

Appendix 1 MOD.613 - INTRODUCTION OF E.C.M.

LIST OF CONTENTS

<i>Introduction</i> ... ..	Para. 1
<b>DESCRIPTION AND OPERATION</b>	
<i>General</i> ... ..	4
<i>Control switches</i> ... ..	5
<i>Cocking switch</i> ... ..	6
<i>Micro switches</i> ... ..	7

<i>Actuators</i> ... ..	Para. 8
<i>Indicator</i> ... ..	9
<i>Circuit operation</i> ... ..	10
<i>Stream</i> ... ..	12
<i>Jettison</i> ... ..	15
<i>Automatic jettison</i> ... ..	17
<i>Re-cocking</i> ... ..	19
<i>Jettison</i> ... ..	20
<i>Stream</i> ... ..	23

<b>SERVICING</b>	
<i>General</i> ... ..	Para. 26
<i>Micro-switch settings</i> ... ..	27
<i>Actuators</i> ... ..	28
<b>REMOVAL AND ASSEMBLY</b>	
<i>General</i> ... ..	29

LIST OF ILLUSTRATIONS

<i>Brake parachute compartment</i> ...	Fig. 1
<i>Brake parachute jettison mechanism</i> ... ..	2
<i>Brake parachute control</i> ... ..	3
<b>Routing charts</b>	
<i>Parachute stream and jettison actuation</i> ... ..	4 (1) and (2)

**Introduction**

1. This appendix contains descriptive and servicing information on the changes made to the brake parachute installation by the introduction of Mod.613.

2. The brake parachute is stored in a compartment just aft of the fin and above

the E.C.M. installation, and is released to the stream or braking position on the opening of the compartment door. This operation is controlled by the pilot who can also jettison the parachute when sufficient additional braking has been effected.

3. The system also provides for the

**DESCRIPTION AND OPERATION**

**General**

4. Two electrically operated mechanisms are employed, one to open the door and referred to as the 'stream' mechanism, the other to jettison the parachute. Each mechanism is operated by two actuators coupled in tandem. Control of the actuators is arranged in two separate circuits each controlling one actuator of each mechanism.

This duplication of control and operation causes the actuators of each system to function jointly under normal circuit conditions. Should a failure affect one of the circuits however, the mechanism will be operated at half speed by the other. For reference purposes the actuators associated with each mechanism have been numbered 1 and 2, in the illustrations and descriptive

automatic jettison of the parachute should the doors inadvertently open. The mechanical aspect of the installation is dealt with in Sect.3, Chap.13A, of this publication. Location illustrations and a theoretical diagram are provided and the necessary routing charts will be found at the end of the text. Power supplies are fully described in Group 2A.

text for the installation. The relays of the circuits are mounted on a panel, 84P, located on the port side of the E.C.M. bay and adjacent to the parachute compartment.

