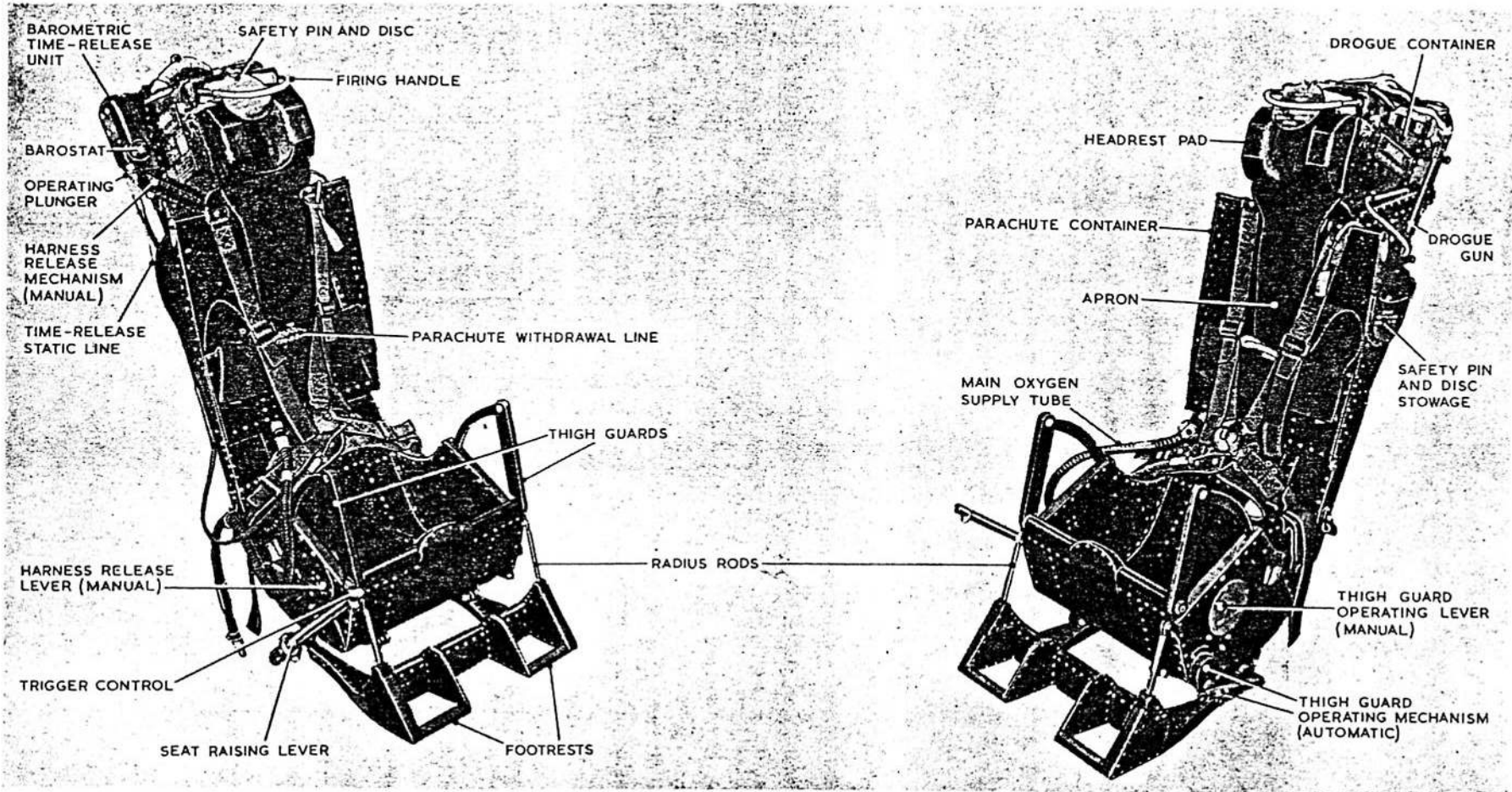


Fig. 1. Mk. 2D ejection seat

8. The automatic system comprises a barostatic time-release unit, which controls the opening of a scissor shackle at the top of the seat structure, and the operation of the safety harness quick-release fitting. An apron, to which the parachute withdrawal line is attached, is provided to pitch the occupant forward and open his parachute.

