GROUP G.2

TARGET TOWING (CODE TT)

(Completely revised)

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Introduction

1. The banner target towing installation in this aircraft provides for towing banner targets launched from containers carried on the E.R.U.'s on the inboard pylons and also for drag launching. The target towing ropes are attached to the aircraft by two 3 000 lb. electrically operated release slips mounted below the centre fuselage. Installation of this form of target towing requires wiring disconnections to be made in the pylon circuits (*Group G.1*), and also for a connection to be made with the air brake control circuit (*Group D.7*). Detailed information on the standard items of equipment used in the circuit will be found in the relevant Air Publications listed in Table 1.

TABLE 1

Equipment type and Air Publication reference

Equipment Type	Air Publication
Stream/Indicator switches, Type 80/10/0591/C red and green Standby release switch, Type B, Dowty C.5162Y, Mk. 6 Launch selector switch, four-pole changeover, Type N.S.F.7695/K5	A.P.4343C, Vol. 1, Book 1, Sect. 1
Relays, Type S.M.5A–M4 and Hendrey Type 10B, No. 15	A.P.4343C, Vol. 1, Book 2, Sect. 3
Target towing release unit, Type A, Mk. 1 Air launch container, Mk. 4, T.670	A.P.1492A, Vol. 1, Sect. 3

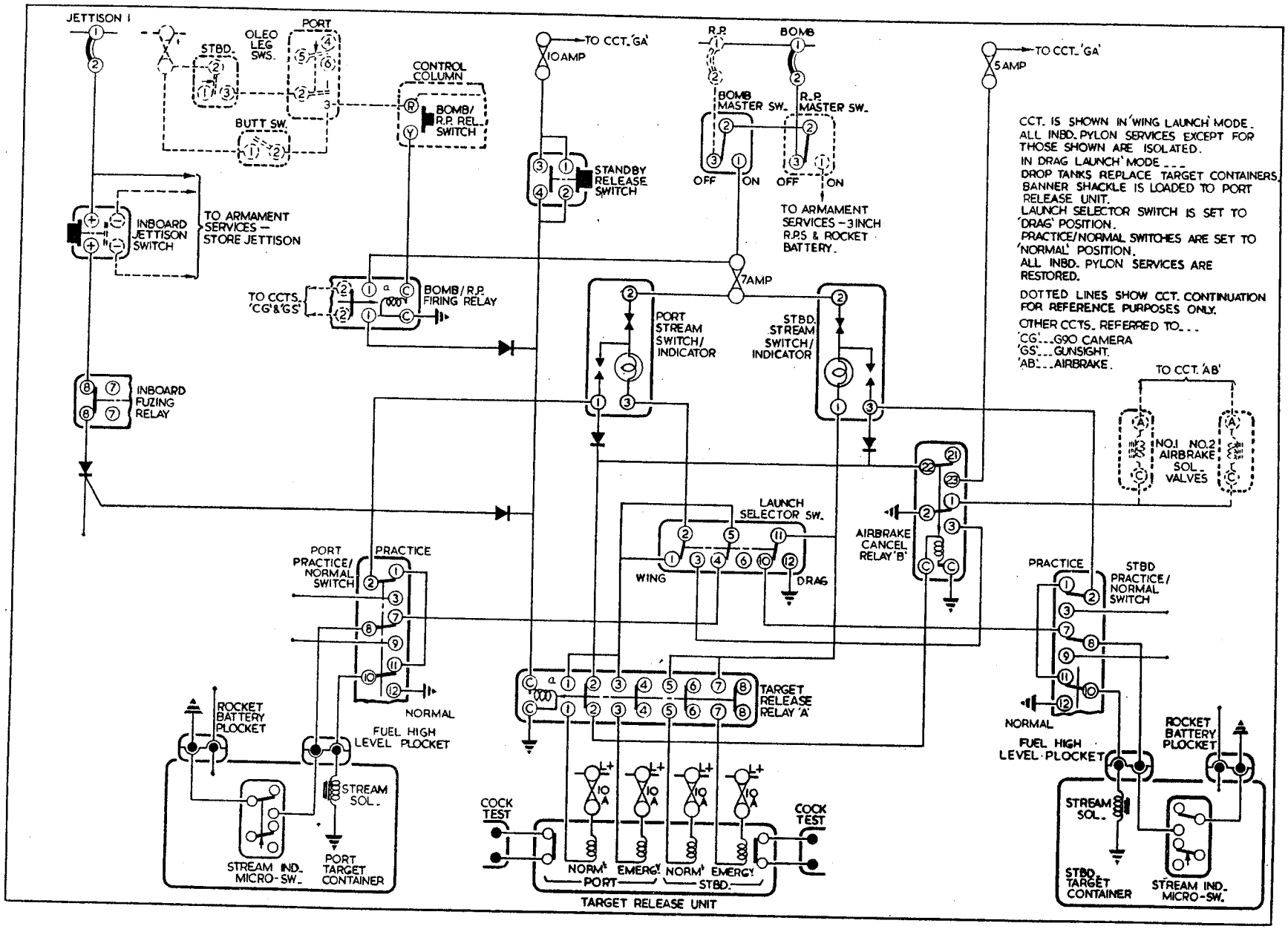

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Fig.1 Target towing (theoretical)

