Chapter 11
EMERGENCY EQUIPMENT

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

DESCRIPTION

WARNING . . .
AIRCRAFT EJECTION SEATS ARE FITTED TO THIS AIRCRAFT.
This equipment is a source of potential danger to personnel and of damage to the aircraft. If a firing mechanism is operated while the aircraft is on the ground a seat will be ejected, damage will be done to the aircraft, and injury can be caused to personnel in, or leaning into the cabin.
The precautions detailed in Sect.1, Chap. 1 of this book must be strictly adhered to.

Introduction

1. This chapter describes the emergency installations in the aircraft, details the servicing procedure and recommends the method of removal and assembly of certain items. The method of operating the controls is given in Sect.1, Chap.3.

EMERGENCY CONTROLS

Alighting gear

2. The compressed air emergency system, used to lower the alighting gear should a failure of the normal system occur during flight, is essentially linked with the hydraulic system and is, therefore, described in Sect.3, Chap.6 of this book. The following paragraphs deal with the control system only, i.e., the control handle assembly in the cockpit and the single run of connecting rods by means of which the two emergency air release valves are operated.

3. The control assembly in the cockpit consists of a tubular push-pull rod with a spade-grip handle at one end and a 12 toothed ratchet extension at the other. The assembly is mounted fore-and-aft along the starboard side of the throttle console with the handle slightly raised and to the rear. The rear (handle) portion of the rod is supported in a single bracket which serves as a 'stop' and also as a means of locking the handle in the stowed (systems normal) position. The forward (ratchet) end of the rod passes through and is supported in a small housing which contains the pawl mechanism and a micro switch. The pawl is swivel mounted below the switch and is spring loaded downward onto the ratchet. When the handle is locked in the stowed position, the micro switch plunger is depressed by the pawl which is raised against its spring and rests on a small ramp at the start of the ratchet. With the micro switch plunger thus retained, all alighting gear electrical circuits are normal.

NOTE . . .
The nose-wheel steering system, unaffected by these circuit changes, is operated in the normal manner.

4. Operating movement of the handle is transferred to the connecting rod system by a bell-crank lever mounted on the starboard side of the console, just below the push-pull rod and slightly aft of the pawl/micro switch housing. This lever converts fore-and-aft movement to vertical, one arm, concealed within the console structure, being connected to a rod which passes downward inside the console support column to a further bell-crank lever below the pilots' floor. From this lever, the connecting rod goes outboard to a tie rod system on the starboard side of the cabin. The tie rod system, routed aft with the throttle control system rods, incorporates a connecting bar/seal assembly for its passage through the rear pressure bulkhead and is supported in suitably spaced fairleads throughout its run. After passing through the nose-wheel bay, the tie rod system terminates at a spring box assembly located above and between the two emergency air release valves. The spring box is mounted on the coupling pin which connects the two operating levers. Two springs in tension retain the valve operating levers in the valve closed position.

Operation

5. When the alighting gear is to be lowered by means of the emergency air system, the spade-grip handle is pulled out to its full extent, i.e., until the collar on the handle push-pull rod abuts the support stop bracket. This operation moves the complete handle assembly aft 3·5 in. The first effect is the withdrawal of support from under the pawl which immediately swivels downward, under the influence of its spring loading, releasing the micro switch plunger and engaging the ratchet. The plunger extension trips the micro switch, causing circuit changes to occur which render the alighting gear normal selectors inoperative. This action occurs immediately after the first 0·98 in. of movement which, although transferred through the bell-crank lever and tie rod system, is completely absorbed by the spring box and has no effect on the release valves. Movement of the handle beyond this point causes the spring box to extend until its limit stop is reached, force then being applied to the individual lever retaining springs. When the handle assembly has travelled approximately 2·6 in. of the total 3·5 in., the release valves should be just on the point of opening. The remaining 0·9 in. of travel moves the operating levers to the fully open position and air, under pressure, is released to the alighting gear 'down' lines. Once operated, the control system is locked by the ratchet and cannot be reset until after the aircraft has landed. The method of resetting the system is given in para.43.

Raising

6. Incorporated in the UP button of the

alighting gear selector switch is an electro-magnetic lock which is engaged until the weight of the aircraft is removed from the wheels. Rotation of the EMERGENCY flange on the UP button, will depress a solenoid within the selector, the safety lock circuit will be broken and the alighting gear can then be raised by pushing the UP button.

Hydraulic power pack

7. In the event of failure of the normal hydraulic supply system, the bomb doors and the aircraft brakes may be operated by selecting an electro-hydraulic power pack, full details of which are given in Sect.3, Chap.6. A rotary 3-position EMERGENCY switch, labelled OPEN – NORMAL – CLOSE, on the port side console will energise the power pack to operate the bomb doors when placed to either the OPEN or CLOSE position. Also on the port side console is a power pack switch which, when operated, will energise the power pack and provide a hydraulic pressure supply direct to the brake accumulators.

Cabin decompression

8. The cabin can be decompressed by any of the following controls:-

(1) EMERGENCY DECOMPRESS switch at the edge of the port console.

(2) ABANDON AIRCRAFT warning switch on the port console.

(3) ABANDON AIRCRAFT warning switch on the starboard console (Post Mod.2358).

(4) Pressure selector switch, on the starboard console when placed to NO PRESS.

(5) Black-and-yellow striped handle in the roof of the crew's compartment.

When the decompression valves are energised, a relay prevents the operation of the flood flow system. The air conditioning system is described in Sect.3, Chap.8 of this book and the electrical details of the system are given in Sect.6, Chap.12 of this publication.

EMERGENCY EQUIPMENT

Ejection seats

9. A Martin-Baker ejection seat is installed at each pilot's position, with the seat guide rails bolted to brackets in the pilots' floor and secured at the upper ends, by a bracing tube assembly to the cockpit rails. Each seat is equipped with an emergency oxygen set, a dinghy pack and fully automatic release harness. The type of seat at each position is given in the Leading Particulars. Descriptive details of the seats are contained in A.P.109B-0122-1.

Crew seats

General

10. When Mod.1696 is embodied, swivel and sliding seats are installed at the three rear crew members stations. The two outboard seats have both swivel and sliding capability whilst the centre seat has a fore-and-aft slide facility only. All seats have the inflatable 'assister' cushion equipment, the main purpose of the installation being to aid escape. A back-type parachute pack, designed with special features to utilise fully the advantages of this type of seat, and a seat-type dinghy/survival pack are used by crew members occupying the outboard seats. A back-type pack which incorporates parachute, dinghy and survival packs is used by the occupant of the centre seat.

11. Each seat has fore-and-aft adjustment and is locked at various positions by pins, through the roller axles at the rear of the seat, which engage with holes in the seat rail. When facing aft and locked (normal working position), the seat provides a crash station for its user and is capable of withstanding deceleration loads of up to 25G and side loads of 4G. The swivel seats and associated equipment are fully described in A.P.101A-0100-16.

Outboard seats

12. For emergency escape, the user has only to slide his seat fully back (forward in aircraft), turn it to face the exit and pull the emergency knob. When the seat is turned the back rest will fold forward approximately 14 deg, pushing the user toward his ultimate standing position. Operation of the emergency knob starts the sequence which releases him from the seat; his cushion inflates - the anchor pins being withdrawn from his lap strap harness in the initial stages of inflation - and he is raised to an almost upright position with his weight on his feet. The parachute and dinghy packs are pulled clear of the seat during this 'assisted' movement and the crew member can 'abandon aircraft' through the entrance door/exit - deploying his parachute automatically by static line, or manually.

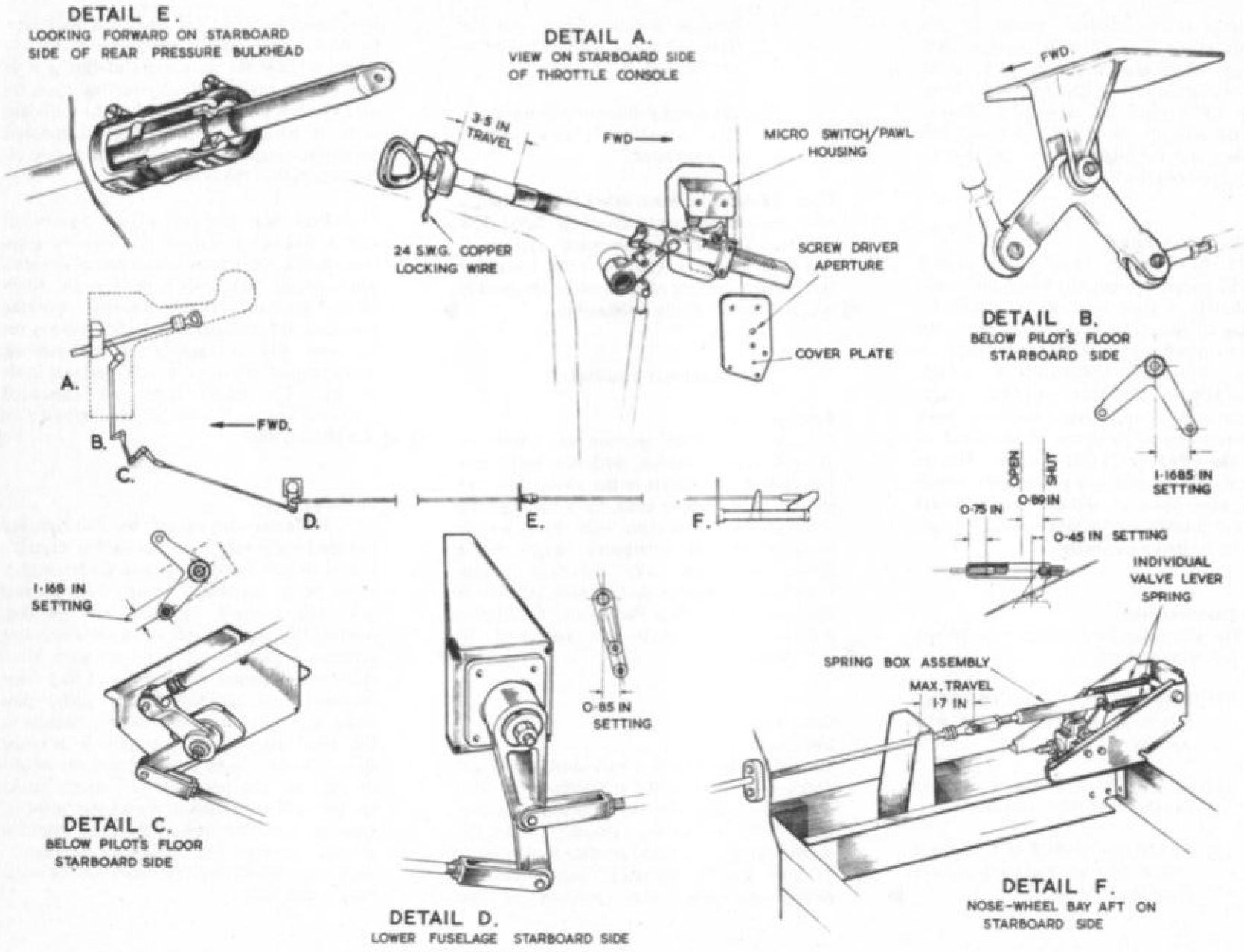


Fig. 1 Control system – emergency air

Centre seat

13. Escape from the centre seat is accomplished with equal ease - the difference being that this seat does not swivel, therefore, after sliding the seat fully backwards, the user pulls the emergency knob (left hand). The sequence following this action is identical to that described for the outboard seats.

Controls and indicators

14. When occupying an outboard seat, the crew member has a lever at his left hand to release the seat position locks, an emergency knob at his right hand and a thigh support adjuster between his legs. There are two additional levers for releasing the seat position locks when the seat is vacated; one at the top of the back rest and another (foot-operated) in the base casting below the backrest. Controls are shown in fig.4, their use is as follows:-

Outboard seats

(1) To move the seat fore-and-aft, pull the left hand lever fully back, slide the seat along its rails to the required position then release the lever, ease the seat fore-and-aft

until the seat rail lock-pins engage. The foot-operated lever performs the same function when moved to the right.

(2) To swivel the seat, move and lock the seat in the fully rearward position (forward in aircraft), push the left hand lever away from the seat and allow the backrest to 'fold'. Using the floor or table for purchase, begin the swivel and release the lever - ensuring that the backrest is locked folded (lean forward). Continue swivelling until swivel lock re-engages, this being the emergency escape position. The lock lever on the back of the head rest also performs this function and, since it folds the backrest, precautions must be taken to prevent the backrest from slamming over as it travels with considerable speed when unladen.

NOTE . . .
The left hand lever has been designed to operate with a simple hand movement and no latch device is provided. Care must be exercised when working on or near the seat with the backrest in the 'unfolded' position.

(3) The backrest should be left in the folded position whenever the seat is unoccupied. To unfold the backrest, when occupying the seat, swivel the seat to face aft (normal working position), push the left hand lever away from the seat and lean back hard against the backrest; release the lever and the backrest locks will engage.

(4) The thigh supports are adjusted by a hand wheel on a screwed rod below their centre. Should the height limiting device be released by over adjustment, the thigh support must be pushed firmly down, at the same time turning the hand wheel to re-engage the screwed rod.

(5) The emergency knob, situated on the right of the seat, controls the air cushion inflation system; it is pulled to operate and is for use in emergency escape only.