Quick-release connections

9. When the seat is ejected, the aircraft oxygen and intercom. services disengage automatically at quick-release connections. Further quick-release connections are provided for disengaging these services when the occupant leaves the seat subsequent to ejection. Quick-release connections are also provided for the emergency oxygen system; one to operate the emergency oxygen bottle on ejection and then disengage, and another to enable the oxygen mask to be disconnected from the oxygen bottle in the dinghy pack. The latter action is not automatic.

Safety precautions

10. A fabric strap is attached to the front edge of the drogue container. When this strap is passed through the firing handle and secured to the lugs below the face screen slot by the spring safety pin provided, the face screen is locked against the possibility of withdrawal. A warning disc is attached to the safety pin. Before any work is done in the aircraft cockpit, the safety pin must be withdrawn from the face screen lock and inserted in the hole in the sear at the top of the ejection gun. A rivet is fitted to the front portion of the firing sear to prevent it being pulled backwards and so firing the ejection gun.

SEAT STRUCTURE

11. The seat structure (*fig. 2*) is made entirely of light alloy. The main frame is built up from a pair 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 distance tube through which passes the countershaft carrying the seat raising levers and handle and the footrests.

12. Each side beam carries at its lower end two of the rollers which engage with the guide rail. The upper rollers leave the top of the guide rail at the moment the piston tube emerges from the cylinder tube at the end of the ejection stroke.

13. The seat pan (*fig. 3*) 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. The sides of the pan are shaped to form thigh guards which both restrain the occupant's knees from contact with the aircraft structure during ejection and also prevent his legs from being injured by being blown apart by the air pressure on emerging from the cockpit. The thigh straps of the safety harness are attached to the seat pan. The weight of the occupant is counterbalanced by two direct acting compression springs (*fig. 4*).

14. Each thigh guard is retained in the retracted position by a locking plunger which engages with a quadrant stop (*fig. 5*). When operated by the manual release lever or the automatic release unit, the thigh guards spring to the raised position under the force of the direct-action torsion spring. The springs continue to exert pressure, thus retaining the thigh guard in the raised position; in this condition the quadrant stop butts against the buffer spring.

15. When the manual control is pulled upwards the sear bar is depressed via the link plate, and the cam-shaped slot in the sear acts on the roller, causing the locking plunger to disengage from the quadrant stop. The locking plunger is spring-loaded and springs back into position ready for recocking. When the automatic release unit is operated by the upward movement of the seat during ejection, the automatic release sear which is attached to the aircraft structure is withdrawn from the end of the spring-loaded plunger, thus allowing the plunger to move forward and actuate the mechanism through the operating lever. The lever is attached to a collar fitted over the end of the torque tube. The collar has a slot machined in it and is secured by a stud; the object of the slot is to provide a measure of lost motion, thus permitting manual control independently of the automatic release mechanism. The torque tube transmits the motion to the right-hand side of the seat where the mechanism is duplicated with the exception of the manual release lever and automatic release unit.

Note . . .

The thigh guards cannot be retracted unless the automatic release sear is in position.

WARNING . . .

Do not operate the manual control, or remove the seat from the aircraft with the sear fitted, whilst standing in front of the seat. The force exerted by the torsion springs is considerable and can cause serious bodily harm if the fast-moving thigh guards should strike the operator.

16. The seat raising mechanism (*fig. 6*) is operated by a handle on the starboard side of the seat. The trigger control by means of the sear and the roller displaces axially the sear bar which in turn withdraws the pair of spring-loaded plungers from engagement with the quadrants and allows the seat raising levers attached to the countershaft to be rotated by the seat raising handle. Release of the trigger control allows the plungers to engage the nearest holes in the quadrants and lock the mechanism in the desired position. Five positions are provided, with a total adjustment of 4 in.

17. The ejection footrests pivot on the countershaft in two split bearings and are maintained in contact with the floor of the aircraft, when the seat is being raised, by a reaction spring in a housing. Radius rods in trunnion guides connect the footrests to the seat pan, but allow the seat to move up and down without moving the footrests.

