Reference: AP 4505B, Vol 1, Bk 1, Sect 3, Chapter 13.

Introduction

1. The chapter contains a description of the brake parachute installation. Fig 1 shows the parachute stowage and the door release mechanism, Fig 2 shows the jettison hook assembly together with its operating mechanism. For details of the electrical installation reference should be made to Book 2, Sect 6, Chapter 10. General information on parachutes is given in AP 1182A, Vol 1.

General

2. The landing-brake parachute (Ref No. 15D/629, Type LB.54 Mk.1) is housed in a built-in stowage in the top of the fuselage, aft of the rudder, and faired off by a fixed front fairing and a single door which is hinged at its forward edge.

3. Normally the parachute is used to supplement the drag of the air brakes, when the aircraft has reached the ground, and thus reduce the landing run. It can also be used as an emergency brake or to assist braking in bad conditions, e.g. icy runway. Use of the parachute reduces the load on the mainwheel tyres and brakes, consequently minimising wear on these components.

Control and Indicator

4. Opening of the stowage door, to release the parachute is accomplished electrically. Two switches are located on the starboard side of the first pilots instrument panel and are normally operated together but either can be operated separately should the other jam. The down position selects STREAM and the up position selects JETTISON/OFF to release the parachute from the aircraft. A dolls-eye indicator is fitted on the ground intercomm panel (84P) and is visible when the small access panel located in the lower starboard side of the rear fuselage is opened. It is energised black when the parachute door is locked and all switches and relays are in their correct positions ready for a stream operation. A cocking switch, situated in the fixed nose fairing of the stowage on the starboard side is used when installing the parachute assembly in the aircraft and is marked DOOR HOOK - PARA HOOK.

Parachute Stowage

5. The parachute stowage is a box type built-in structure in the rear fuselage above the airborne equipment compartment. The two side-walls in the stowage house the door opening struts incorporating a moisture draining system. A longitudinal trough in the base of the stowage accommodates the parachute riser when the parachute is correctly stowed. This trough also incorporates a moisture draining system. Water which runs into these systems is ducted overboard through light alloy tubings at the port side of the rear section.

6. All joints in the water drain troughs and in the corners of the stowage where water leakage may occur are sealed with a mixture of Bostick 1752 and Bostick 1790. (Ref No. 33H/9450627 and 33H/2202125).

7. At the rear, occupying the width of the stowage, covered by a detachable alloy panel, is a compartment containing the door release/lock mechanism. This panel is suitably reinforced against impact from the parachute shackle after release by a detachable ply-board face (MOD. 1837).

8. The drag beam structure with the jettison hook and associated mechanism is forward of the stowage in the roof of the airborne equipment bay.

9. Externally and forward of the stowage is the fixed fairing which covers the jettison hook and cocking switch. A rubber-padded steel guard is provided, over the jettison hook, below the fixed fairing, to restrict and flaying motion by the shackle during release.

Door Operating Mechanism

10. Selection of STREAM on the cockpit control switches will energise two actuators in the door release/lock mechanism to retract their actuating rods and disengage the door hook from the door catch. The door is then thrust open by the door operating mechanism, consists of two spring strut assemblies, one at each side of the stowage, which force the door open when the door lock is released. During their initial movement the spring strut assemblies are aided by assistor struts which are located forward of each spring strut assembly. Each of these struts has a spring-loaded plunger which bears a reaction block mounted on the underside of the door. A cut-away view of the stowage, port side looking inboard, is shown in Fig. 1.

11. When the door is closed the assistor struts and spring struts are compressed, the elbow-joint coupling of the tubular struts having moved in an arc formed by the forward lower struts swivelling in their fixed bottom mountings. The door is held in the closed position by an electrically actuated lever hook which engages with a catch on the inside of the door. When in the locked position a lever hook depresses a micro-switch (4) which completes a circuit and energises the dolls-eye indicator on panel 84P. A micro-switch (5) in the jettison hook operating mechanism prevents the door actuators from moving the door lever hook until the jettison hook is fully locked in the closed position.

Jettison Mechanism

12. The jettison mechanism which is located at the forward end of the stowage, consists of a pivot-mounted jettison hook and a fixed block attached to a drag beam. The drag beam is part of the aircraft structure and houses a jettison hook operating mechanism which is electrically actuated through a cam-lever assembly (Fig.2).