**Control switches**

5. Two single-pole switches, PYE Type 3000, are mounted on the inboard

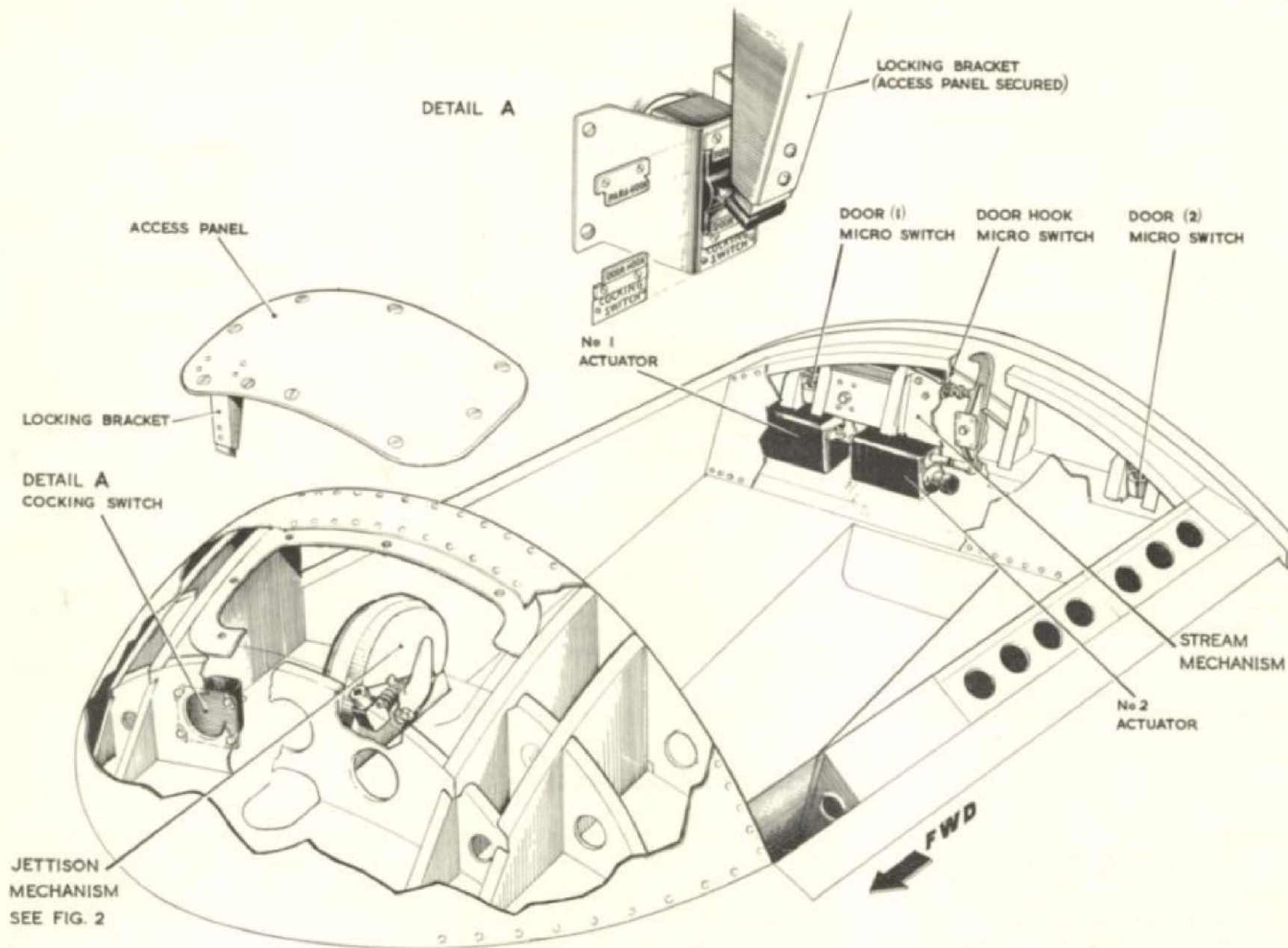


Fig.1 Brake parachute compartment

RESTRICTED

edge of the 1st pilot's panel and labelled **TAIL PARA-STRM-JETTISON**. Simultaneous or separate operation of these switches is provided by a split toggle link. This facility permits operation of one of the switches should either jam and independent functional checking of the circuits. The left hand switch controls the No.2 and the right hand switch the No.1 actuator of each mechanism.

#### Cocking switch

6. A two-position toggle switch Ref. 5CW/5824 is installed adjacent to the jettison mechanism and is labelled **COCKING SWITCH - DOOR HOOK - PARA HOOK**. The toggle of this switch is secured in the door hook position for normal operation by a bracket attached to an access panel in the forward fairing of the compartment. Removal of this panel allows manipulation of the switch for recocking purposes as described at paras. 19 and 23.

#### Micro switches

7. Five micro switches control the operation of the actuators and the indicator circuit. These switches are mechanically operated by various parts of the installation, the types in use being as follows:-

Door (1), door (2)  
and door hook - Honeywell IEN-N14  
Jettison shackle  
and jettison hook - Dowmic C1831-Y Mk.9

#### Actuators

8. Four Plessey actuators are employed and are installed in the parachute compartment, two at the aft end for the door release or stream mechanism and two at the forward end mounted as integral parts of the jettison release mechanism. Those for the stream circuits are Type ICZ/135840/B4, whilst those for the jettison circuits are ICZ/135840/B5. Further technical details of these actuators

will be found in A.P.4343D, Vol.1, Sect.14.

#### Indicator

9. A magnetic indicator, Type B2, is provided for ground servicing purposes and is located on the ground servicing intercomm panel on the starboard outer skin surface of the tail section. The supply circuit to the indicator is controlled by both door (1) and (2) micro switches and the earth circuit by the door hook micro switch. The indicator is energised to give a black display only when the installation is securely cocked.

#### Circuit operation

10. Referring to fig.3, it should be noted that the circuit is shown with the brake parachute correctly stowed and ready for use, i.e., the door and jettison micro switches are shown with their associated mechanism in the cocked position and the actuators extended with the retract field selected. The magnetic indicator will be energised black to show this condition when 28-volt d.c. supplies are connected to fuses 31 and 1044 by the following circuit action:-

- (1) A supply will be connected from fuse 1044 via normally closed relay contacts 650/4, 652/4, 701/1 and the door (2) micro switch terminals 4-6, to the coil of relay 653. The earth circuit will be completed, via terminals 6-4 of the door hook, 5-6 of the jettison hook and jettison shackle micro switches, and the relay will be energised.
- (2) Closing of relay contacts 653/1 will connect a supply from fuse 31, via normally closed relay contacts 649/4, 651/4, 700/1 and terminals 1-3 of the door (1) micro switch to the magnetic indicator.