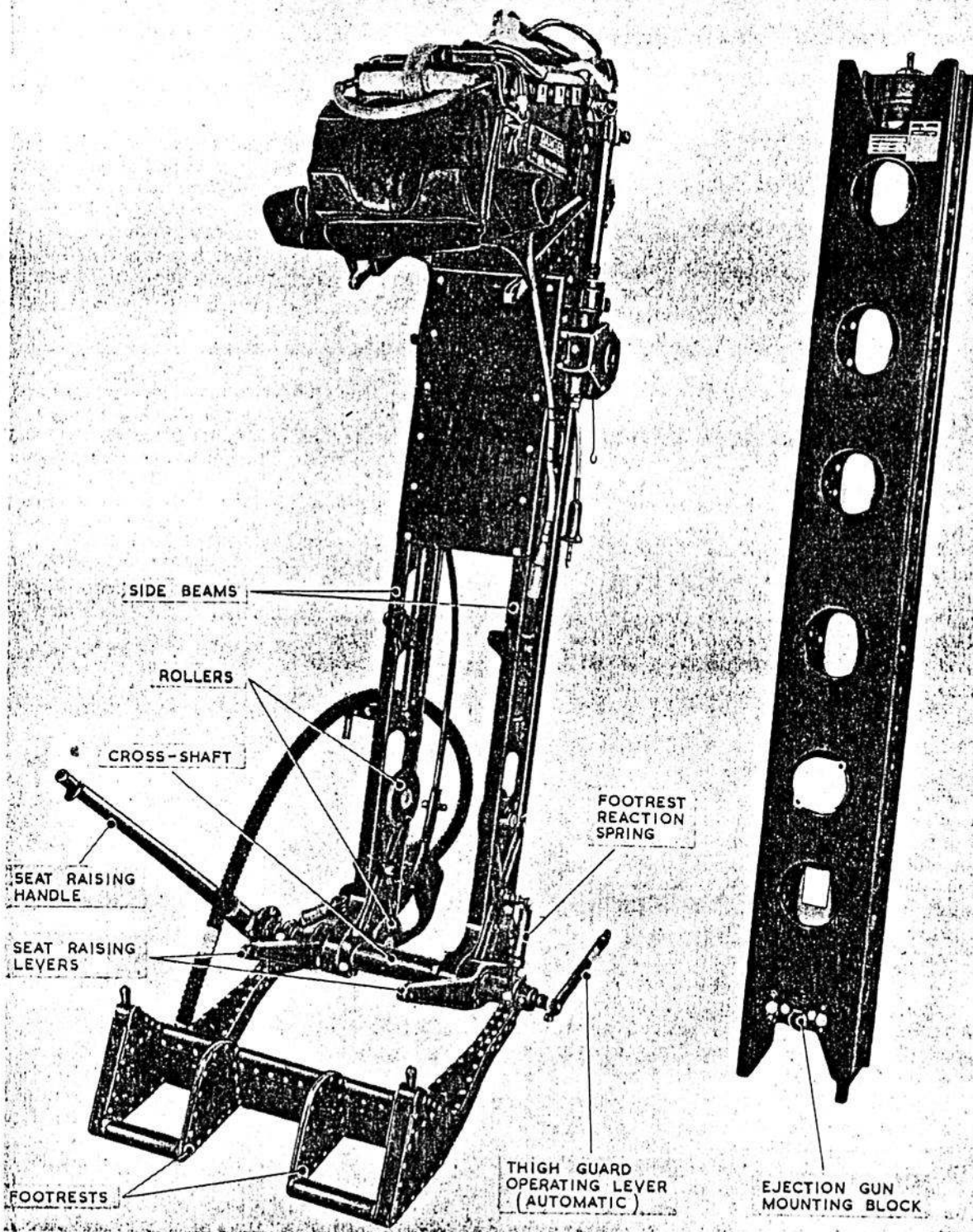


Fig. 2. Seat structure and guide rail

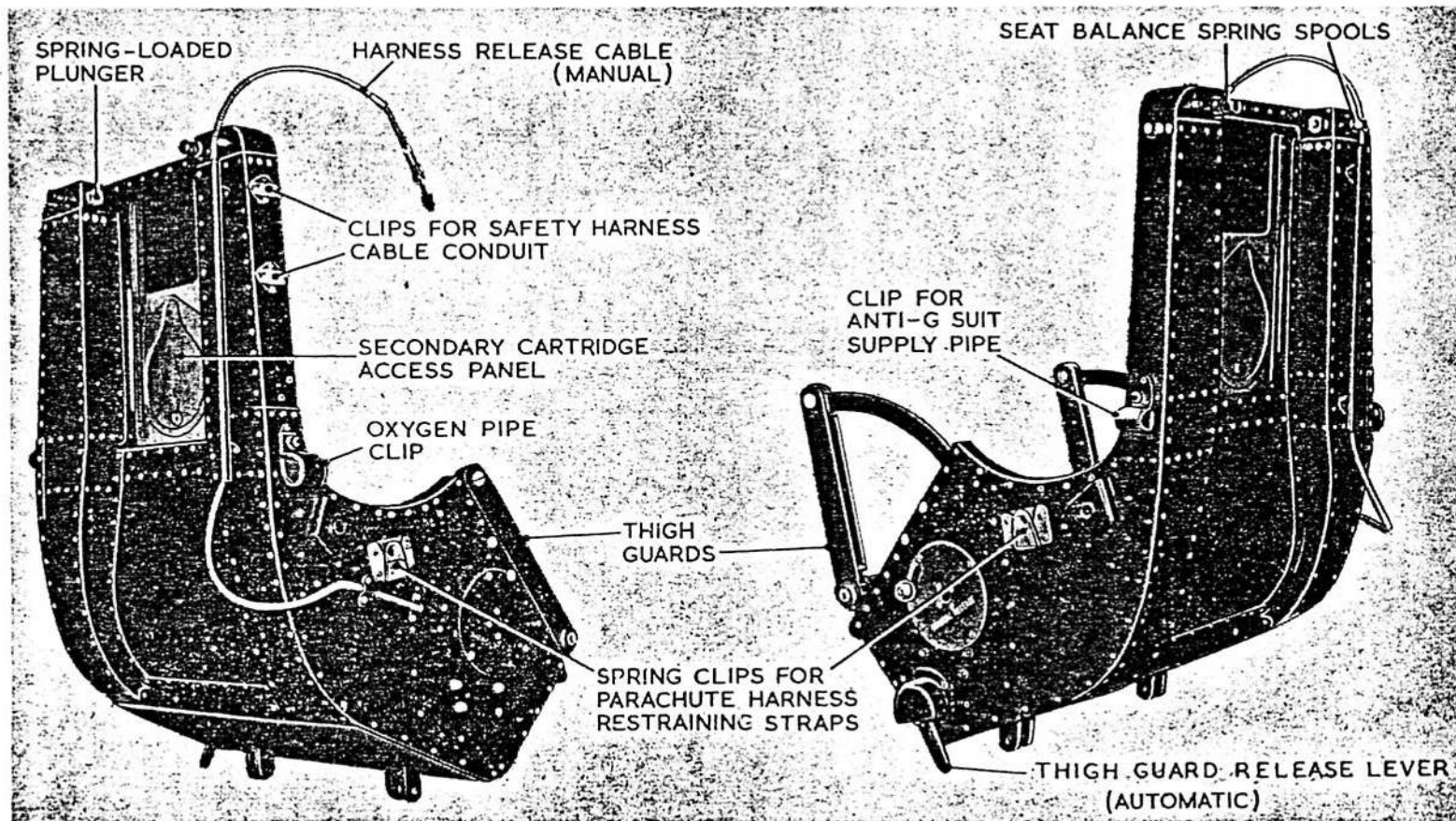


Fig. 3. Seat pan

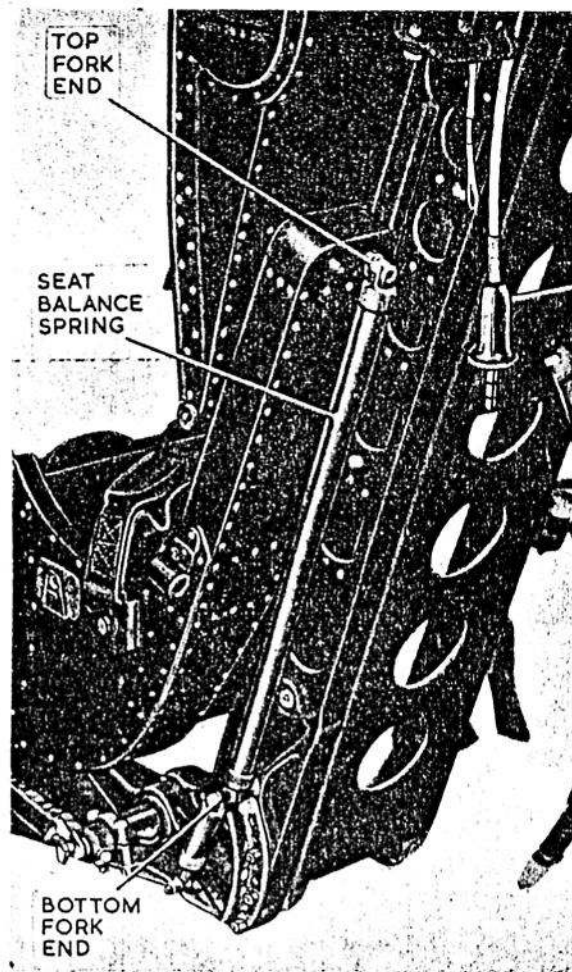


Fig. 4. Seat balance spring

18. The parachute container (*fig. 7*) is a riveted sheet metal box hinged at its lower edge to a pair of brackets bolted to the seat beams. The hinge is formed by spring-loaded plungers which are freed by pulling the withdrawal knobs. The container supports the weight of the parachute during flight and takes sideways loads. The parachute lifts easily out of the container when the occupant leaves the seat. The upper edge of the container is secured to a pair of telescopic radius arms, the body of each of which is pivoted to the seat beam, and the sliding member to the container upper edge. This latter point forms the attachment for the shackle for the Type ZF safety harness shoulder strap. Each sliding member has three notches which may engage with the spring-loaded plunger. Two of these notches are chamfered on their forward faces