13. Selection to JETTISON position on the cockpit control-switch will energise two actuators to retract the actuating rods and move the cam lever about its pivot pin. This moves the roller attached to the cam lever away from the stop link to unlock the assembly. A srping loaded micro-switch lever, which is pivoted in the cam will release the hook micro-switch (5) when the cam-lever roller leaves the stop link. The purpose of this micro-switch is given in para 11. Further movement of the cam-lever brings its cam faces into contact with rollers on the stop link which forces this link to pivot downwards. The stop link is connected through a strut link, to the lower end of the jettison hook, which is pulled aft by the strut link as the stop link pivots downwards. This movement opens the jettison hook to release the parachute shackle and the restraining strop.

14. During a landing run, and using the parachute as a brake, the pull on the ring shackle will open the jettison hook without the assistance of the cam lever faces on to the stop link rollers, once the stop link has been unlocked. A recoil action would now take place, on release of the ring shackle, due to the action of

/the stop link

the stop link return spring, thereby causing damage to bearings, actuators, etc.

The prevent this from happening, VULCAN MOD. 1156 introduces a restraining lever catch (Fig 2) which at the jettison hook "half-open" stage, will engage behind the catch block located between the forked-end of the jettison hook, therefore, after release of the ring shackle, the jettison hook can only recoil half way and therefore, the hook and stop link are arrested before the cam lever contact is remade, which, if both actuators fully retract, will open the hook fully.

The reason for allowing a half-way rebound is to provide a ready means of assessing the serviceability of the two jettison hook actuators. Normally two actuators will fully open the hook but, one is sufficient to move the cam lever to unlock the stop link, and partially open the hook, then cam lever movement ceases. Any pull from the ring shackle will now open the hook fully and the hook will then rebound half closed.

To enable this lever to be disengaged prior to hook closing, the lever catch cocking lever on the forward bulkhead of the brake para compartment is lifted against the resistance from the restraining lever spring and locked in the 'Up' position by a pip-pin. After the hook is closed, the cocking lever is replaced against the face of the bulkhead and locked with the same pip-pin (Fig.2).

Spring Box

15. When the nose of the stop link approaches top dead centre of the cam-lever roller it exerts a high load on the roller, which is transmitted, through the actuating rods to the actuators. To prevent overloading of the actuators this momentary high load is absorbed by a spring box which is fitted at the forward end of the assembly and connected, by a pivoted lever, to the rod of the forward actuator.

ACTUATORS

General

16. Each of the cockpit switches operates one pair of actuators, one in the jettison mechanism and one in the door lock operating mechanism. Normally both actuators in the jettison mechanism are operated, but failure of any part of one circuit, or its associated actuator, allows the mechanism to be operated at half speed and at half travel by the remaining unit, this movement being sufficient to unlock the jettison hook, which will then be fully opened by the pull of the parachute. Similarly, the door-lock mechanism is normally operated by the two actuators, though the mechanism can be operated by one, which will move the door hook at half speed and at half its normal travel. This travel will be sufficient to open the door hook due to the large overtravel obtained when using both actuators.

Operation

17. The actuators of the jettison mechanism retract to open the jettison hook when the cockpit switches are set to JETTISON, they also retract automatically if the door opens in flight (para 29). The actuators extend and close the jettison hook when with the cocking switch in the PARA, HOOK Position, micro-switch (3) is depressed by placing the parachute shackle in the jettison hook. The actuators of the door-lock mechanism retract to unlock the door latch when the cockpit switches are set to STREAM, they extend and lock the door when with the micro-switches (1) and (2) depressed by the door in its closed position, the cocking switch is placed in

the DOOR HOOK position. It should be noted that although some of the functions of the micr-switches have been given reference should be made to Book 2 of the AP 4505B if complete information is required.

PARACHUTE ASSEMBLY

18. The parachute assembly consists of a main canopy of concentric rings, and a riser, which connects the main canopy to the jettison hook mechanism (Para 12) an extractor parachute, and packs for the main and extractor parachutes.

Main Parachute

19. A 45 feet ring-slot parachute constitutes the main canopy, it has 56 rigging lines which are bound together by a keep ring at a point 10 feet from their end. This 10 feet length forms the riser and is protected by a canvas sock. A woggle and snap hook are positioned near the mid point of the sock for attachment of the restraining strop (para 21).