The earth circuit of the indicator will be completed as for the relay 653 at (1) and it will be energised to give a black display.

11. The primary function of relays 700 and 701 is to prevent inadvertent jettisoning of the parachute in the event of malfunctioning of either control switch or circuit. They also facilitate the independent functional checking of the circuits. The contacts of these relays are therefore included in the circuit of the switch opposite to that which controls the supply to the coil of their respective relay.

#### Stream

12. Normal operation of the control switches will cause simultaneous operation of both circuits. For the purpose of the following description however, the circuit action affecting the No.1 actuators only is dealt with, including the indicator circuit, that for No.2 actuators being similar.

13. When the stream position is selected, supplies will be connected from fuses 31 and 1044 via terminals 1-2 of their respective switches to energise the coils of relays 701, 651, 652 and 700. The following circuit action will take place:-

- (1) Change-over of relay contacts 651/4 to 651/3 will transfer the supply at fuse 31, from the indicator to the retract field of the stream (1) actuator. The indicator will be de-energised to give a white display.
- (2) Change-over of relay contacts 651/2 to 651/1 will transfer the earth connection from the jettison (1) actuator circuit, to complete the earth circuit of the stream (1) actuator. The actuator will run

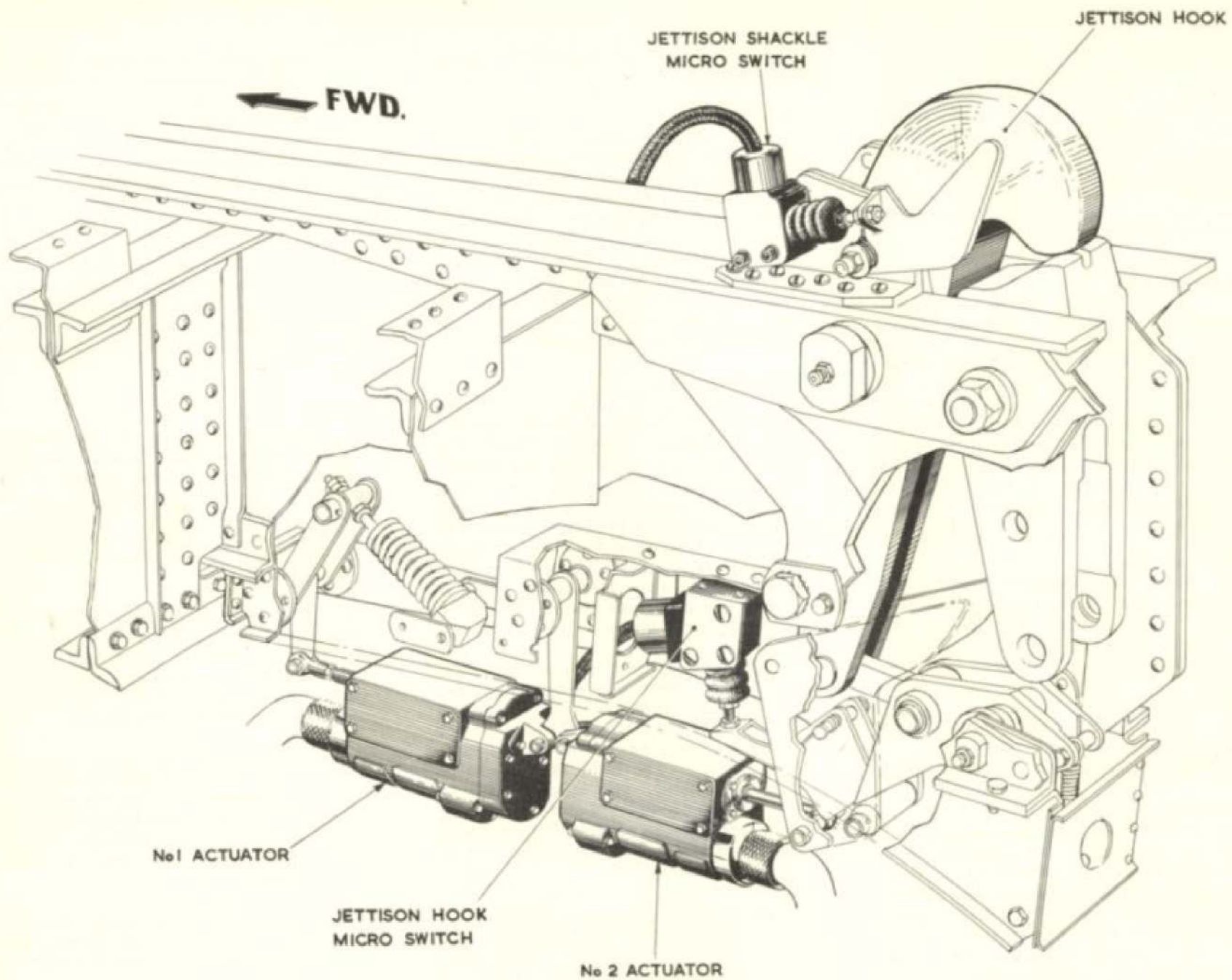


Fig.2 Brake parachute jettison mechanism

RESTRICTED

to the retract position, opening the door hook to allow the doors to open and the parachute will be released to the stream or braking position.