so that if the plunger is in either of these notches the seat occupant can return the container to the next position to the rear by leaning back without operating the harness release lever. The spring-loaded plungers are controlled by the levers mounted on the cross shaft, the starboard lever being operated by the flexible cable from the control lever in the starboard thigh guard.

19. In the position shown in *fig. 7* the mechanism is locked right back. The two other notches provide positions of restraint against forward movement, and the unchamfered one against back-

ward movement also. With all the notches forward of the plunger the sliding member moves freely, but is limited in the forward direction by the retaining screw which butts against the edge of the groove in the sliding member. The parachute container embodies clips for restraining the apron and parachute pack.

20. The drogue container (*fig. 8*) is a riveted sheet metal box mounted at the top of the seat frame. A leather covered headrest pad is secured to the front of the container by two pins which are withdrawn by the lifting lines after the scissor shackle has opened. The firing handle is attached to the front edge of the face screen. The face screen, which is normally retained folded in the front compartment of the drogue container, is made of lined canvas and is specially shaped to protect the user's face from the air stream and to provide support for the head. The face screen is designed to accommodate a protective helmet. The firing cable is attached to the centre of the face screen by a sewn nylon cord loop and then passes through a conduit to the ejection gun firing mechanism. This conduit prevents the cable from being pulled inadvertently and so firing the gun.

21. The top of the drogue container is closed by four fabric flaps which normally retain the drogue. They are numbered 1 to 4 in the order starboard, port, rear, front.

GUIDE RAIL

22. The guide rail (fig. 2) 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 cross-beam and restrain the forward impulse of the seat in the event of a crash landing.