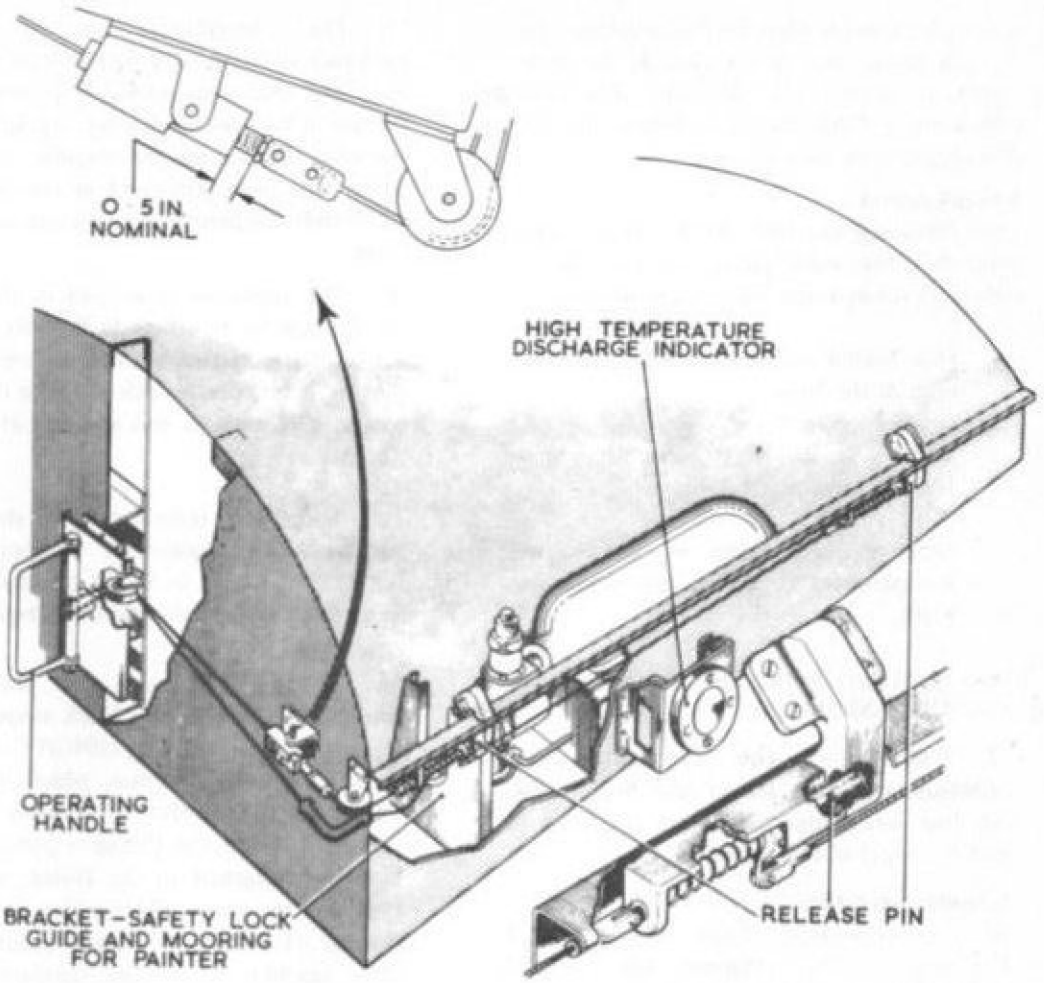


Fig.2 Liferaft - operating mechanism

Centre seat

(1) The centre seat has two controls, the fore-and-aft slide lock/release at the right and the emergency knob which is included in the pneumatic assister assembly, at the left of the seat.

15. Four indicators are provided in the lower left hand corner of the first pilot's instrument panel to indicate individual crew escape. These

indicators come on when the micro switch, one to each static line, is operated as the crew member leaves the aircraft. Mod.2374 introduces a fifth escape indicator for the seventh seat crew member.

Fire protection

16. Mounting for five (B.C.F.) type trigger controlled fire extinguishers are provided in the crew's cabin at the following positions:-

One behind each pilot's seat, at the aft edge of the floor.

One under the pilots' floor secured to the port support strut.

One at each side of the crew's compartment, adjacent to the outer seats.

The extinguishers are described in A.P.107E-0400-1A.

17. Details of the automatic fire extinguishers in the power unit bays, bomb bay and fuel compartments are contained in Sect.4, Chap.5 of this book.

Liferaft installation

18. A liferaft, Type M.S.5 Mk.1 Ref.No.27C/2324, complete with survival equipment, is installed in a prepacked removable stowage container at the rear of the canopy and provides seating capacity, in an emergency, for five or six persons. The scale of equipment is listed in A.P.1182C, Vol.1, Book 2, Sect.8, Chap.16 and A.P.101B-1902-3B. The container is replaceable and interchangeable as a complete unit to allow all detailed packing and servicing to be carried out in the Safety Equipment Section. The liferaft is operated by a single point manual release, behind the pilots, after the canopy has been jettisoned.

19. The installation is a built-in, positively-locked stowage in the form of a box, so shaped that it is covered and faired off by the rear of the cockpit canopy. The liferaft and operating handle are inaccessible unless the canopy has been jettisoned or removed; they are outside the pressurised compartment of the cabin.

20. The container is secured to the top of the fuselage by two lugs at the rear and two quick-release fasteners at the front. Three slinging points are provided on the container, two at the forward end and one at the rear (fig.8).

21. Descriptive information of the liferaft and associated equipment is contained in A.P.1182C, Vol.1, to which reference should be made if further information is required.

Operation

22. Centrally-disposed on the liferaft container is a yellow and black striped D-ring, identified by the marking DINGHY RELEASE on the adjacent structure, which is used to release the liferaft after the canopy has been jettisoned. When the D-ring is pulled, a cable assembly, attached to the D-ring, withdraws two pins to release the positive lock on the stowage lid, further movement causes a second cable assembly to actuate mechanically the type L operating head of a carbon dioxide cylinder Mk.2L. The liferaft is now inflated and forces off the stowage lid, which falls away. Method of packing ensures that the survival equipment is already in the liferaft on inflation and the liferaft can be hand launched over either side of the fuselage since it is attached to the aircraft with a single painter cord only.

23. As an indication of whether or not the liferaft head has been operated, a high temperature discharge indicator is visible through an inspection window in the port side of the canopy. Normally a copper disc, with 'APPEARANCE OF STREAMER INDICATES THAT DINGHY CYLINDER HAS DISCHARGED DUE TO HIGH TEMPERATURE' printed on it, is visible. If the cylinder has discharged through the indicator due to its contents expanding at high temperature, the red streamers will be seen. The head once fired will remain in that condition until reset.

Ram air turbine

General

24. The purpose of the ram air turbine is to provide an independent drive to an alternator to give limited electrical supplies should power failure occur at altitude. This is accomplished by driving a 22½ k.VA alternator from a turbine which is lowered into the airstream (fig.3). Electrical details are given in Sect.6, Chap.5.

Controls

25. The cockpit control of the ram air turbine is a T-shaped handle located above the cockpit coaming over the pilots' centre instrument panel. The handle is painted with black and yellow stripes and marked RAM AIR TURBINE RELEASE. Operation of the handle allows the turbine to swing down, under its own weight, to the operating position where it remains until reset by the ground servicing personnel. To aid resetting and to enable the turbine to be lowered without using the cockpit control a separate control is provided. This is flush fitting lever located immediately forward of the turbine housing.

Operation

26. To lower the turbine the T-handle

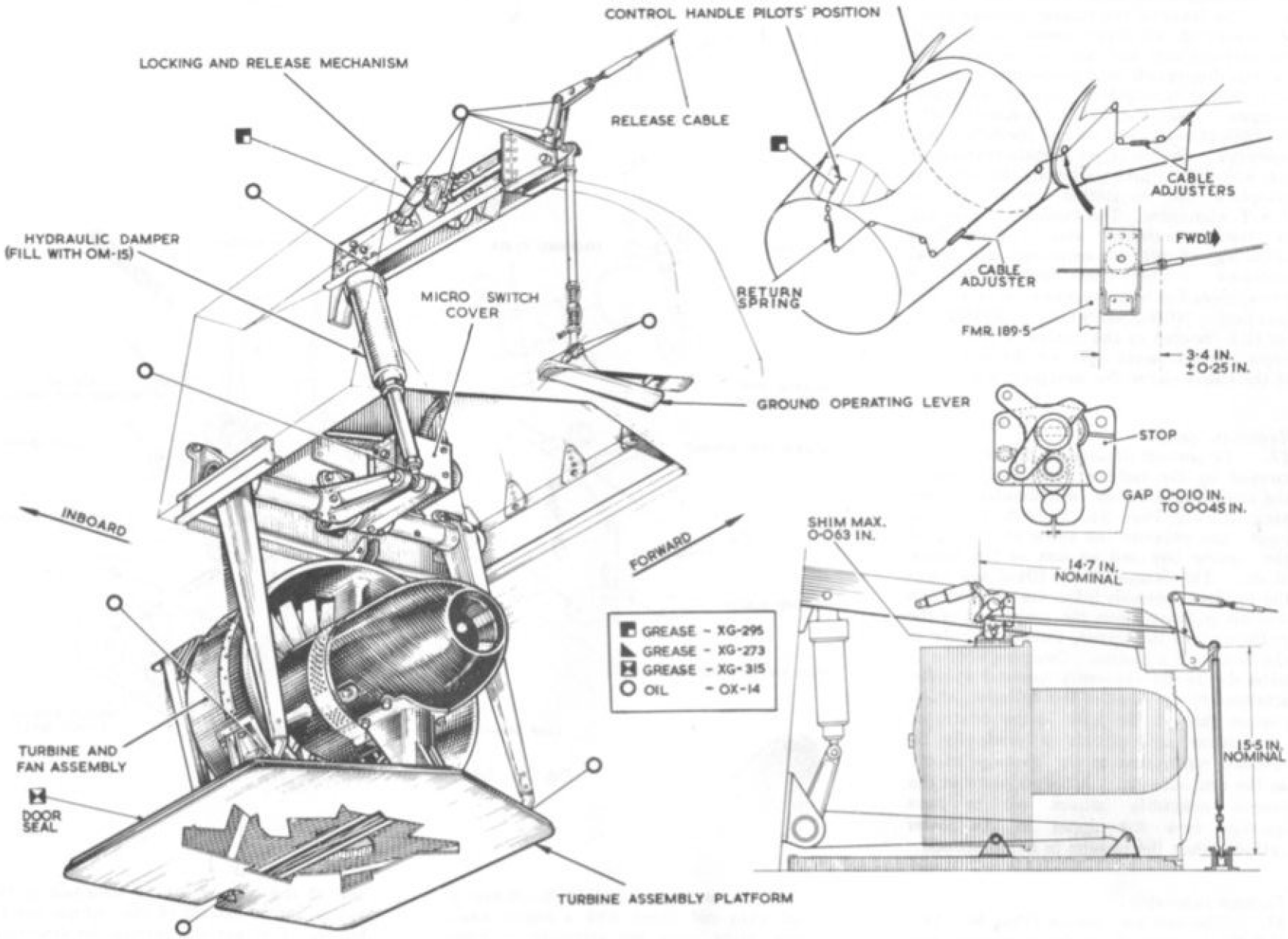


Fig. 3. Ram air turbine installation
(◀ Setting dimensions added ▶)

RESTRICTED

is pulled to its fullest extent and this pull is transmitted through cables and rods to move the lever of the turbine release unit. Movement of the lever opens the jaws of the release unit and the turbine assembly swings downwards and rearwards - rate of fall being controlled by a hydraulic damper. When the R.A.T. is ejected into the slipstream, two micro switches are operated; one to prime certain features of the A.A.P.P. starting circuit, the other to complete the excitation circuit of the R.A.T. alternator. The combined operation of these switches also causes load shedding of all non-essential electrical services. This latter function can be overridden, for test purposes, by a switch labelled NON-ESSENTIAL SUPPLIES RESET located in the centre of the alternator control panel 10P, on the port wall of the cabin above the navigator's table.

Hydraulic damper

27. To prevent damage to the structure - caused by the turbine slamming down to the operating position - a hydraulic damper strut (Dowty Part No. C11896 YA01) is connected between the boom at the top of the turbine bay and an arm on the torque shaft. The damper is oil filled and when the turbine assembly falls, the ram extends and oil is forced from the lower end of the cylinder into the upper, through a hole in the centre of a piston. Damping action is obtained by an inversely tapered spindle attached to the head of the cylinder, which passes through the hole in the centre of the piston and affords a gradually increased restriction to the passage of oil as the ram extends. A flutter plate in the piston assembly allows oil to pass quickly from the upper to the lower cylinder when the turbine is being stowed.