- (3) Opening of normally closed relay contacts 700/1 will disconnect terminal 1 of the door (1) micro-switch from the supply circuit.
- (4) Change-over relay contacts 652/4 to 652/3 and opening of normally closed relay contacts 701/1, will disconnect the supply from fuse 1044 to the coil of relay 653, which will become de-energised.
- (5) Opening of relay contacts 653/1 will isolate the magnetic indicator from the supply circuit.

When the stream (1) actuator runs to the fully retracted position as at (2) above, operation of the internal limit switches will stop its movement at that point, the extend field will then be connected in readiness for recocking operations.

14. Operation of the door hook and opening of the doors will cause the operation of the door hook and door (1) micro switches resulting in the following circuit action:-

- (1) Door hook switch.
  - (a) Connection of terminals 1-2 will cause a supply to be fed from fuse 31 to terminal 1 of the jettison hook micro switch in readiness for recocking.
  - (b) Disconnection of terminals 4-6 will break the earth circuits of the indicator and relay 653.
- (2) Door (1) switch.

- (a) Connection of terminals 1-2 will place the retract field circuit of the jettison (1) actuators at readiness for operation.
- (b) Disconnection of terminals 4-6 will break the stream recocking circuit.

Operation of the door (2) micro switch will place the retract field circuit of the jettison (2) actuator at readiness for operation. The installation will then be set for selection of the jettison position at the control switches.

#### *Jettison*

15. Selection of the control switches to the jettison position will disconnect the supplies from fuses 31 and 1044 to the coils of relays 701, 651, 652 and 700, which will then be de-energised. The following circuit action will then take place:-

- (1) Change-over of relay contacts 651/3 to 651/4 will transfer the supply at fuse 31 from the retract field of the stream (1) actuator to the retract field of the jettison (1) actuator, via normally closed contacts 700/1 and terminals 1-2 of the door (1) micro switch.
- (2) Change-over of relay contacts 651/1 to 651/2 will transfer the earth connection from the stream (1) actuator circuit to complete the earth circuit of the jettison (1) actuator. The actuator will run to the retract position, operating the jettison hook and detaching the parachute from the aircraft.

When the actuator runs to the fully retracted position as at (2) above, operation of the internal limit switch will stop its

movement at that point and select the extend field in readiness for recocking.

16. Operation of the jettison hook to release the parachute will cause manipulation of the jettison hook and jettison shackle micro-switches resulting in the following circuit action:-

- (1) Jettison hook switch.
  - (a) Connection of terminals 1-2 will cause a supply to be fed from fuse 31, via terminals 1-2 of the door hook switch to terminal 1 of the cocking switch in readiness for recocking.
  - (b) Disconnection of terminals 5-6 will further break the earth circuits of the indicator and relay 653.
- (2) Jettison shackle switch
  - (a) Disconnection of terminals 2-3 will break the supply circuit from fuse 31 to the recocking relay 655 and the recocking circuit.
  - (b) Disconnection of terminals 5-6 will disconnect the earth from the circuits of the indicator and relays 649 and 650.
  - (c) Connection of terminals 5-4 will complete the earth circuits of relays 649 and 650 in readiness for recocking.

The contact arms of all the micro switches will be in the dotted position and the cocking switch in the position of door hook selected.