20. A light-alloy line shackle is attached to the end of the riser and is connected to a steel shackle by a shear pin. When the parachute assembly is installed in the aircraft the ring shackle rests inside the jettison hook, which is secured to the aircraft structure. The shackle assembly is protected by a fabric and felt sleeve. Although the Mk.2 and Mk.1A aircraft use the same type of brake-chute, the aircraft AUW's differ, therefore, to differentiate between the shear pins, which are designed to sheer at different loads, they are coloured RED for Mk.2 and BLUE for Mk.1A (para 30). A bolt fitted with two clamp washers passes through the line shackle the washers lightly bearing on the forked faces of the ring shackle to reduce the tendency of fork end 'splay out' under high side loads.

Restraining strop

21. The purpose of the restraining strop is to prevent the parachute riser fouling the door structure during the landing run. One end of the strop is located in a slot in the hook-retaining block of the jettison-hook mechanism and is held in position, with the parachute shackle, by the jettison hook. From this point the cable passes round a steel tube in a bracket attached to the removable panel which covers the door-hook mechanism. The other end of the strop is attached to the snap hook on the parachute riser.

Extractor parachute

22. The vane-type extractor parachute is spring loaded by means of a helical coil spring, 24 in. in length housed in a pocket running vertically down from the canopy vent. The canopy is 102 in. in diameter, has six vanes and twelve gores. This parachute is secured to the end of the beaver tail of the main pack by four continuous loops of 1200 lbs. nylon cord, bound as a single 18 inch riser.

Parachute Packs

23. The main pack is divided into two parts, one containing the canopy and the other the rigging lines. The canopy is folded and stowed in the pack concertina fashion, this part of the pack is then closed by nylon cord side-lacing. The rigging lines are stowed horizontally on the lower flap of the pack and are held in position in stowage loops at the sides of the flap. The lower flap terminates in a 'beaver-tail' to which is attached the extractor parachute and which has a flat metal ring for attachment to the cone on the compartment door. The main pack is secured to the canopy apex by four continuous loops of 1200 lb nylon cord. The extractor pack is of the simple envelope type with two small side flaps and 2 small horizontal top and bottom flaps. This pack is secured to the beaver tail of the main pack by 700 lb. nylon cord. The extractor-parachute pack is held closed against the spring loading of the parachute by the stowage door.

24. The parachute packs and the extractor parachute remain attached to the main canopy during the landing, but can be detached and replaced or renewed separately, if required, during servicing operations on the parachute assembly.

OPERATION

Parachute Stream

25. Selection of STREAM on the cockpit switches causes the door-lock actuators to retract, this moves the door hook, about its pivot, away from the roller of the door catch. When the door hook has disengaged from the door catch roller the spring-strut assemblies and spring assisters force the parachute-compartment door open. This releases the extractor parachute. At the same time the beaver tail, which is also attached to the inside of the door, is pulled taut; this causes the extractor parachute pack to be ejected rearwards which will ensure that the extractor parachute will clear the rear section.

26. When the extractor parachute is ejected from the stowage into the airstream, the rearwards movement causes the release cable, attached to the extractor parachute, to pull the attachment pin from the cone on the inside face of the door allowing the flat steel ring of the beaver tail to be pulled from the cone as the extractor parachute moves aft.

27. The extractor parachute develops just aft of the aircraft tail structure and the drag which it produces is sufficient to withdraw the main parachute pack out of the stowage and clear of the aircraft. The drag produced by the streamed parachute reacts along the rigging lines, up the riser, through the shear pin to the ring shackle and is then transferred to the main structure of the aircraft through the jettison hook and drag beam assembly.

Parachute Jettison

28. Selection of the cockpit switches to the JETTISON position retracts the actuators of the jettison mechanism and, through the cam-lever assembly, opens the jettison hook. This releases the parachute ring shackle, and the ball end of the restraining strop, and the parachute assembly is jettisoned.

Automatic Jettison

29. In the event of an unselected stream taking place, due to the door opening inadvertantly, the jettison hook opens automatically and released the parachute assembly before the main canopy can develop. This is arranged electrically when the micro-switches (1) and (2) (Fig 1) are released when the cockpit switches are not in the STREAM position.