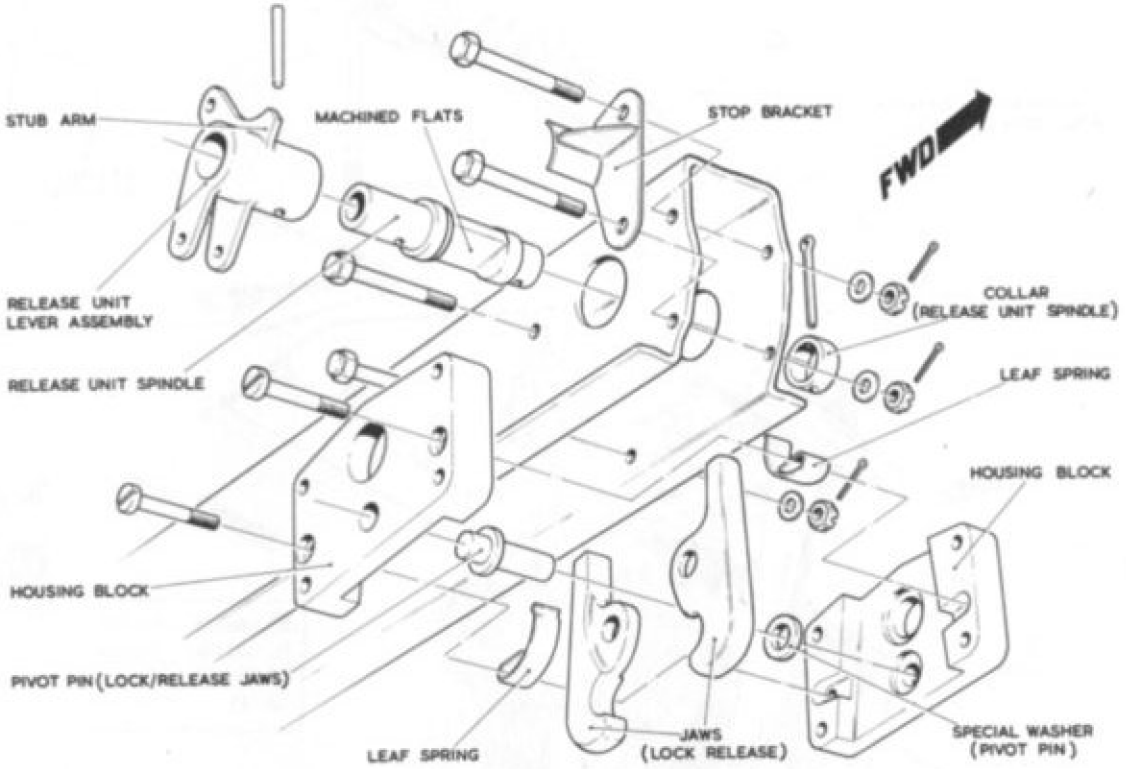
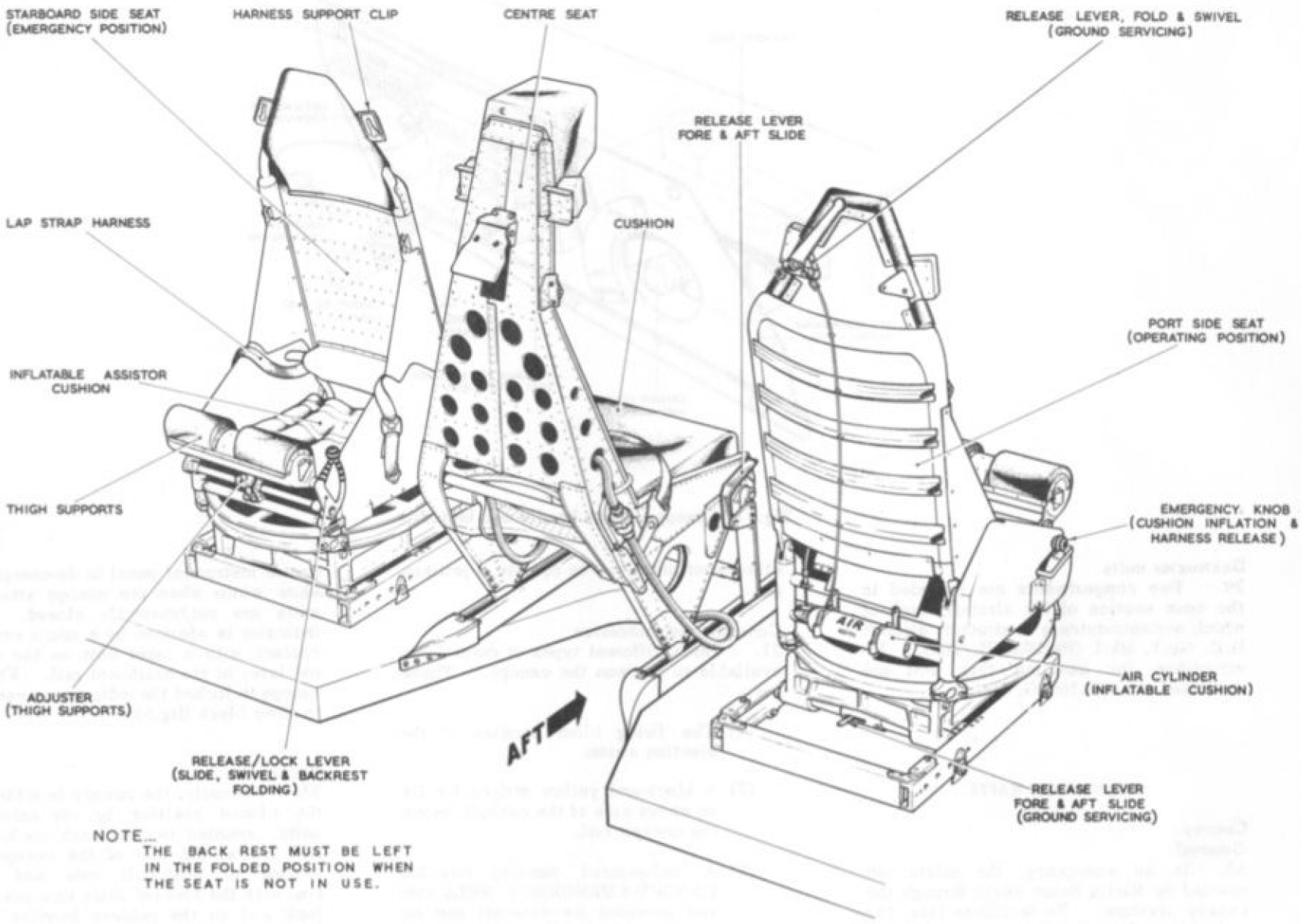


Fig. 3A. Release unit assembly – R.A.T.

Turbine assembly

28. The ram air turbine (Part No. TRA 170.26) is housed in the port wing root between the inner engine air intake and the bottom skin of the wing. It is mounted on a door constructed of 1 in. thick honeycomb skin and fitted with a rubber seal. Three pivot arms are attached to hinge brackets on the door, two at the front which connect to the torque shaft and one at the rear which is attached to the aircraft structure aft of the turbine installation. The rear arm carries the electrical cables to the alternator and lies proud of the underskin when the turbine is stowed.



NOTE...
THE BACK REST MUST BE LEFT IN THE FOLDED POSITION WHEN THE SEAT IS NOT IN USE.

V.2.1A. 1499

Fig.4. Crew seats
(Mod.2147 incorporated)

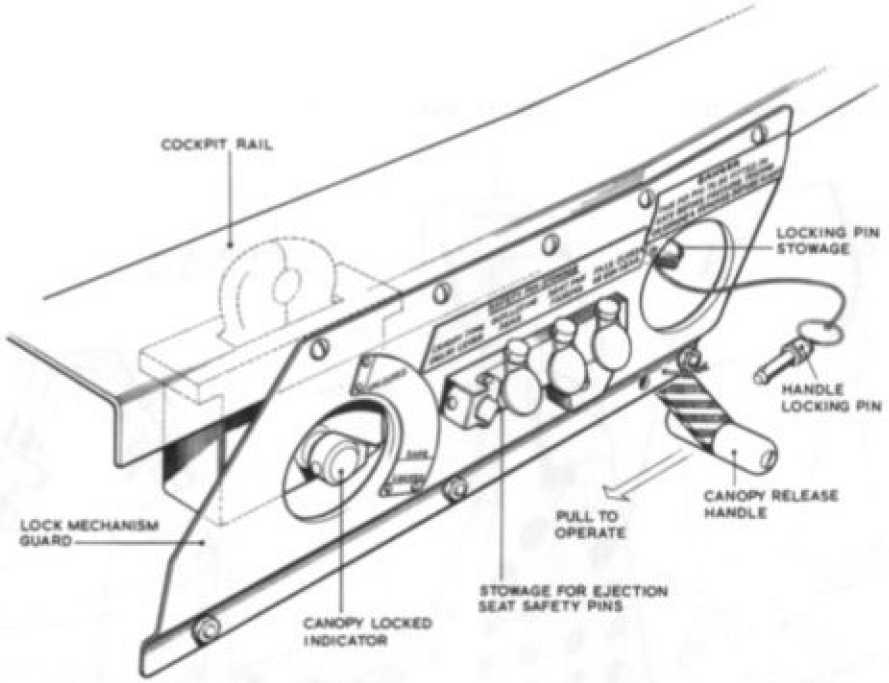


Fig.5. Canopy release handle and indicator

Destructor units

29. Two compartments are provided in the nose section of the aircraft, each of which accommodates a destructor, aircraft H.E. No.1, Mk.1 (Ref.No.27L/203). Instructions for handling this unit are contained in A.P.1661G, Vol.1.

EMERGENCY EXITS

Canopy

General

30. In an emergency, the pilots are ejected by Martin-Baker seats through the canopy aperture. To facilitate this, the canopy is released and jettisoned by the operation of a pneumatic jack, the function of which is to open the jaws of the canopy attachment units and to operate a jettison gun.

Controls and indicators

31. Three different types of control are available to jettison the canopy. These are:-

(1) The firing blind handles of the ejection seats.

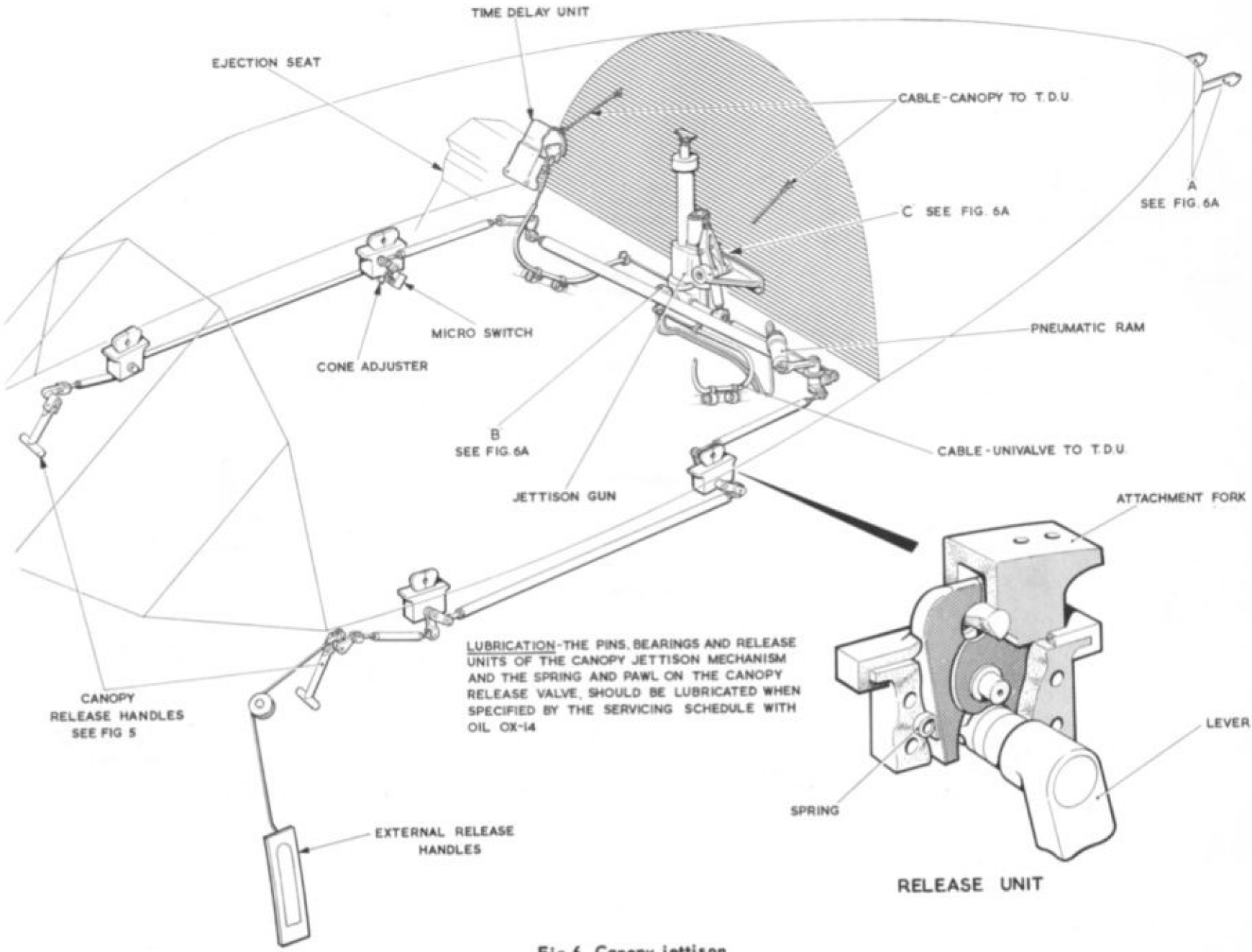
(2) A black-and yellow striped handle on either side of the cockpit, below the cockpit rail.

(3) A red-painted handle, labelled CANOPY-EMERGENCY RELEASE and provided for external use on the port side of the nose section.

32. A magnetic indicator on the pilots' centre instrument panel is de-energised to show white when the canopy attachment units are not correctly closed. This indicator is operated by a micro switch in contact with a taper bolt on the control rod lever at the starboard rail. When the canopy is locked the indicator is energised to show black (fig.6).