#### *Automatic jettison*

17. Referring again to fig.3, it will be

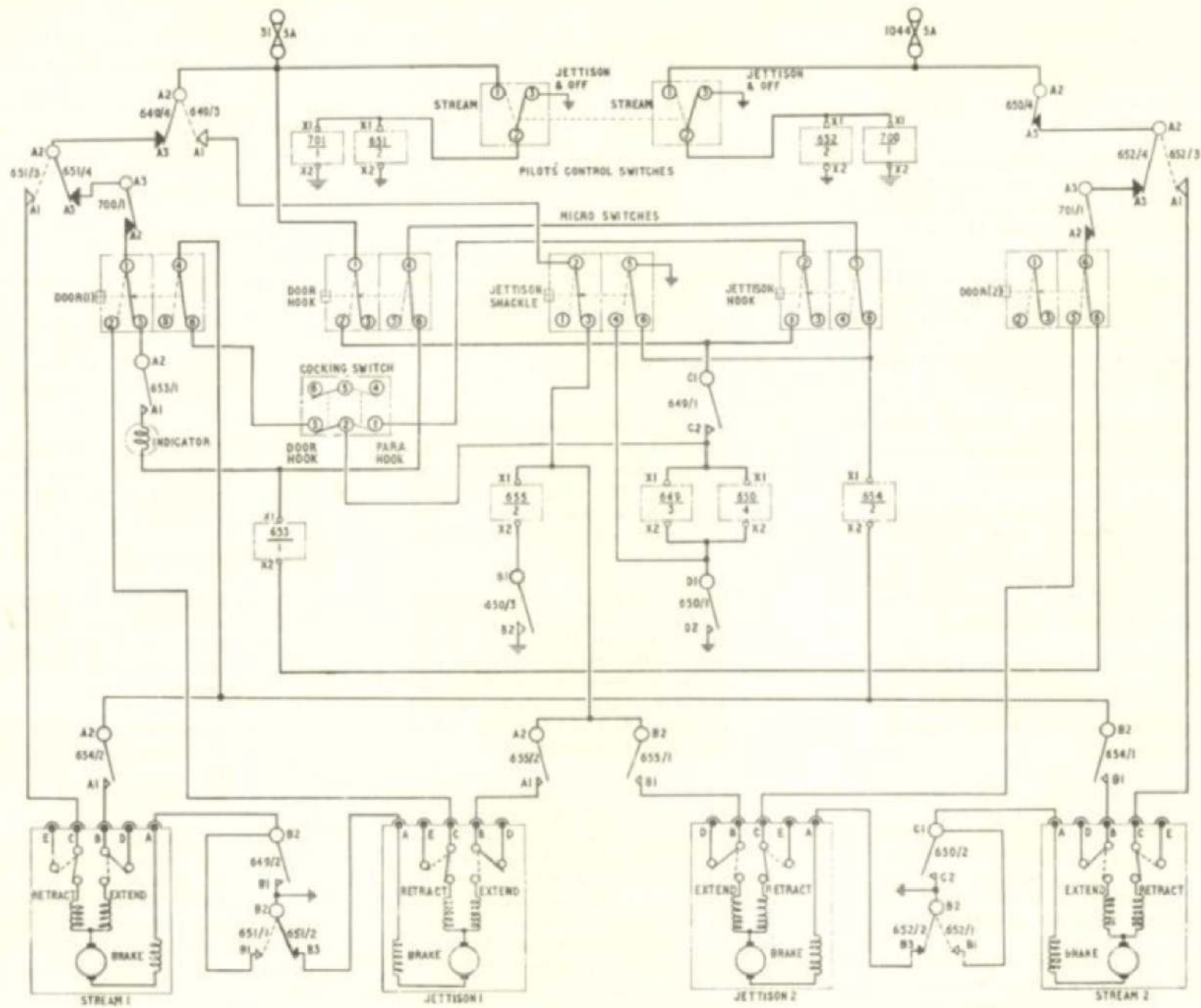


Fig.3 Brake parachute control

RESTRICTED

seen that should the door of the compartment inadvertently open, the resulting manipulation of the door (1) micro switch will cause the following circuit action:-

- (1) Disconnection of terminals 1-3 will break the supply from fuse 31, via relay contacts 649/4, 651/4, 700/1 and 653/1, to the magnetic indicator. The indicator will be de-energised to give a white display.
- (2) Connection of terminals 1-2 will transfer the supply at (1) to the retract field of the jettison (1) actuator which will run to the retract position, operating the jettison hook and detaching the parachute from the aeroplane.

The simultaneous manipulation of the door (2) micro switch will de-energise relay 653 and cause the jettison (2) actuator to run in tandem with the jettison (1) actuator operation at (2) above, opening of relay contacts 653/1 will additionally break the supply circuit to the magnetic indicator.

18. The circuit operation for automatic jettison will therefore leave the stream actuators at the extended or cocked position. All the micro switches except the door hook switch will be at the chain dotted position. Subsequent selection of the stream position at the control switches will cause the normal operation of the actuators as described at para.13. The door hook switch will then be operated to the dotted position. When the control switches are returned to the jettison off position the circuit will be reverted to the post normal operation condition.