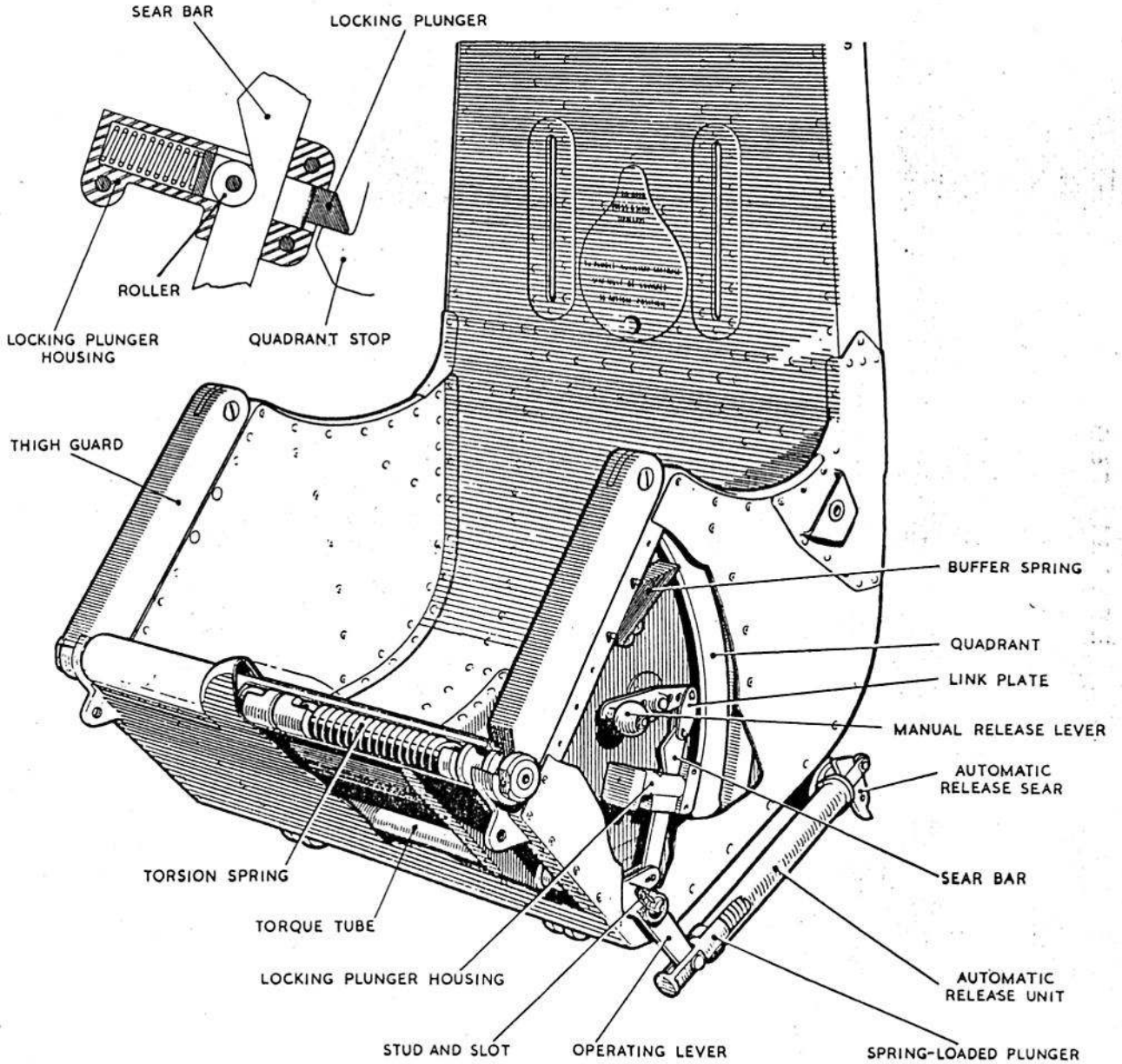


Fig. 5. Thigh guard mechanism

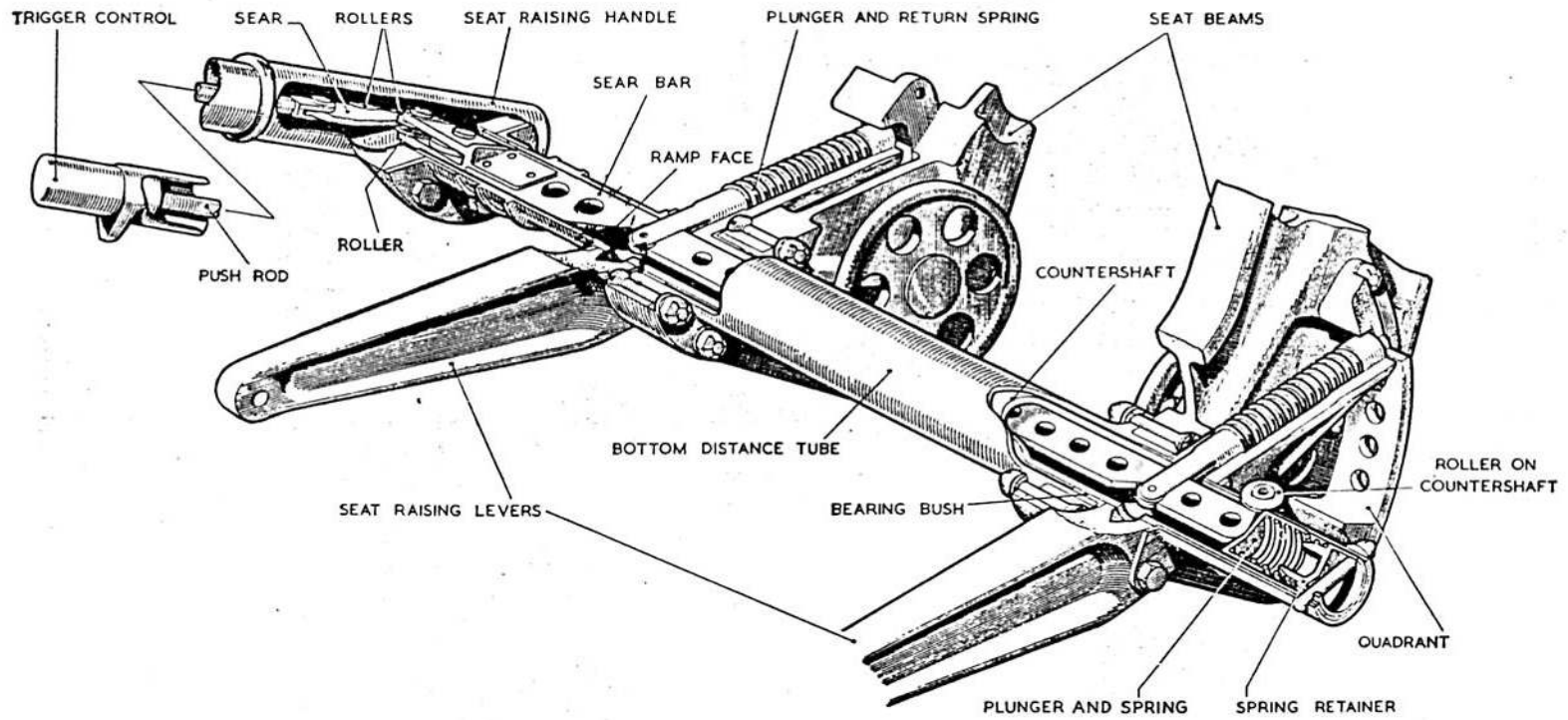