Mechanism

33. Normally, the canopy is retained in the closed position by six attachment units, mounted two on each cockpit rail and two at the rear of the canopy. A system of push-pull rods and levers connects the forward units to a pneumatic jack and to the release handles in the cockpit; the external handle is also connected by Teleflex cable to a rod assembly. The rear units are not attached



V.2.1A 1865

Fig.6 Canopy jettison

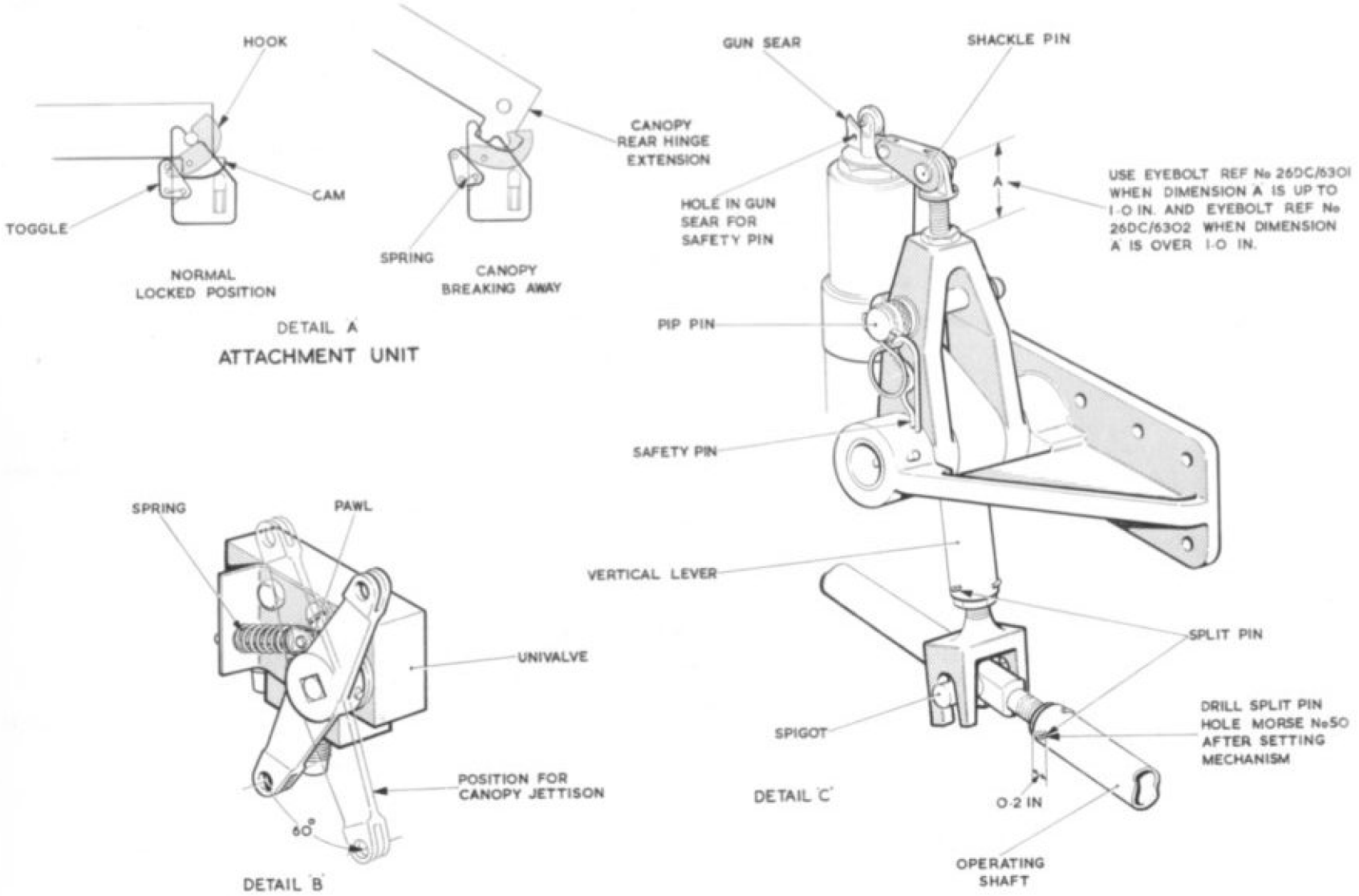


Fig.6A Canopy jettison

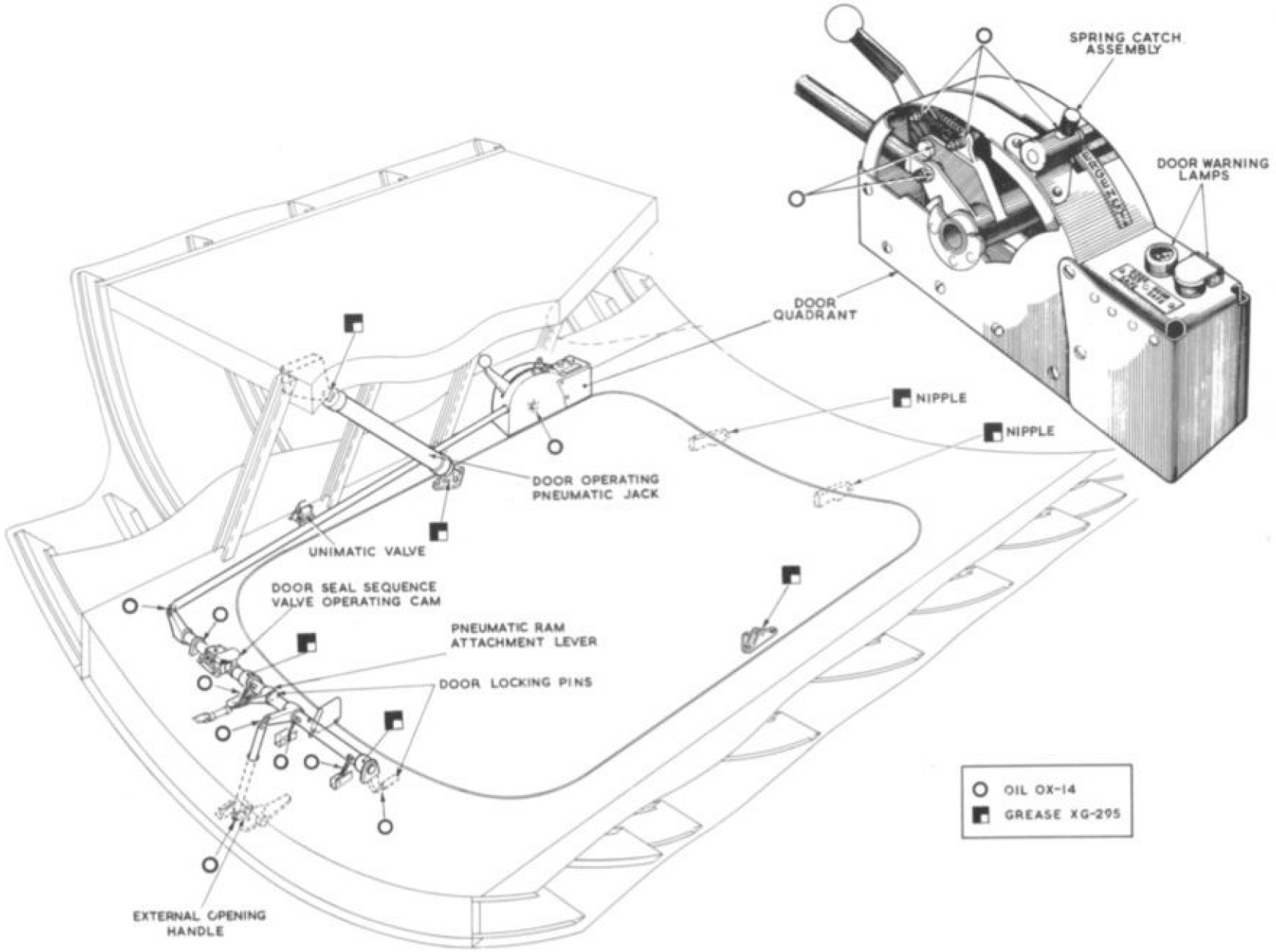


Fig. 7. Emergency exit – entrance door.

V.2.1A 1867

but are designed to open when the canopy leading edge is raised through 20 degrees.

Operation

34. When the firing blind handle of either ejection seat is pulled, a time delay mechanism at the back of the seat is set in motion, a cable assembly is operated to open the canopy pneumatic control valve and air passes to a pneumatic jack. Extension of the jack rotates a torque lever assembly and, through a system of push-pull rods, the jaws of the attachment units are opened. A second arm on the torque assembly is moved and, through a push-pull rod and vertical lever, the rear jettison gun is operated to remove the canopy. When the canopy is blown off, a restrictor pin, attached by cable to the canopy, is pulled from the time delay unit. The time delay unit, which has a built-in delay of one second can now complete its movement and fire the gun of the ejection seat to eject the pilot. It is necessary for the remaining pilot to select his firing blind handle to operate his ejection seat.

External jettison

35. When either a canopy release handle or the external handle is selected the mechanical operation is similar to that described in the preceding paragraph but, since the time delay mechanism has not been selected, seat ejection is not effected.

36. The connection between the canopy jettison gun and its associated lever is made with a 'pip' quick release pin. It is therefore of vital importance that the following warning is complied with prior to removing the canopy for servicing purposes.

WARNING...

The Pip-pin is to be removed and the attached safety pin is to be placed in the jettison gun sear immediately after landing. Immediately before flight, the safety pin must be removed and the Pip-pin must be replaced in the operating arm.

The shackle pin connecting the operating lever to the jettison gun must be removed during servicing operations.

37. To remove the canopy for servicing purposes, a check must first be made that the safety pin is in the jettison gun sear. The restrictor pin cable between the time delay mechanism and the canopy must be disconnected at the bulkhead, the attachment units can then be opened by selection of either the handle in the cockpit or the external handle and the canopy released manually.

Entrance door - emergency exit

General

38. The entrance door is used, in flight, to provide the means of escape for crew members. Two pneumatic jacks, supplied from air storage cylinders, provide the required power to open the door against the force of the air-stream. Since the door is opened downwards and forwards, it acts as a windbreak to protect the crew members against buffeting by the slip stream when leaving the aircraft.

39. Descriptive and servicing details of the pneumatic system for door-operation, are given in Sect.3, Chap.7, of this book.

Controls and indicators

40. A gated lever together with warning indicators is mounted on the door port frame member. The warning indicators consist of a red lamp marked DOOR NOT SAFE and a green lamp marked DOOR SAFE. On the centre instrument panel there is a magnetic indicator which shows white until the door is closed and locked. The electrical circuit to the warning devices is completed or broken by a micro switch on the door lay shaft. The door may be opened in flight for crew escape by operation of a switch on the navigators panel. This switch, marked DOOR OPENING EMERGENCY, is located outboard of the ABANDON AIRCRAFT sign and is protected by a black and yellow striped spring loaded guard. Mod.2295 introduces an additional centre OFF three position switch mounted on the front face of the rear crew members table between the Nav (Plotter) and AEO positions. Movement of the switch to either right or left will operate the emergency door opening system. The switch is protected by a yellow and black striped guard labelled, EMERG DOOR OPEN, ON-OFF-ON.

Mechanism

41. The door opening lever is connected by a push-pull rod to a lay shaft aft of the door aperture. Levers on the lay shaft are connected to the door locking pins which project through the door frame into the rear edge of the door. Three tension coil springs attached to the lay shaft, spring-load the pins and the lay shaft to the locked position. A flush fitting external handle with an integral lock is connected to the lay shaft by a short rod enabling the door to be opened from outside.

Operation

42. Initial movement of the gated lever forward in the quadrant, moves a cam on the door operating lay shaft away from the plunger on the sequence valve and the door seal exhausts to atmosphere. Further movement of the lever withdraws the door locking pins and the door will partly open under its own weight. Final movement of the lever to the EMERGENCY position depresses the plunger of the door-operating sequence valve and admits air from the forward storage cylinder, through a pressure-reducing valve set to 1,200 p.s.i. and through a restrictor by-pass valve to the 'down' side of the jacks. The route of the pneumatic pressure-via the restrictor or the restrictor by-pass valve - is determined by the position of the nosewheel unit. Air from the 'up' side of the jacks is exhausted through a sequence valve to atmosphere.

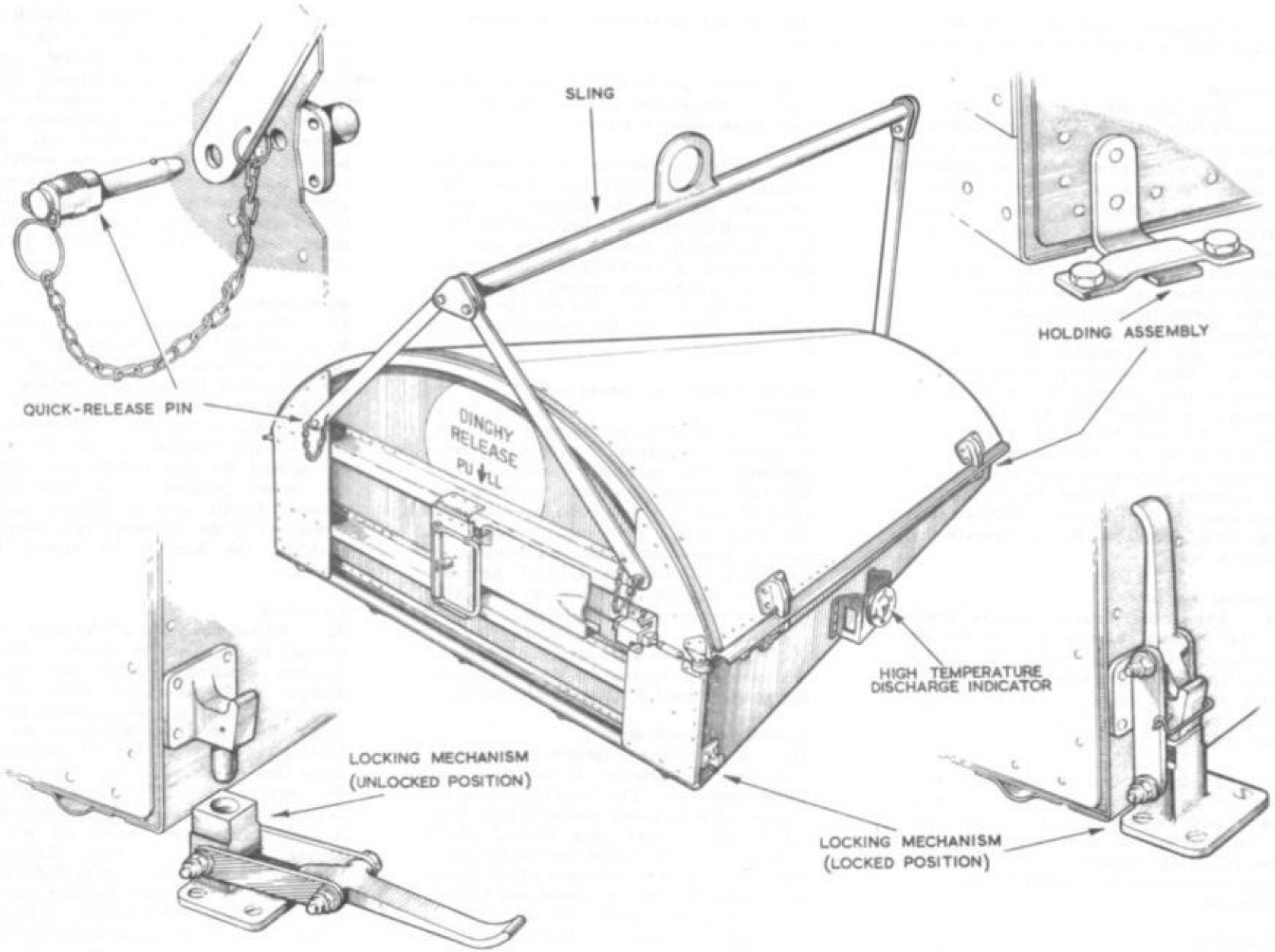


Fig. 8 Removal of liferaft container

◀42A. Operation of either of the emergency opening switches causes a unimatic valve in the door opening pneumatic system to open allowing air to pass to the lay shaft operating jack which in turn rotates the lay shaft causing the sequence of operations detailed in para.42 to occur and the door to open automatically. ▶