#### Recocking

19. With the control switches in the off position, recocking operations commence with the selection of the para. hook

position at the cocking switch, when a supply will be fed from fuse 31, via terminals 1-2 of the door hook, jettison hook and cocking switches, to the coils of relays 649 and 650. The earth circuits will be completed via terminals 4-5 of the jettison shackle switch, the relays will be energised and the following circuit action will result:-

- (1) Closing of relay contacts 649/1 and 650/1 will, respectively, complete a hold-in supply from fuse 31, via the door hook switch terminals 1-2, and an earth circuit to the coils of relay 649 and 650.
- (2) Closing of relay contacts 649/2 will complete the earth circuit of the stream (1) actuator.
- (3) Change-over of relay contacts 649/4 to 649/3 will transfer the supply at fuse 31 to terminals 2 of jettison shackle micro switch.
- (4) Closing of relay contacts 650/3 will complete the earth circuit of relay 655.
- (5) Opening of relay contacts 650/4 will isolate the supply at fuse 1044 from the operating circuits of the No.2 actuators.

#### Jettison

20. The next operation is the insertion of the parachute shackle in the jettison hook and when this is carried out manipulation of the shackle micro switch will cause the following circuit action:-

- (1) Connection of terminals 2-3 will complete a supply from fuse 31, via relay contacts 649/3 to the coil of relay 655, the earth circuit will be made as at para.19 (4), and the relay will be energised.

- (2) Closing of relay contacts 655/2 will further connect the supply at (1) to the extend field of the jettison (1) actuator. The earth circuit will be completed, via normally closed relay contacts 651/2, and the actuator will run to the extend or cocked position closing the hook. Movement of the actuator will be stopped by operation of the internal limit switches.
- (3) Connection of terminals 5-6 will complete the earth circuit of relay 654 in readiness for stream re-cocking.

21. Should it be found necessary at this stage, for any reason to re-open the jettison hook, this can be achieved by first selecting the door hook position at the cocking switch. Momentarily depressing the door hook micro switch will then cause both actuators to run to the extend position, opening the hook. Cocking operations can then be re-commenced as at para.19.

22. When the actuators run to the extend position as at para.20 (2), the jettison hook micro switch will be manipulated resulting in the following circuit action:-

- (1) Disconnection of terminals 1-2 will remove the supply from fuse 31 to terminal 1 of the cocking switch.
- (2) Connection of terminals 5-6 will further connect the earth at para. 20 (3) to terminal 4 of the door hook switch.

The parachute will now be securely attached to the aeroplane and correctly housed in its stowage.

#### Stream

23. In preparation for recocking the stream mechanism the door hook position at the cocking switch should now be selected. When this occurs the following circuit action will result:-

- (1) Disconnection of terminals 1-2 will break the initial supply circuit to the coils of relays 649 and 650.
- (2) Connection of terminals 2-3 will cause the hold-in supply at para. 19 (1) to be fed also to terminal 6 of the door (1) micro switch.

24. The next operation will be to close the compartment door and when this is carried out manipulation of the door (1) and (2) micro switches will result in the following circuit action:-

- (1) Door (1).
  - (a) Disconnection of terminals 1-2 will break the supply circuit to the retract field of the jettison (1) actuator.
  - (b) Connection of terminals 1-3 will place the indicator circuit at readiness for operation.
  - (c) Connection of terminals 4-6 will further connect the supply at para.22 (2) to the coil of relay 654. The earth circuit will be completed, via terminals 6-5 of the jettison shackle micro switch and the relay will be energised.

- (d) Closing of relay contacts 654/2 will connect the supply at (c) also to the extend field of the stream (1) actuator. The earth circuit will be completed, via relay contacts 649/2 and the actuator will move to the extended or cocked position operating the door hook to secure the door.

(2) Door (2).

- (a) Disconnection of terminals 4-5 will break the supply circuit to the retract field of the jettison (2) actuator.
- (b) Connection of terminals 4-6 will cause a supply to be fed from fuse 1044, via normally closed relay contacts 650/4, 652/4 and 701/1 to the coil of relay 653.

25. When the door hook is operated to secure the door, the hook micro switch will be manipulated resulting in the following circuit action:-

- (1) Disconnection of terminals 1-2 will:-
  - (a) Remove the hold-in supply from fuse 31, via relay contacts 649/1 to the coils of relays 649 and 650, which will be de-energised.
  - (b) Remove the supply from fuse 620 to the coil of relay 654, as at para.24 (1) (c), and the relay will be de-energised.

- (2) Opening of relay contacts 649/1 and 650/1 will break the hold-in circuit to the coil of both their relays.

- (3) Opening of relay contacts 649/2 will isolate the field circuits of the stream (1) actuator from earth.

- (4) Change-over relay contacts 649/3 to 649/4, will transfer the supply at fuse 31, via relay contacts 651/4, 700/1 and terminals 1-3 of the door (1) micro switch to relay contacts 653/1 in readiness to operate the indicator.

- (5) Opening of relay contacts 650/3 will isolate relay 655 from earth.