Fig. 6. Seat raising mechanism

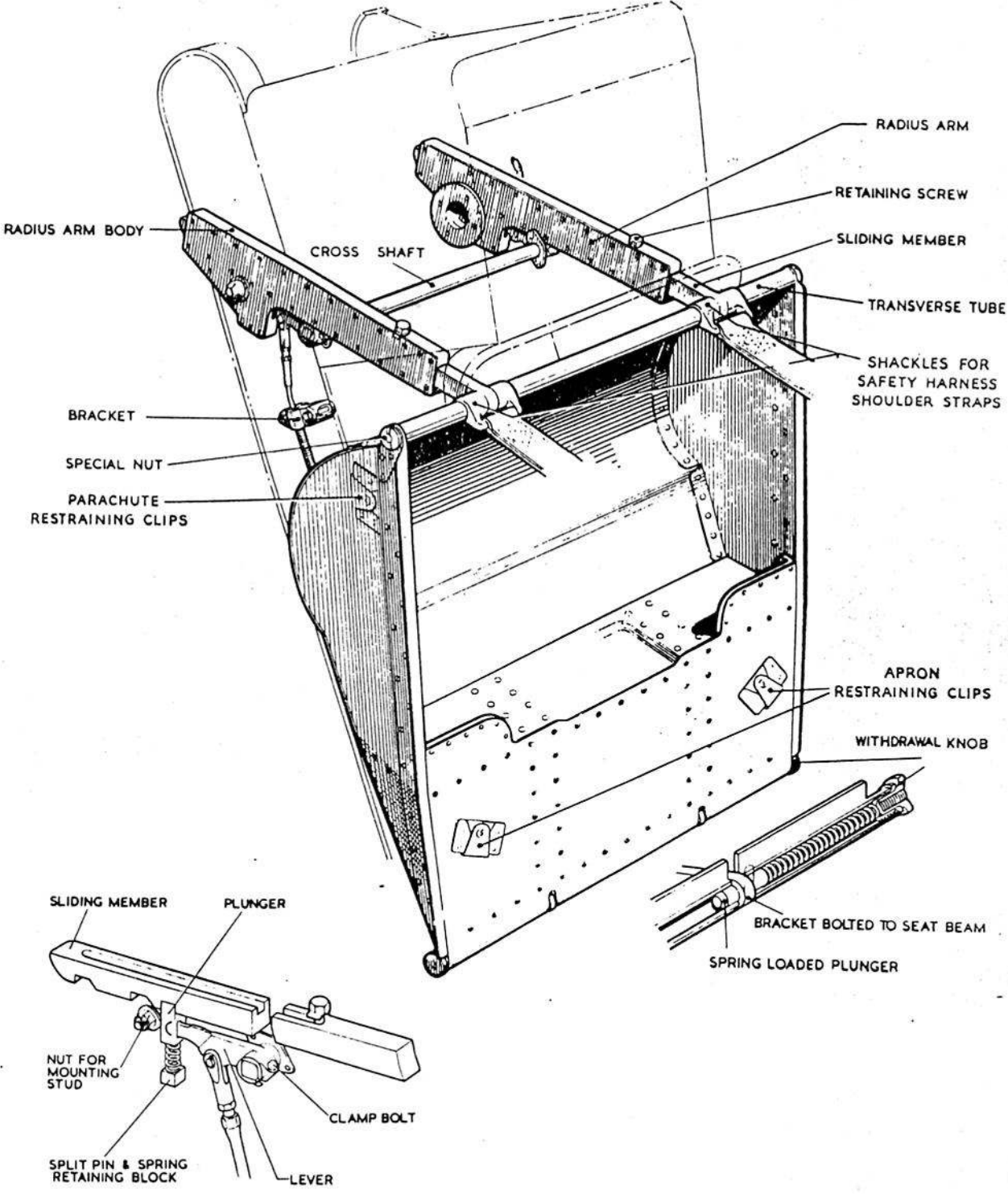


Fig. 7. Parachute container