ALIGHTING GEAR EMERGENCY CONTROLS

43. Before the alighting gear emergency lowering system can be reset and the normal system of lowering restored, the control handle assembly ratchet mechanism must be disengaged. This is accomplished by lifting the pawl with a narrow screwdriver inserted through the hole in the micro switch/pawl housing cover plate. When the pawl is raised clear of the ratchet, the system will tend to return to the normal position under the influence of the individual operating lever retaining springs which collectively impart a tension of 13·5 lb. to the system - reducing to 6·5 lb. when the system is reset. It may be necessary to assist this return movement by pushing the handle forward until it abuts the stop/support bracket. The handle is then locked in this position with 24 s.w.g. copper locking wire (Ref. No.30B/997 in the manner shown in fig.1.

44. Should any part of the system be removed during servicing operations, it is essential when re-assembly operations begin, to ensure that the various settings and operating functions of the system are in accordance with those given in this text and illustrated in fig.1.

45. A tool (Dowty Pt.No. ST.1657), is provided to reset the emergency flange on the 'UP' button of the alighting gear selector switch. Insert the pointed end of the tool into hole in the centre of the selector and rotate the flange in an anti-clockwise direction through 90 degrees.

EJECTION SEATS

46. Servicing of the ejection seats is given in detail in A.P.4288, Vol.1, Part 2, Sect.11, Chap.11, and Vol.5.

Time delay mechanism

47. If, before flight, it is found that the safety pin is not in position in the time delay trip lever, it is probable that setting of the delay mechanism will be required. To re-lock the mechanism, insert a cocking tool into the hexagonal recess on the trip lever shaft and rotate in a clockwise direction.

◀ *NOTE . . .*

When ejection seats Type 3KS1 and 3KS2 Mk.2 are fitted - (Martin Baker Mod.2540), provision is made (Vulcan Mod.No.1921) to stow the guillotine cartridge sear pins in clips, mounted below the existing safety pin stowage clips, on each side of the cockpit. The new arrangement is shown in fig.5. ▶

FIRE EXTINGUISHERS

48. Periodic weighing is normally the only servicing required for the hand-operated fire extinguishers. The charged weight 5 lb. 7 oz. ± 4 oz. is stamped on the operating head. If the weight is not within this tolerance, leakage may be suspected and the cause should be investigated. The method of recharging this equipment is given in A.P.957C, Vol.1, Part 1, and a pedestal spring balance (Ref.No.21C/328) is used.

RAM AIR TURBINE

◀ **Release control system**

49. If cable adjustment is necessary, this is carried out on the tumbuckle at the unit end of the system. When major break down of the system is made, adjustment must be made in the following manner, with reference to fig.3:-

(1) Lower the ram air turbine and remove the detachable dishing in the front wall of the turbine stowage compartment - this reveals the vertical connecting rod, cable end coupling link, operating lever, etc.

(2) Disconnect the cable end coupling link from the end of the long arm of the bell-crank operating lever.

(3) Check and, if necessary, adjust the horizontal connecting rod (Pt.No. 13/F11002) to a nominal length of 14·7 in. between centres.

(4) Disconnect the vertical connecting rod (Pt.No. 10/F11002) at the lower adjustable end and adjust to obtain a nominal length of 15·5 in. between centres.

NOTE . . .

At this stage it will be advantageous to prove correct functioning of the release unit mechanism, by moving the vertical lever up and down, i.e., as if operating the ground release handle. The jaws of the release unit must open and close with equal ease.

(5) With the release unit in the locked position, i.e., a gap of 0·010 to 0·045 in. between the jaws, and the ground release handle in its stowage, reconnect the vertical rod to the ground release handle. Slight adjustment to the rod is permissible to enable the connection to be made without difficulty.

(6) With the ground release handle held firmly in its stowage (by hand), adjust the vertical rod until the short stub arm on the release unit lever assembly is 0·025 to 0·030 in. away from its stop bracket.

(7) To check and clear this portion of the system, stow and release the ram air turbine two or three times using the ground release handle as follows:-

(a) Pull the ground release handle down (turbine release position). ▶

(b) Stow the turbine (Stand on a servicing platform of suitable height and push the turbine into its stowage using the shoulders below the turbine platform at the area marked LIFT AT THIS POINT). When the turbine engages the release/lock jaws the ground release handle may tend to be slow in reaching its stowed (flush with skin line) position, although the turbine assembly is held secure by the jaws of the release unit. This can be overcome by supporting the turbine assembly in its stowed position, bring the ground release handle a little further out of its stowage then slap it smartly to its stowed position, the handle should then remain correctly stowed and flush with the skin line.

NOTE . . .
This retarded movement of the ground release handle can be misinterpreted to mean that the vertical rod requires shortening, this may not be so. It must be remembered that the whole release mechanism, levers, rods, etc., are operated in reverse during the stowage procedure. It follows therefore, that some mechanical lag may occur; the most common fault being that the release unit lever assembly spindle does not rotate the full 45 deg. necessary to reset the system to its correct position, even though the turbine is held secure. Cleaning and adequate lubrication of the release unit mechanism - especially the machined flats on the lever assembly spindle should eliminate this malfunction. The rapid movement, imposed when the handle is slapped into its stowage (7)(b), ensures that the spindle rotates to the correct position, i.e., machined flats horizontal. It is recommended that this technique of assisting the handle into its stowage be included in the stowage drill.

(8) Before connecting the cable end coupling link at the turbine, check the R.A.T. RELEASE handle in the cockpit. The handle should operate smoothly and with ease; stiff or interupted withdrawal and/or return to stowage action is a fault to be investigated and rectified before proceeding.

NOTE . . .
Distortion of the return spring tubing - vertical cable run located behind the pilots' instrument panel - even though slight, can cause severe restriction.

(9) Stow the R.A.T. RELEASE handle correctly then check throughout the cable run for fouling of cable, roller movement, adequate lubrication, etc., which may not have been exposed during the handle test. Rectify as required.

(10) At the turbine stowage compartment, extend the cable end coupling link turnbuckle to provide some slack in the cable (do not exceed the turnbuckle safety margin), then connect the coupling link to the end hole in the long arm of the bell-crank operating lever.

(11) With the R.A.T. RELEASE handle (cockpit) in the stowed position, locate the in-line cable coupling - just forward of the pulley on former 189·5 - in the nose-wheel bay, then using the turnbuckle adjuster in the crews' cabin area, adjust the cable to provide a setting of 3·4 ±0·25 in. between the front face of former 189:5 and the in-line coupling pin centre.

(12) When all adjustments and checks contained in the preceding text have been proved satisfactory, the cable must be set - by adjustment at the cable end coupling link turnbuckle - to obtain a total movement of 4·25 to 4·75 in. at the R.A.T. RELEASE handle in the cockpit. The turbine will be released after 1·0 to 1·5 in. of this movement.

(13) To check the complete turbine release system, stow and release the unit two or three times using the R.A.T. RELEASE handle in the cockpit.

NOTE . . .
It is recommended that a thin film of 'Engineer's Blue' be applied to the pin in the top bracket of the turbine to provide indication of contact between pin and release unit jaws. Unsatisfactory contact, engagement, etc., thus exposed, can be rectified by adjusting the bracket. Shims (Pt.No.9/F10875) may be used to a maximum of 0.065 in.

(14) Ensure that all connecting rods, turnbuckles, adjusters etc., are within the required safety limits then wire lock using 22 s.w.g. stainless steel wire (Ref.No.33A/3339).

Lubrication

50. If any control cable is renewed, the new cable and the cable joint must be coated with lanoline. The fork end of the T-handle must be lubricated with grease XG-295. The 10 cwt. cable must be coated with grease XG-273 where it passes through the pressure seal at the

rear of the cabin. The door seal must be covered with silicone grease XG-315, to prevent the rubber from adhering to the aircraft structure at low temperatures. The drain holes in the casing of the release unit spring box must be kept clear and the casing lubricant with grease XG-295.

Micro switches

51. To check the micro switch setting, proceed as follows:-

(1) With the turbine assembly in the down position check that the top face of the micro switch striker plate lines up with the centre of the top adjusting hole in the inboard side plate of the micro switch cover, check that the micro switches are depressed. Adjustment is carried out on the adjuster arm which connects the striker plate to the torque shaft.

(2) Suitably support the turbine assembly and remove the two side arms from the hinge brackets on the turbine platform. Move the arms to the closed position and check the clearance between the striker plate and the micro switches, this should be 0·10 to 0·17 in. At this setting the top face of the striker plate should line up with the centre of the lower adjusting hole in the inboard side plate of the micro switch cover.

DESTRUCTOR UNITS

52. Refer to A.P.1661G, Vol.1, before attempting to service, install or remove these stores.

CANOPY

WARNING . . .
Pip-pins, accessible through a flanged hole in the port and starboard canopy release handle guards, must be inserted into the holes in the handle quadrants when the aircraft is on the ground to prevent inadvertent operation of the canopy release mechanism. If the 28 s.w.g. copper wire locking the pilots' handles to their quadrants is broken for any reason, it must be replaced as illustrated in fig.5.

53. Periodical lubrication of the canopy mechanism is the only normal servicing required. When Mod.763 is embodied, a grease nipple is provided in Bowden cable which runs from the time delay mechanism on each ejection seat to the univalve of the canopy jettison mechanism; it is important that grease XG-273 is applied through these nipples at periods laid down in the Servicing Schedule.

Jettison mechanism setting

54. To ensure that the canopy jettison mechanism is functioning correctly and that the sear in the canopy ejection gun is completely removed to allow the firing pin to strike the instant the canopy release units are unlocked, proceed as follows:-

(1) Disconnect the time delay mechanism, remove the drogue gun and disarm the pilots' ejection seats, (A.P.4288, Vol.1, Part 2 and Vol.5). The delay mechanism may be disconnected in the following manner:-

(a) WITH THE SEAT GUN SAFETY PIN IN POSITION, ease the seat gun sear slightly aft until the articulated link can be lifted clear of the sear.

(b) Remove the safety pin from the time delay trip lever.

(c) Insert the cocking tool into the hexagonal recess of the lever and unlock by turning in an anti-clockwise direction sufficiently to allow the operating cable to be removed from the trip lever.

(d) Recock, and refit safety pin.

(e) Push down the quadrant lever on the side of the delay mechanism just enough to disconnect the cable.

NOTE . . .
When the cable to the quadrant lever on the side of the delay mechanism is reconnected, always ensure that the quadrant lever fork-end is returned to its position just above the base of the guard to prevent the cable eye-end springing off.

(2) Prepare the canopy for removal as outlined in Sect.3, Chap.1, fig.17, but replace the canopy jettison gun after the cartridge has been removed. The firing body of the ejection gun should be screwed down tight and then turned back approximately half a turn to allow for the thickness of the cartridge rim.

(3) Remove the locking wire from the canopy release handles and ensure that the canopy jettison gun is disconnected from the release mechanism by removing the split pin, collar and shackle pin securing the vertical lever to the jettison gun sear. With the canopy fitted, the release mechanism should be operated from the handle at each pilot's station in turn, using a spring balance, once with the canopy seal inflated and again with the seal deflated. If the force required to operate the release in any of the tests exceeds 29 lb.,

the bearings must be inspected and lubricated, and the test or tests repeated until the correct figure is obtained.

(4) Fit the canopy, and, with the seal inflated, operate the release mechanism at the external handle with a spring balance. If the force required to operate the release exceeds 45 lb., the system should be inspected and lubricated, and the test repeated until the correct figure is obtained.

(5) Raise the canopy until a ½ in. dia. rod or bolt-shank can be inserted vertically in the jaws of each of the four canopy release units.

(6) Slowly operate a pilot's release handle toward the locked position and adjust, if necessary, on the mechanism operating rods until the jaws of the four release units just grip their rods simultaneously.

(7) When the mechanism is set up as in op. (5), mark the positions of both release handles on their guards, and the position of the operating shaft across the rear of the cockpit rail where it enters the guide bearing. Fit the shackle pin, collar and split pin securing the vertical lever to the jettison gun sear and remove the four rods from the release units.