Shear Pin

30. Should the parachute be streamed at an excessive speed the braking load would damage either the parachute assembly or the aircraft structure. To prevent this damage occuring the ring shackle is attached to the line shackle by a 1.9/16" diameter light alloy shear pin; this allows the parachute assembly to break away from the aircraft before its braking load becomes excessive. At present the RED Mk.2 shear pin is designed to shear at 103,000 lbs ± 5 per cent and the maximum stream speed should not exceed 135 kts. The BLUE Mk.1A shear pin is designed to shear at 76,000 lbs ± 5 per cent and the maximum stream speed should not exceed 135 kts. Any parachute streamed above this speed must be scrapped. In the event of a shear pin being sheared, the ring shackle must be checked for damage, distortion etc., and rectified or replaced as necessary.

/Servicing

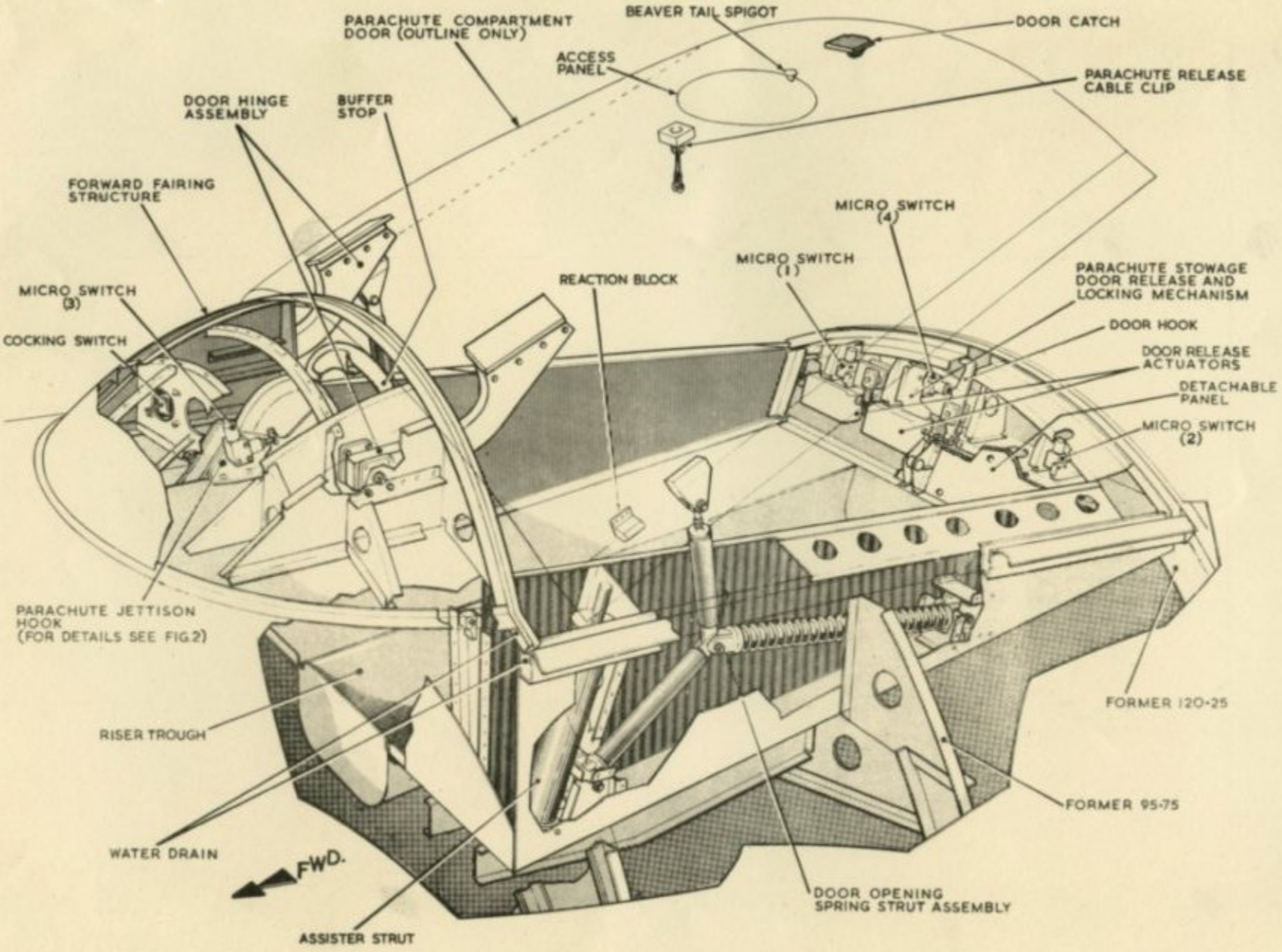

Fig. 1. Brake parachute stowage

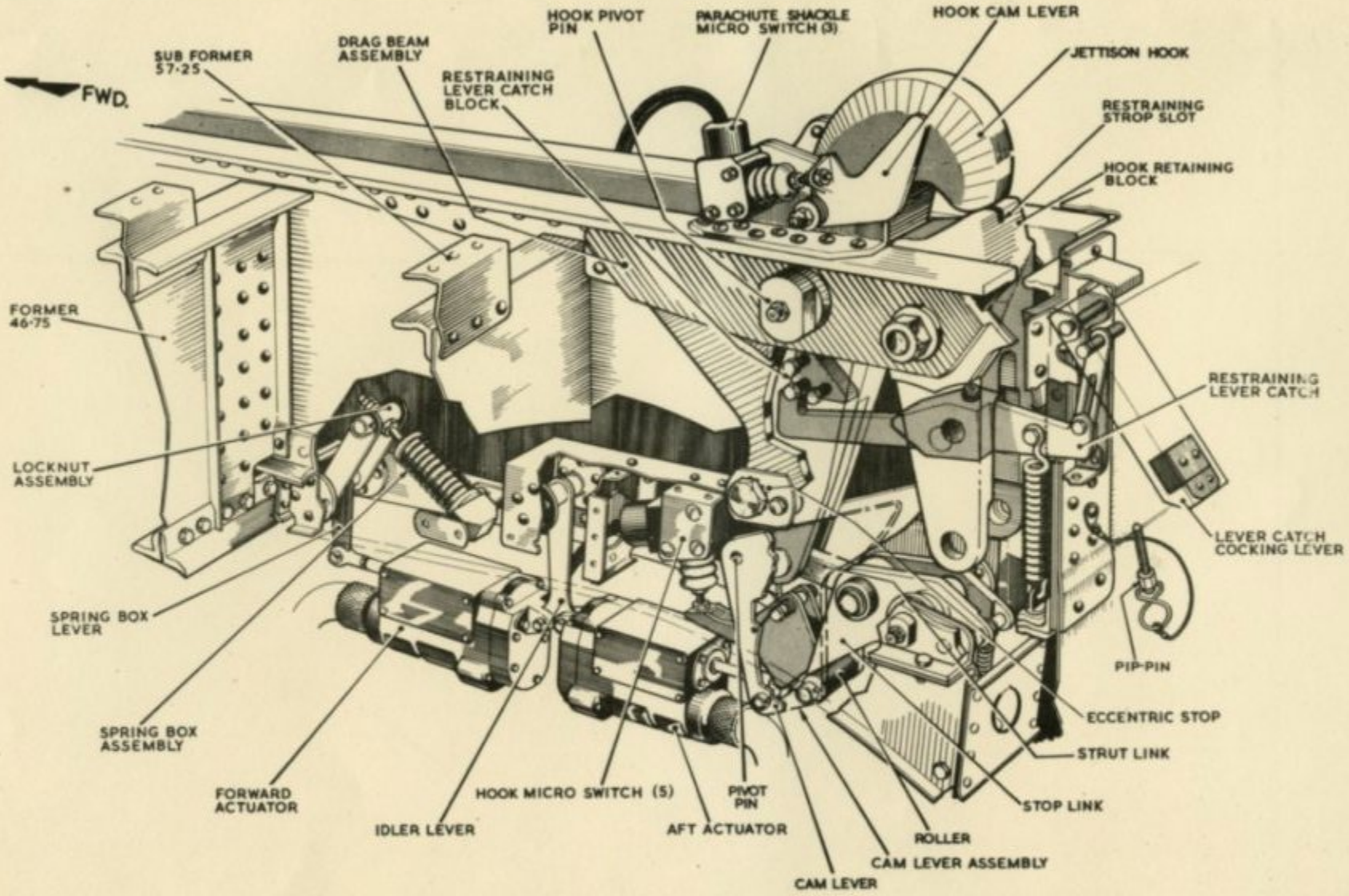

Fig. 2. Jettison hook mechanism

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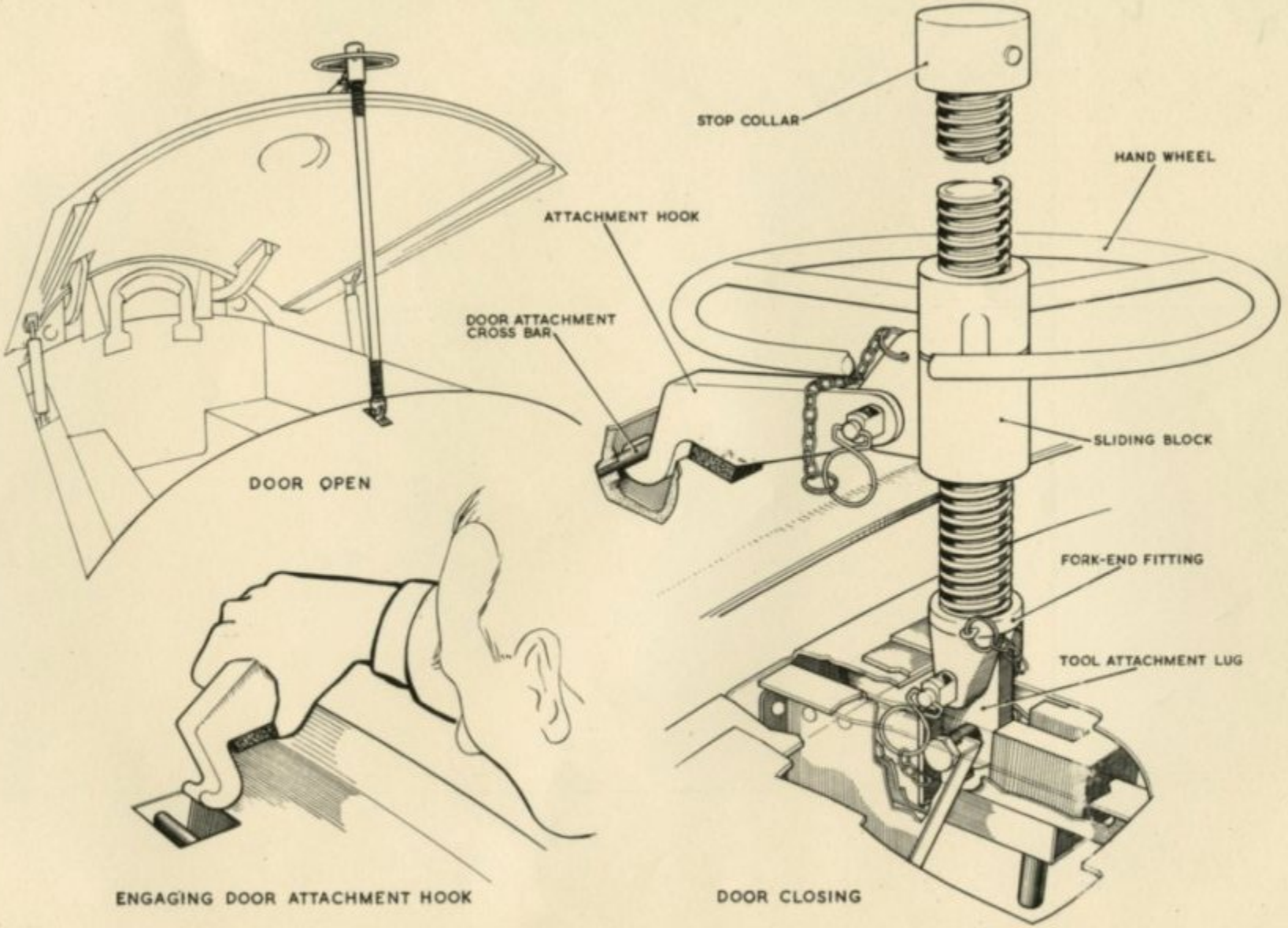

Fig. 6. Door manipulation — closing tool