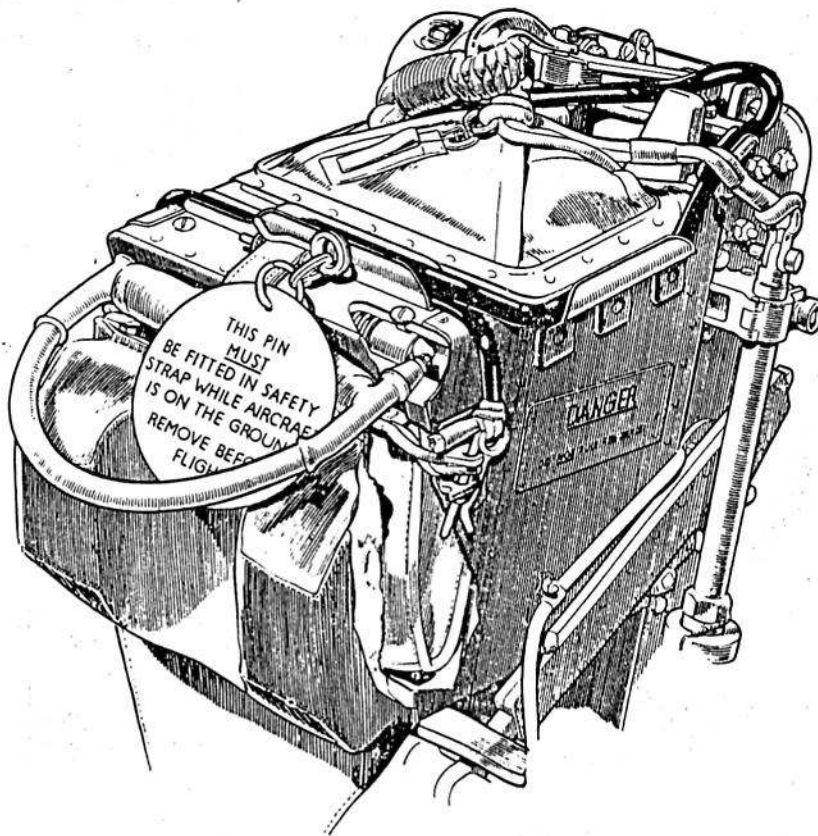


Fig. 8. Drogue container



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