- (6) Closing of relay contacts 650/4 will connect a supply from fuse 1044, via relay contacts 652/4, 701/1 and terminals 4-6 of the door (2) switch to the coil of relay 653.

- (7) Connection of terminals 4-6 of the door hook switch will complete the earth circuit of relay 653, via terminals 5-6 of the jettison hook and shackle switches, and the relay will be energised.

- (8) Closing of relay contacts 653/1 will complete the supply at para. (4) to the indicator, which will be energised black, indicating that recocking operations have been correctly completed.

#### SERVICING

#### General

26. The installation should be inspected

periodically for security of attachment of the components and associated cable connections. A check should also be

made for signs of chafing where cable runs are affixed to the aircraft structure adjacent to moving parts.

RESTRICTED

**Micro switch settings**

27. Setting of the micro switches in relation to the mechanism by which they are operated is detailed fully in Sect.3, Chap.13A, of this publication. These settings should be checked periodically,

including at the same time a check to ensure freedom of plunger movement. Simultaneously also operation of the indicator should be checked to ensure that a black indication occurs only when the door is securely closed and locked.

**Actuators**

28. Servicing instructions for the actuators employed in the installation will be found in A.P.4343D, Vol.1, Sect.14.

**REMOVAL AND ASSEMBLY****General**

29. Access to the components is

straightforward and therefore no detailed instructions are required. When it is necessary to remove or replace any

components, secure all loose connectors to the adjacent aircraft structure to prevent damage.