(8) Lower the canopy into position, lock the release units and lightly load the canopy in an upward direction by crane.

(9) Operate the pilots' release handle slowly and check that as the canopy moves upward the canopy gun firing pin operates. Hold the release mechanism in the position at which the click of the firing pin indicates that it has functioned. If the mechanism is set correctly, the marks made in operation (7) will align at the moment of firing. If the gun fires early or late, the position of the vertical lever, which operates the canopy gun sear, requires adjustment. The position of the vertical lever is governed by the spigots on the operating shaft across the rear of the cockpit rail. Adjustment to lengthen or shorten the operating shaft, must only be carried out on the fork end at the port side end of the rod. After adjustment, make a new mark on the shaft where it enters the guide bearing, reset the mechanism and again pull the pilot's release handle to check operation. These adjustments and checks must be repeated until the correct setting is obtained.

NOTE . . .
If a replacement operating shaft or vertical lever has been fitted, the operating shaft and the vertical lever end fitting must be drilled and 1/16 in. split pins fitted as shown on fig.6.

(10) Using a spring balance on the release handle, ensure that the load required to operate the mechanism does not exceed 40 lb.

(11) Reconnect the cables to the time delay mechanism, as illustrated in fig.7 and remove the safety pin from the time delay mechanism.

(12) If necessary, charge the pneumatic system after ensuring that the canopy ram pneumatic control valve is in the exhaust position (white line on operating lever in line with those on the cover).

(13) Place the canopy in position, lock the release units and lightly load the canopy in an upward direction by crane. Ensure that the Pip-pins in the two pilots' release handle quadrants have been removed, and activate the release mechanism by pulling the first pilot's ejection seat blind. Excessive force is not required. Ascertain that the canopy gun firing pin operates and that both forked firing cables are freed from the time delay unit.

(14) Reset the time delay mechanism, the pneumatic control valve and the quadrant levers and repack the pilot's blind.

(15) Repeat item (12), using the second pilot's ejection seat blind. On conclusion, repeat item (13).

(16) Repeat items (12) and (13) twice more, using the two pilots' secondary firing handles, situated on the front face of the ejection seats, in turn.

When tests have been completed, and the time delay mechanisms and the pneumatic control valve have been reset, refit the drogue guns; re-arm the ejection seats and canopy ejection gun (A.P.4288. Vol.1, Part 2, and Vol.5). CHECK THAT ALL SAFETY PINS ARE IN POSITION.

(17) Install the canopy, lock the release units and wire lock both canopy release handles to their quadrants with 28 s.w.g. copper wire.

NOTE . . .
Whenever the Bowden cable control run is disturbed, a final check must be made to ensure that all cable cover ends are correctly accommodated in their respective adapters. Disregard for this instruction could result in incorrect setting of the cable with subsequent malfunction of the system.

ENTRANCE DOOR - EMERGENCY EXIT

55. The lubrication points of this mechanism are given in fig.7.

REMOVAL AND ASSEMBLY

◀ LIFERAFT CONTAINERS

56. The canopy must be removed before the liferaft stowage container is revealed. Details of canopy removal are given in Sect.3, Chap.1 of this book. The method of removal of the liferaft stowage container is shown in fig.8.▶

EJECTION SEATS

WARNING . . .
Ejection seats are dangerous. Personnel should be fully conversant with all recognised safety precautions before any removal operations are attempted.

57. The recommended method of ejection seat removal is through the canopy aperture. The method of canopy removal is given in Sect.3, Chap.1 of this book. Before carrying out the instructions which follow, the time delay mechanism must be disconnected. The method is as follows:-

(1) With the seat gun safety pin in position ease the seat gun sear slightly aft until the articulated link can be lifted clear of the roller.

(2) Remove the safety pin from the time delay trip lever.

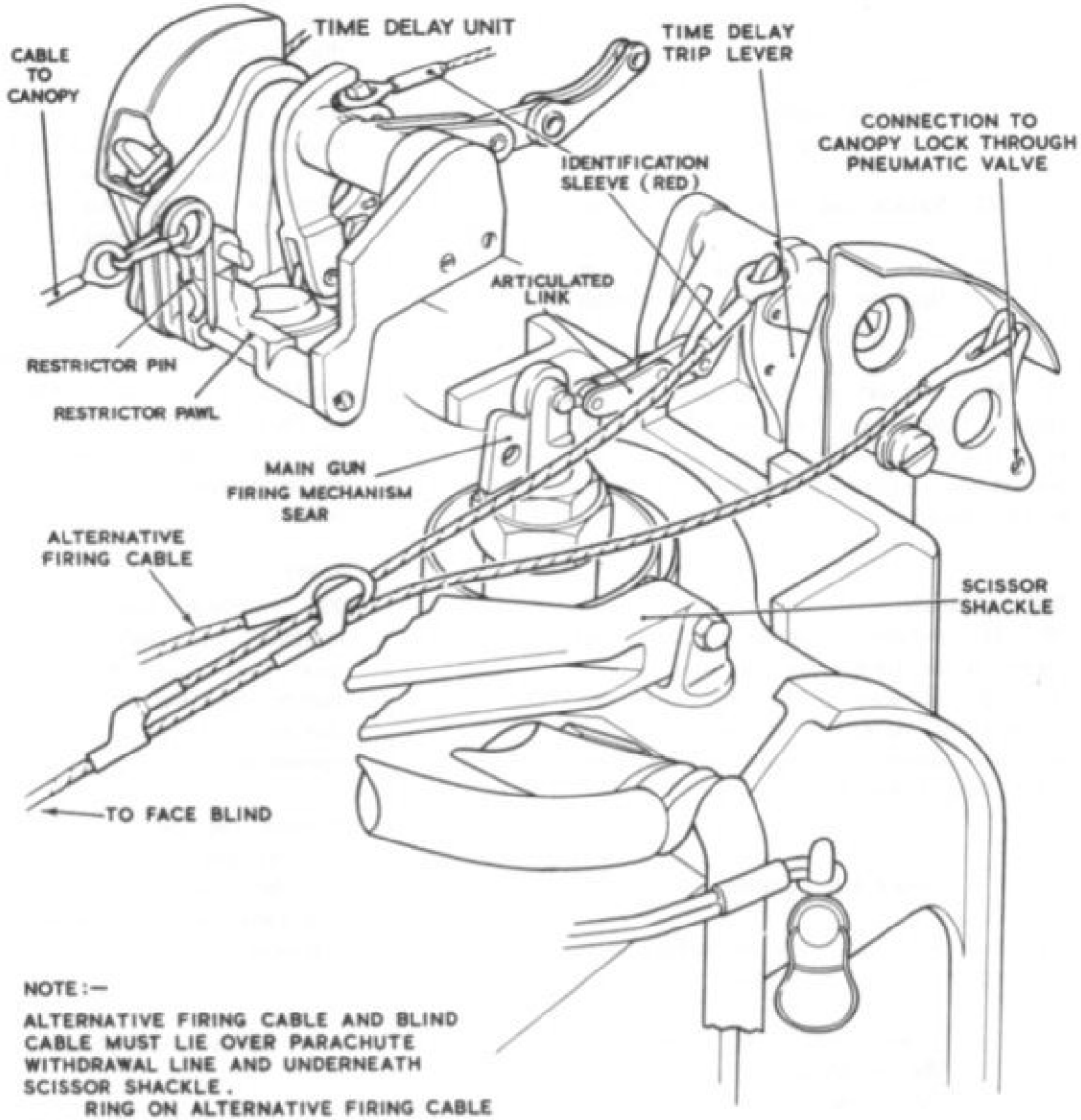


Fig.9 Arrangement of cables to ejection seat

(3) Insert the cocking tool into the hexagonal recess of the lever and unlock by turning in an anti-clockwise direction, sufficiently to allow the operating cable to be removed from the trip lever.

(4) Relock and refit the safety pin.

(5) Lift up the quadrant lever on the side of the delay mechanism and disconnect the cable.

58. The removal or installation of an ejection seat must be carried out in accordance with instructions and precautions contained in A.P.4288, Vol.1, Sect.4, Chap.5.

Cable assembly

59. The method of connecting the firing cables to the time delay trip lever and to the bell-crank lever at the top of the seat is shown in fig.9. For further information reference should be made to A.P.4288, Vol.1, Part 2, Sect.11, Chap.11.

RAM AIR TURBINE

60. To remove the ram air turbine from the aircraft proceed as follows:-

(1) Lower the ram air turbine to the operating position by use of the ground operating lever.

(2) Remove the bolt attaching the forward mounting to the attachment bracket on the assembly platform.

(3) Remove the two bolts attaching the outboard half of the forward mounting pedestal to the ram air turbine.

(4) Remove the three screws securing the forward mounting pedestal halves together. The outboard half of the pedestal can now be removed to gain access to the electrical connections.

(5) In conjunction with an electrical tradesman, ensure that all electrical supplies are switched off and then disconnect the electrical leads from the ram air turbine.

NOTE . . .
The electrical leads must be insulated and pulled rearwards well clear of the ram air turbine to avoid being damaged during subsequent removal operations.

(6) Remove the two bolts securing the two rear mounting brackets to the two line attachment brackets on the assembly platform.

(7) Remove the ram air turbine from the mounting platform.

STATIC LINE/OXYGEN HOSE/MIC. TEL.

61. The following paragraphs give the method of assembly of Static line/Oxygen hose/Mic.tel. assembly provided for use in conjunction with the Emergency Parachute assemblies, Type B. Mk.46 and B. Mk.49. Fig.10 shows the components of a typical assembly.

Assembly

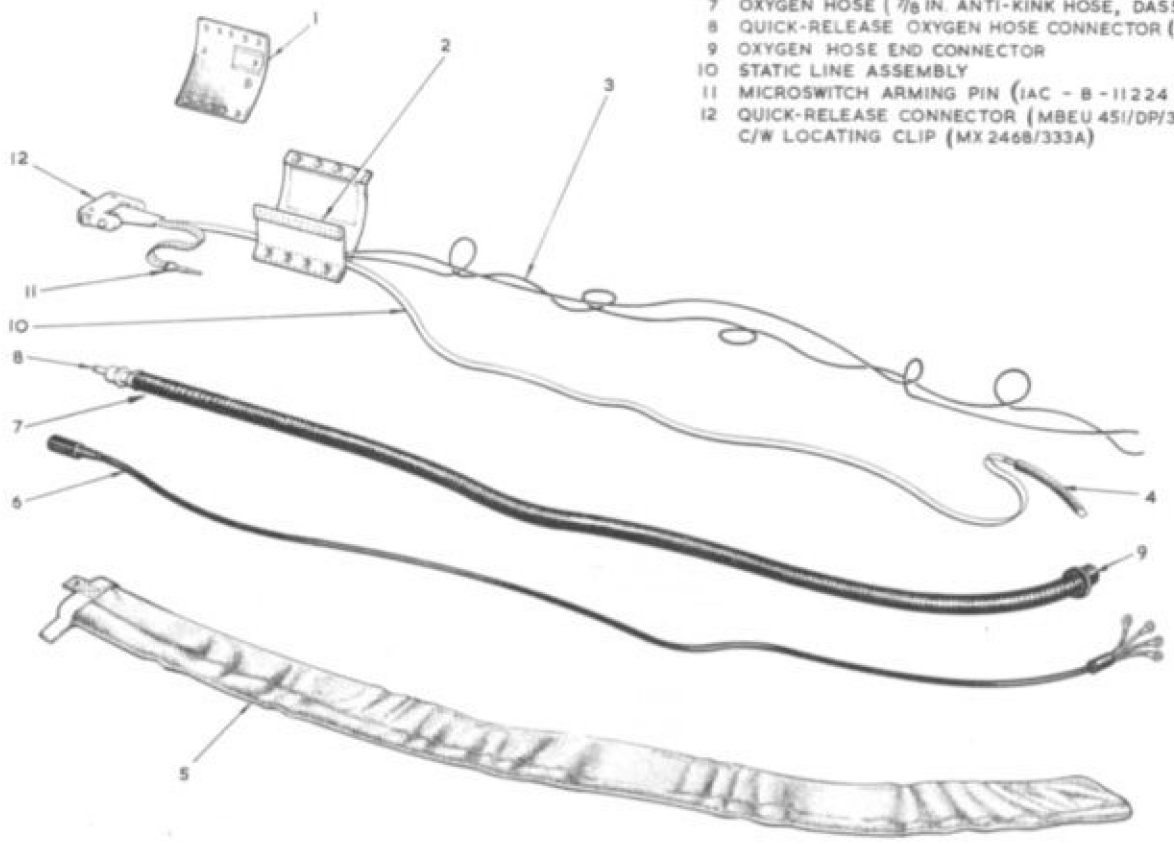
62. After referring to fig.11 for the lengths required for the various aircrew positions, proceed as follows:-

◀ (1) Ensure Mod. Para. M.300 and Mod. Para. M.301 have been embodied on the oxygen hose.

(2) Lay the static line on a clean flat surface, with the microswitch facing upward. Remove any kinks or twists from the static line and arrange the two microswitch leads so that they lie alongside the static line without twisting.