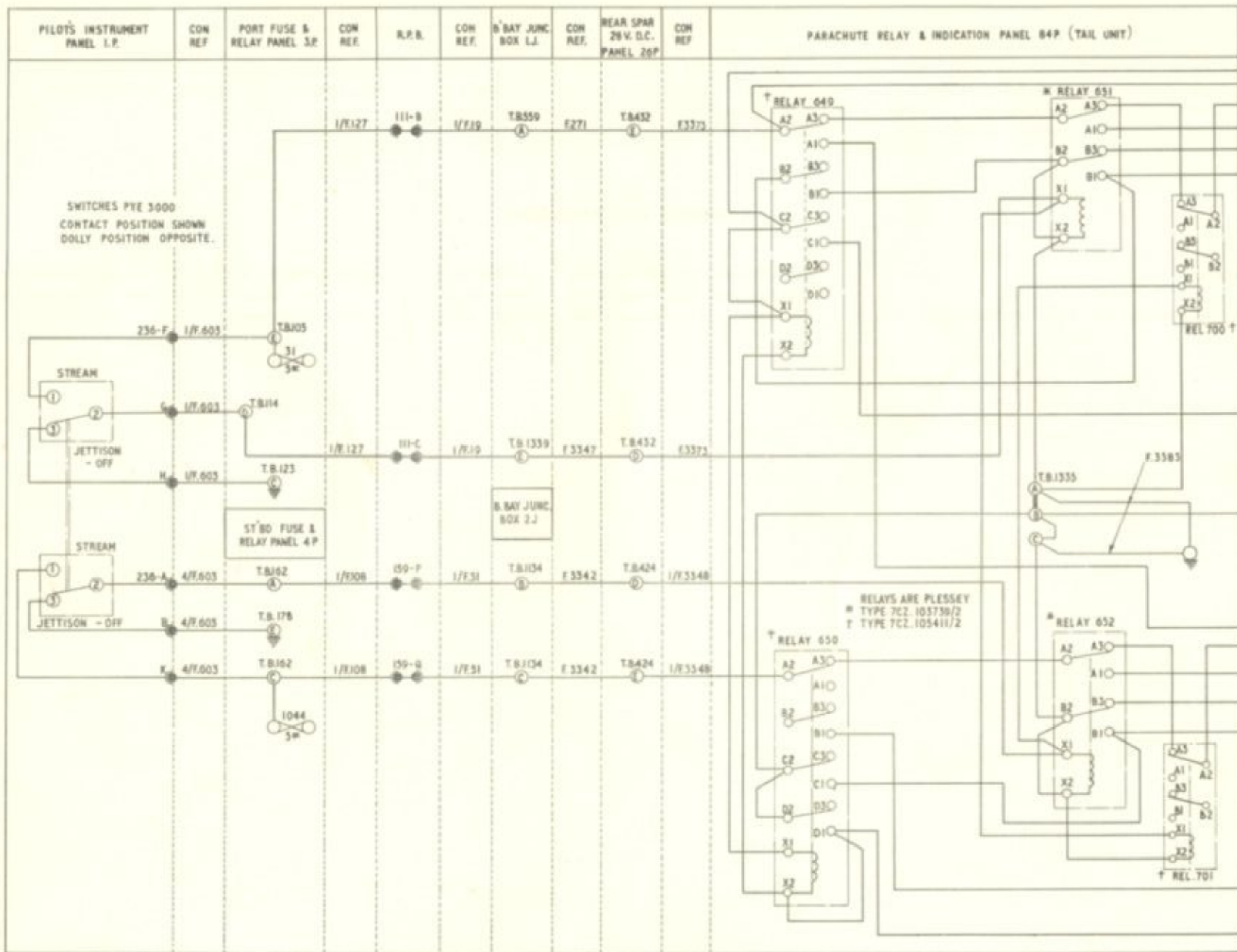


Fig.4 (1) Parachute stream and jettison actuation

RESTRICTED

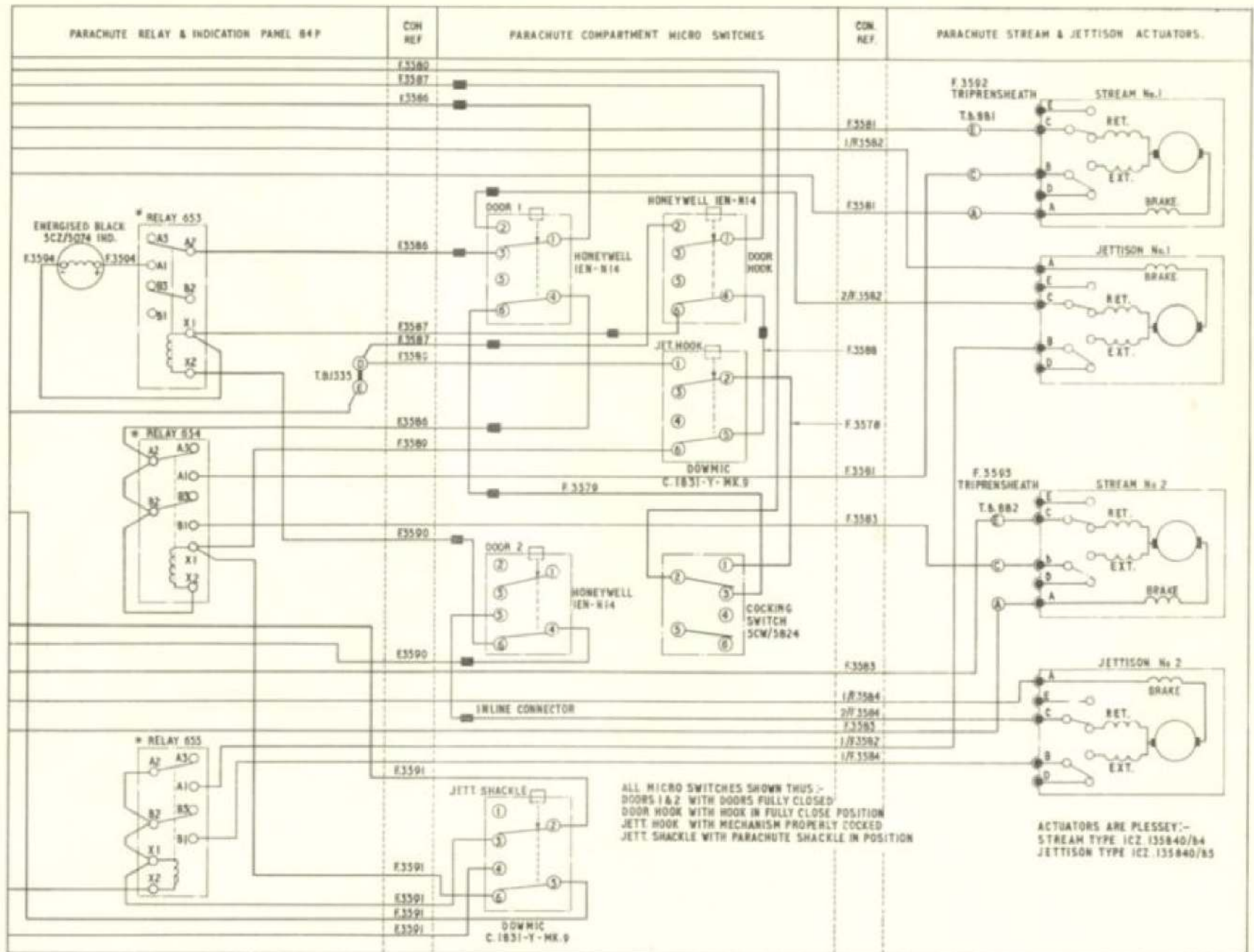


Fig.4 (2) Parachute stream and jettison actuation

This file was downloaded  
from the RTFM Library.

Link: [www.scottbouch.com/rtfm](http://www.scottbouch.com/rtfm)

Please see site for usage terms,  
and more aircraft documents.