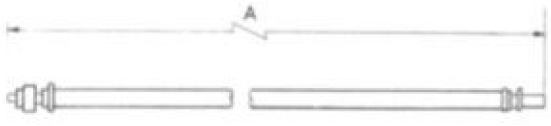
(3) Before commencing with this operation i.e., taping the microswitch leads and static line together (fig.12), it may prove convenient to mark the tape positions on the switch leads and static line. Tape the two microswitch leads together using short lengths of Lassovic tape (Ref.No.32B/1168) at intervals of 14 ± 1/8 in., commencing at a distance of 14 ± 1/8 in. from the microswitch. Secure the leads to the static line, again using short lengths of Lassovic tape, so that each 14 inch length of lead is secured to a 12 inch pitch length of static line (fig.12) ▶

1 HOSE GAITER (IAC - C - 11788)
2 MICROSWITCH (6AS - N34)
3 MICROSWITCH LEADS
4 PROTECTIVE SLEEVE
5 STATIC LINE SLEEVE (IAC 3362)
6 MIC. TEL. LEAD ASSEMBLY (MX2468/386C)
7 OXYGEN HOSE (7/8 IN. ANTI-KINK HOSE, DAS5231G)
8 QUICK-RELEASE OXYGEN HOSE CONNECTOR (REF. NO. 6D/2248246)
9 OXYGEN HOSE END CONNECTOR
10 STATIC LINE ASSEMBLY
11 MICROSWITCH ARMING PIN (IAC - B - 11224)
12 QUICK-RELEASE CONNECTOR (MBEU 451/DP/3, REF. NO. 27C/4485980) C/W LOCATING CLIP (MX 2468/333A)

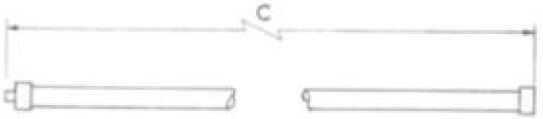


6047

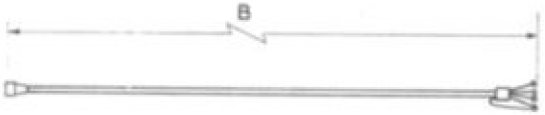
Fig. 10 Components of a typical assembly
► Minor alterations ◄



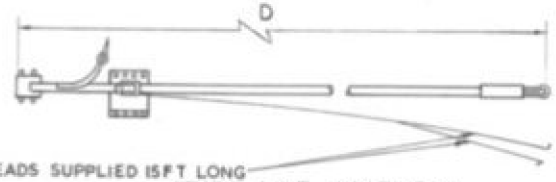
OXYGEN HOSE



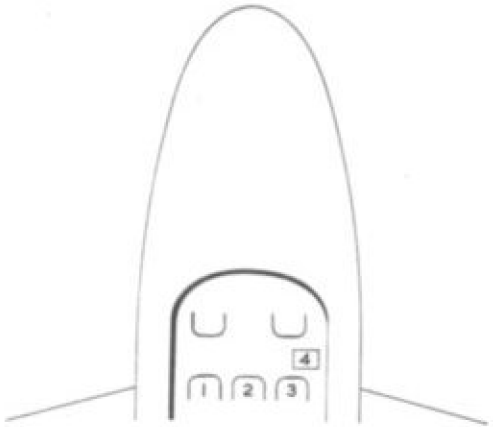
STATIC LINE SLEEVE



MIC -TEL LEAD ASSEMBLY



STATIC LINE ASSEMBLY



AIRCREW POSITIONS

IDENTIFICATION AND REFERENCE NUMBER OF COMPLETE ASSEMBLY			AIRCREW POSITION	LENGTH OF COMPONENTS			
IRVING PART No.	B Ae PART No	REF. No.		A	B	C	D
3361/17/1	1/2 12787	26DC/6116175	1	6FT 8 IN	9FT 0IN	6FT 6 IN	6FT 6 IN
3361/17/2	2/2 12787	26DC/6116174	2	6FT 8 IN	8FT 1 IN	6FT 0IN	6FT 6 IN
3361/17/3	3/2 12787	26DC/6116173	3	6FT 8 IN	7FT 11IN	6FT 6 IN	6FT 6 IN
3361/17/4	4/2 12787	26DC/6116176	4	7FT 8 IN	8FT 4IN	7FT 6 IN	7FT 6 IN

5865

Fig. 11. Identification of static line / oxygen hose / mic. tel. assemblies.

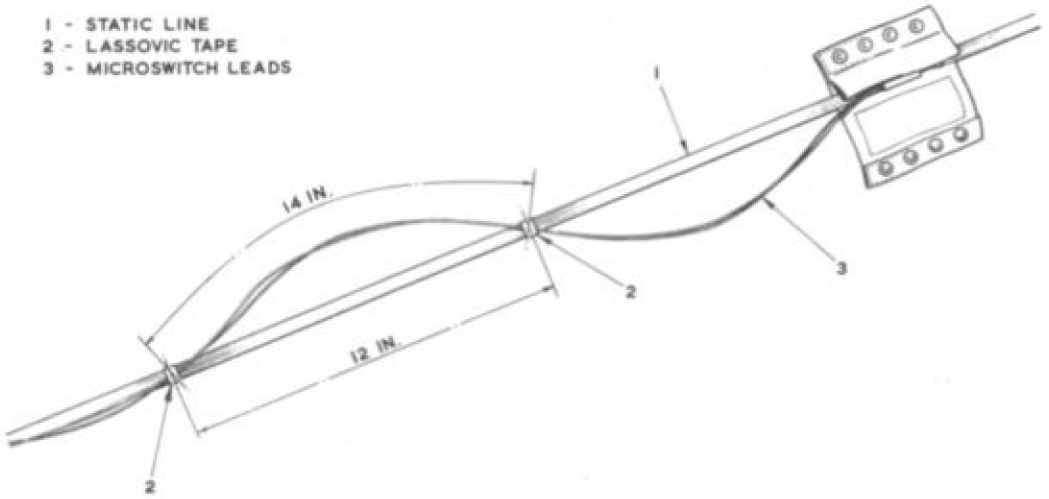


Fig. 12. Assembly of microswitch leads and static line. 3872

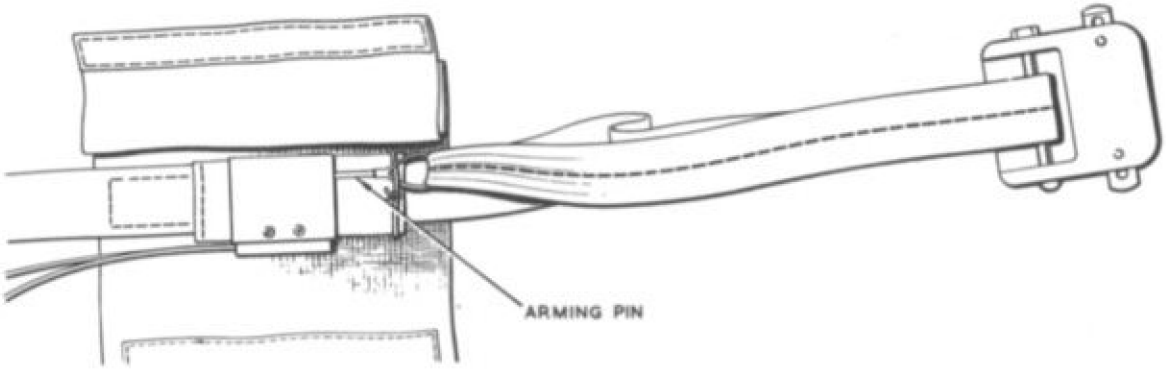


Fig. 13. Fitment of microswitch arming pin.

This looping arrangement prevents the leads from breaking when the static line is tensioned during use.

(4) Insert the arming pin into the micro-switch (fig.13) and tie the pin loop to the adjacent becket with a single length of un-waxed linen thread (Ref. No.15A/4177183 as follows).

(a) Arrange the length of thread transversally beneath the static line immediately below the loop of the arming pin and adjust the ends to that they are of equal length. Pass one end down through the wire loop and then through the becket, from the adjacent side. Pass the other end through the becket from the opposite side.

(b) Pull the cord tight and tie off the ends immediately behind the wire splice of the pin with a double reef and stop knot. Trim-off the surplus thread.

(c) Ensure that the pin can not be withdrawn from the switch without breaking the tie.

NOTE . . .
The tie of single linen thread (Ref. No. 15A/4177183) is critical since it is designed to break in sequence with a tie of 50 lb nylon cord on the parachute assembly.

(5) Lay the mic tel lead gaiter and oxygen hose alongside and over the static line microswitch with the mic tel lead socket and oxygen hose quick release connector adjacent to the Martin Baker release unit (fig.14). The end of the mic tel lead socket should lie approx. 1.0 inch from the extreme end of the oxygen hose quick release connector. Temporarily tape together the oxygen hose mic tel lead and static line/micro switch leads assembly at intervals to retain them in position while fitting the static line sleeve (fig.12).

NOTE . . .
Care must be taken to prevent ingress of dirt and moisture into the ends of the mic tel socket and oxygen hose.

(6) Using a single 245 lbs nylon cord No.3 thread the cord through the end of the hose gaiter.

(7) Take the gaiter and lay the static line inside the outer flap cover with the Velcro tape end over the hose clamp. Arrange the assembly so that:-

(a) The press fastener on the gaiter to which the static line sleeve is subsequently attached is towards the quick release oxygen connector.

(b) The mic tel lead is not enclosed by the hose gaiter.

(c) The various components remain in their correct relative positions.

(8) Take the two ends of the cord, secure one end firmly with a double reef knot so that the gaiters covers the clamp on the oxygen hose. Fasten the Velcro tape over the cord and proceed to thread the cord eyelets as shown in fig.15. Secure the loose end of the cord with a double reef and stop knot and fasten the remaining loose ends to the hose using Lasovic adhesive tape. Check that the static line is sufficiently free to move within the outer flap cover in order to operate the 'crew-gone' switch. The degree of freedom can be checked by carefully sliding the static line forwards and backwards within the flap cover. The maximum load for movement is 25 lbf/ft.

(9) Using a rubber cable clip, secure the mic tel lead to the hose at the position shown in fig.14.

(10) Take the open end of the static line (i.e. the end fitted with the Velcro strip and pass it over the aircraft end of the oxygen hose assembly and along towards the microswitch cover. Removing the temporary tapes (para 62(5)) as the work proceeds. Ensure that the various leads lie neatly within the sleeve, without cockling and twisting and that the material of the sleeve is evenly distributed. ◀

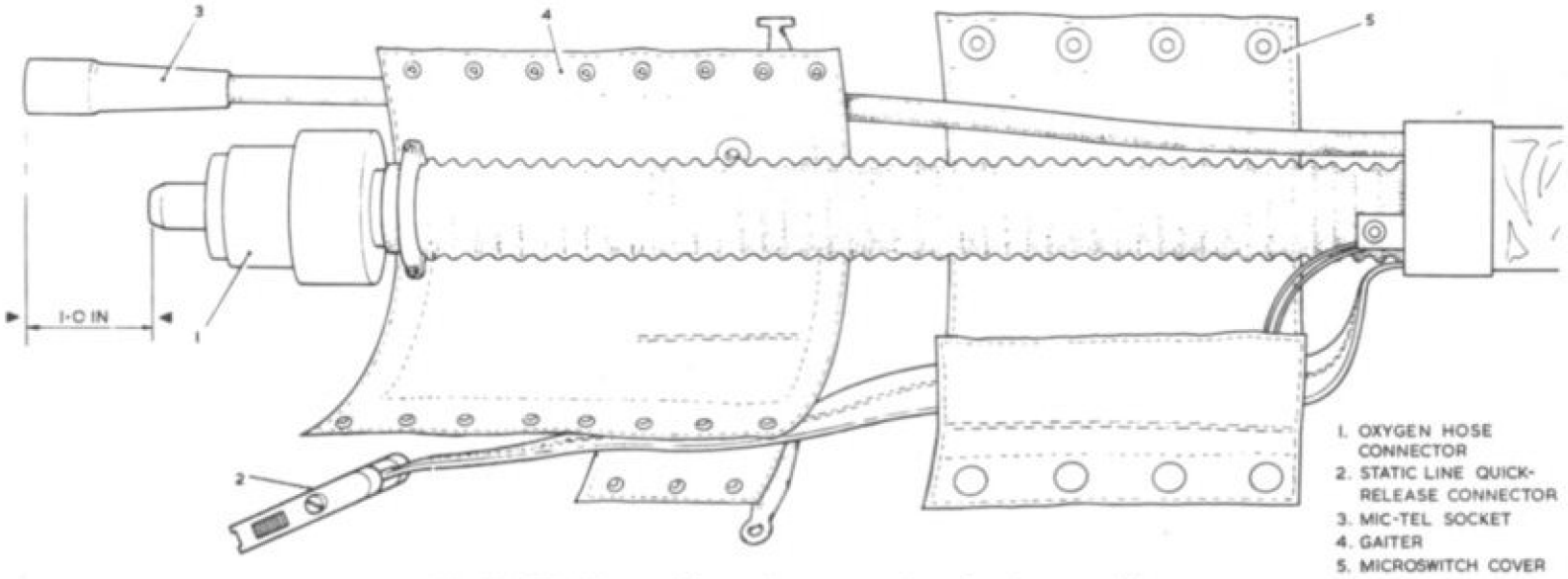


Fig. 14 Relative positions of components prior to assembly
► Mod. 2393 ◄

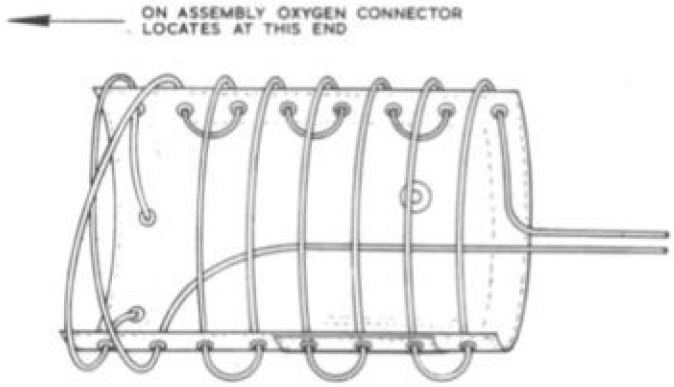


Fig. 15 Method of lacing gaiter
► Mod. 2393 ◄

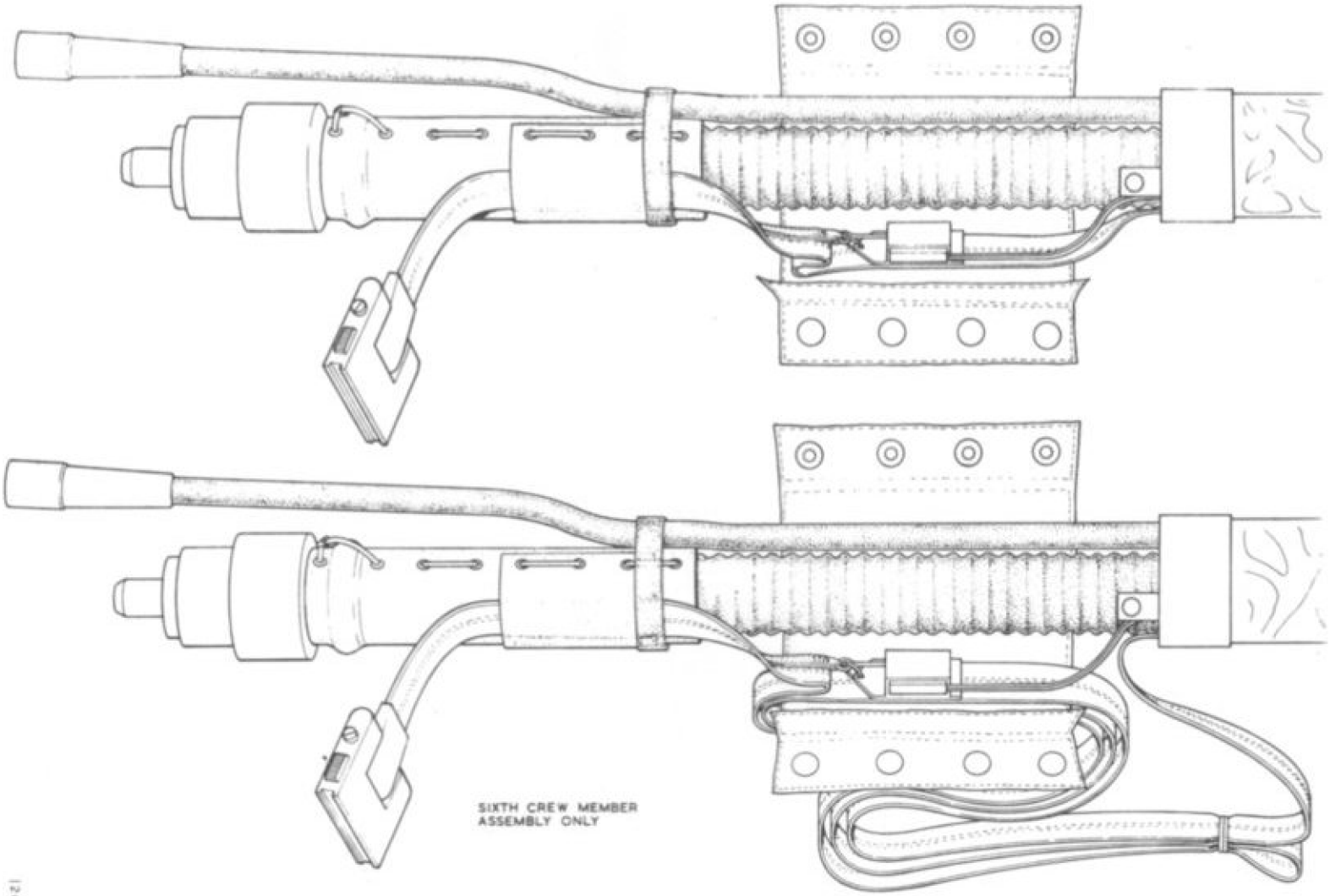


Fig. 16 Securing of gaiter
► Mod. 2393 ◄

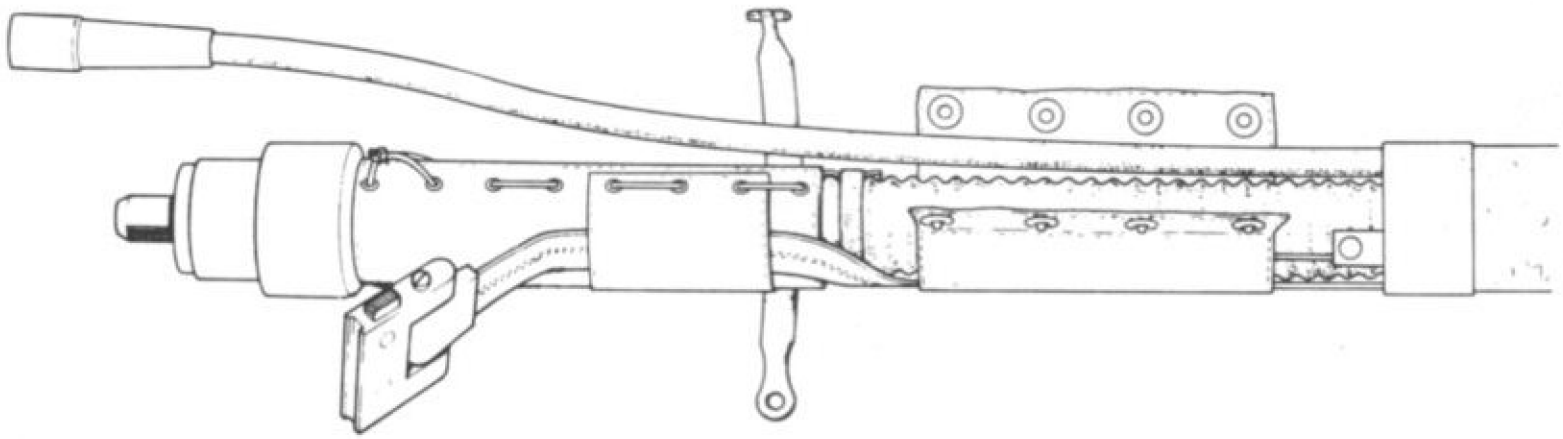
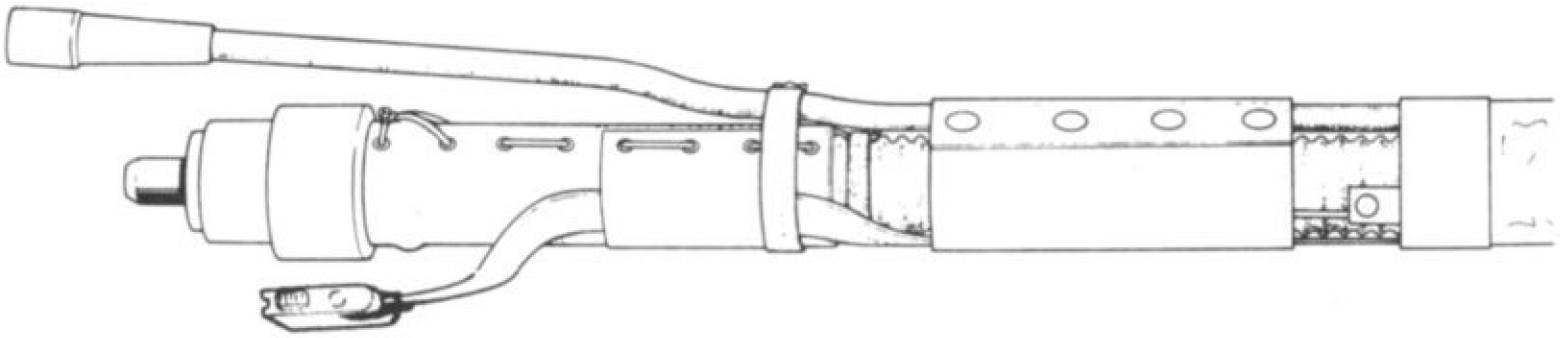
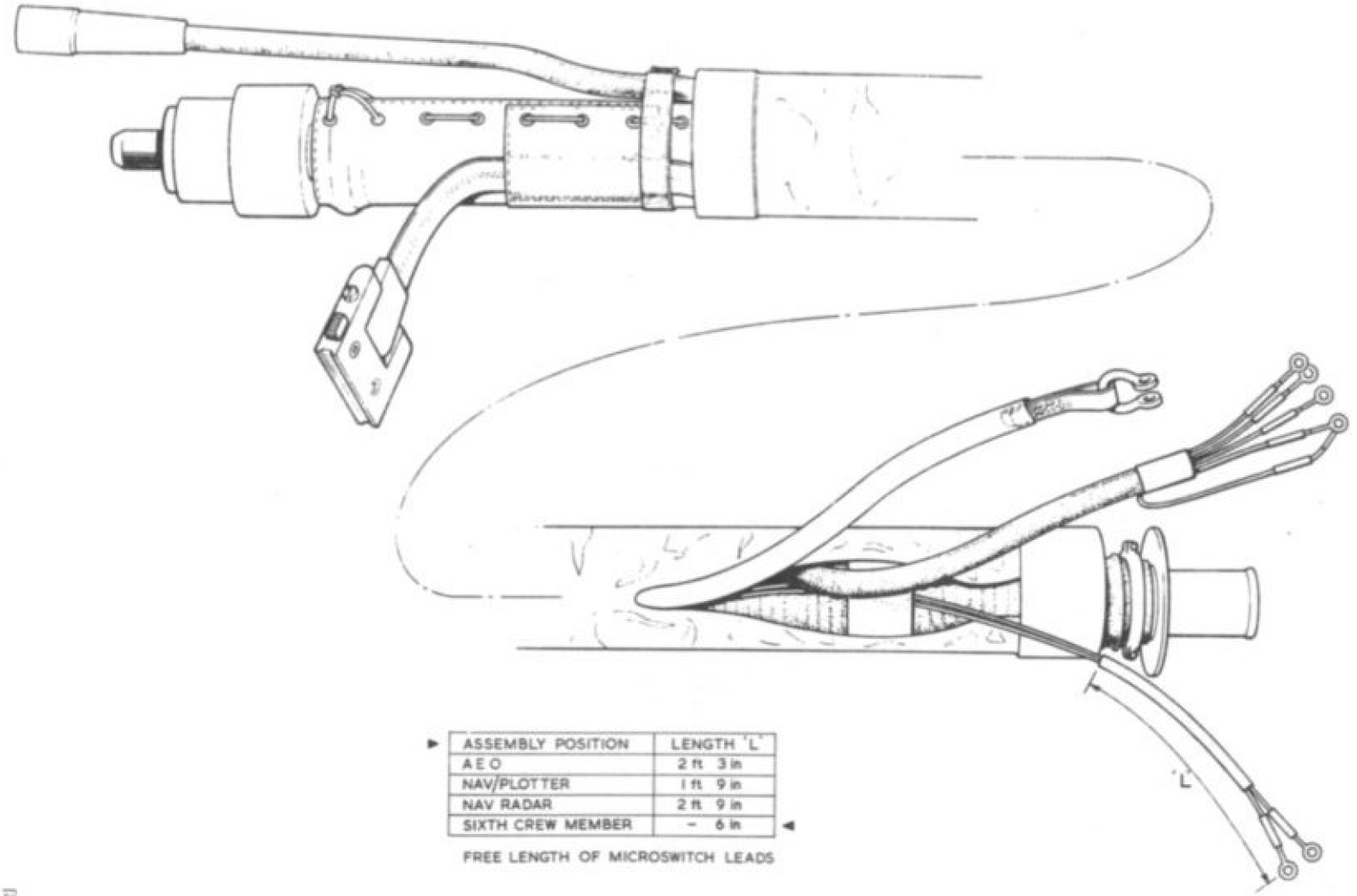


Fig. 17 Position of mic-tel lead
► Mod. 2393 ◄



[20049]

Fig. 18 Microswitch cover secured
► Mod. 2393 ◄



►

ASSEMBLY POSITION	LENGTH 'L'
AEO	2 ft 3 in
NAV/PLOTTER	1 ft 9 in
NAV RADAR	2 ft 9 in
SIXTH CREW MEMBER	– 6 in

◄

FREE LENGTH OF MICROSWITCH LEADS

105-0021

Fig. 19 Static line sleeve secured
► Mod. 2393 ◄

▶ (11) Check the microswitch pin and tug-line for security, fold the inner flap cover over the microswitch cover and fasten it by means of the four press fasteners (fig.18).

If the static line is of the long type, fold the surplus length emerging from between the microswitch cover and the gaiter back and over the microswitch cover (fig.16). Secure the surplus length of static line to the standing part with a doubled length of scarlet locking thread BSF 58/60's/2/3. The tie should be made by making one turn of doubled thread around the line approximately 1 inch from the folded end and the ends should be tied off with a double reef and stop knot.

(12) Continue to draw the static line sleeve over the microswitch cover and then over the gaiter. Secure the press fastener tab on the sleeve to the stud on the gaiter, then wrap the sleeve firmly round the gaiter and secure in position with the Velcro tape strip.

(13) Ensure that the static line protective sleeve (item 4 fig.10) butts against the eye on the aircraft end of the static line. The purpose of the sleeve is to protect the line against chafing. The assembly is now ready for installation in the aircraft.

(14) After installation in the aircraft, the aircraft end of the static line sleeve (which is open-ended to facilitate distribution of the switch leads, hose and static line) must be wrapped around the assembly as close to the end as possible and secured with Lassovic tape.

NOTES . . .

(1) The length of the oxygen hose determines the normal functioning length of the static line assembly. Therefore ensure that the static line sleeve does not restrict the hose length or drag unduly on the gaiter.

(2) Fitment of oxygen quick-release connector Ref. No. 6D/2248246 (Post Mod 2393) necessitates the use of the complimentary equipment on the oxygen mask hose assembly and jerkin hose assembly. ◀