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DESCRIPTION

Release slips

2. The two target towing release slips are bolted to a T-shaped mounting bracket which is secured to the underside of the fuselage, just aft of the engine access panel, on the aircraft centre line. The mounting bracket is secured by four bolts screwed into anchor nuts attached to a mounting structure inside the fuselage between frames 37 and 38. Inside the fuselage a bracket on the forward side of frame 37 holds a socket into which the cable from the release units is plugged. The cable enters the fuselage through a recess in the landing of the engine access panel, the panel being recessed to fit around the cable.

3. In each of the release units operation of the release slip mechanism is effected by two solenoids, each of which is energized, providing independent and alternative means of release. The release slip can also be opened manually from outside the unit by a push-button plunger which trips the mechanism and releases the jaws. After reloading, the release mechanism is re-cocked manually by operating an external lever. Re-cocking the mechanism closes a switch inside the unit which is wired in series with a test plug. The test plug for each unit is located just inside the fuselage and provides a means of connecting a cocking test set.

Cocking test

4. Cocking tests should always be made after reloading the units. The test set consists of a lamp and low voltage battery. When connected to the test socket the lamp will light if the unit is correctly cocked, the circuit being completed via the switch inside the unit.

Target containers

5. For carrying target containers, ejector release units are fitted to the inboard pylons and the bomb fuzing, release and jettison lines are disconnected by carrying out the procedure given in para. 17. The practice/normal switches on the pylons are wired to the launch selector switch (*para. 7*) in the target towing control box. When the containers are fitted, the Type 'R' plugs and the fuel high level plockets connect the container circuits which, on each container, include a stream solenoid and a stream indicator microswitch. The stream solenoid, which is wired to the stream push-switch (*para. 6*), operates the banner release mechanism. The microswitch is actuated by the tow-rope and, when closed, completes an earth return for the stream indicator lamp, via the fuel high level plocket. This earth return is also used, after the target has streamed, to complete the circuits for the solenoids of the target towing release unit (*para. 8*).

Control switches

6. Launching of the targets from the containers is controlled by two stream switch/indicator units, each consisting of a combined push-switch and indicator lamp, with a red lamp in the port unit and a green lamp in the starboard unit. They are mounted, together with a standby release push-switch, on a panel on the gunsight in the position normally occupied by the camera recorder. The stream switch units are supplied with power from the bomb master switch and are wired to the stream release solenoids and indicator microswitches on their respective containers (*para. 5*). The standby release switch is supplied from the essential load (*A+*) line (*Group B.1*) and is wired to the coil of a target release relay A in the target towing control box.

Target towing control box

7. The target towing control box is mounted on frame 19 in the radio bay. In addition to relay A the box contains an air brake cancel relay B, a launch selector switch, two pairs of linked fuses and four diode rectifiers, wired as illustrated in fig. 1. The launch selector switch is used to condition the circuit for the required launching mode. Two poles of the switch are wired to the indicator lamps and to contacts on relay A, and one pole is wired, via each practice/normal switch and the plocket connectors, to the stream solenoids. In the WING LAUNCH position the switch provides an earth return circuit for the target release solenoids, via the stream microswitch, and also connects each lamp line to the stream microswitches.

8. The linked fuses in the control box are fed from a terminal on the supply panel, each fuse being connected to a solenoid on one of the release units. The negative ends of the solenoids are connected to contacts on relay A, so that when relay A is energized, the solenoids of the release unit in use will be connected to the earth connection on the pylon from which the target is streamed (*para. 5*). When relay A is not energized a pair of its contacts connects the coil of relay B to the stream switch lines from the control units and also to a contact on relay B. This contact, when closed, conducts a supply from the A+ line to the coil, thereby keeping it energized after the stream switch has been released. The other contact on relay B is wired to earth, and while the relay is un-energized, this contact completes the earth return circuit for the air brake valve solenoid (*Group D.7*).

9. The coil of relay A, besides being wired to the standby release switch (*para. 6*), is also wired to a contact on the bomb/R.P. firing relay and to the inboard pylon stores jettison switch. The arrangement thus provides means of energizing relay A and thereby connecting the solenoids of the release unit, whose target has streamed, to an earth return (*para. 5*).

Drag launching

10. When the drag launching mode is used, the ejector release units on the pylons are loaded with fuel drop tanks and the practice/normal switches in the pylons put to the NORMAL position. The towing shackle is loaded to the port side release unit. In the target towing control box, the launch selector

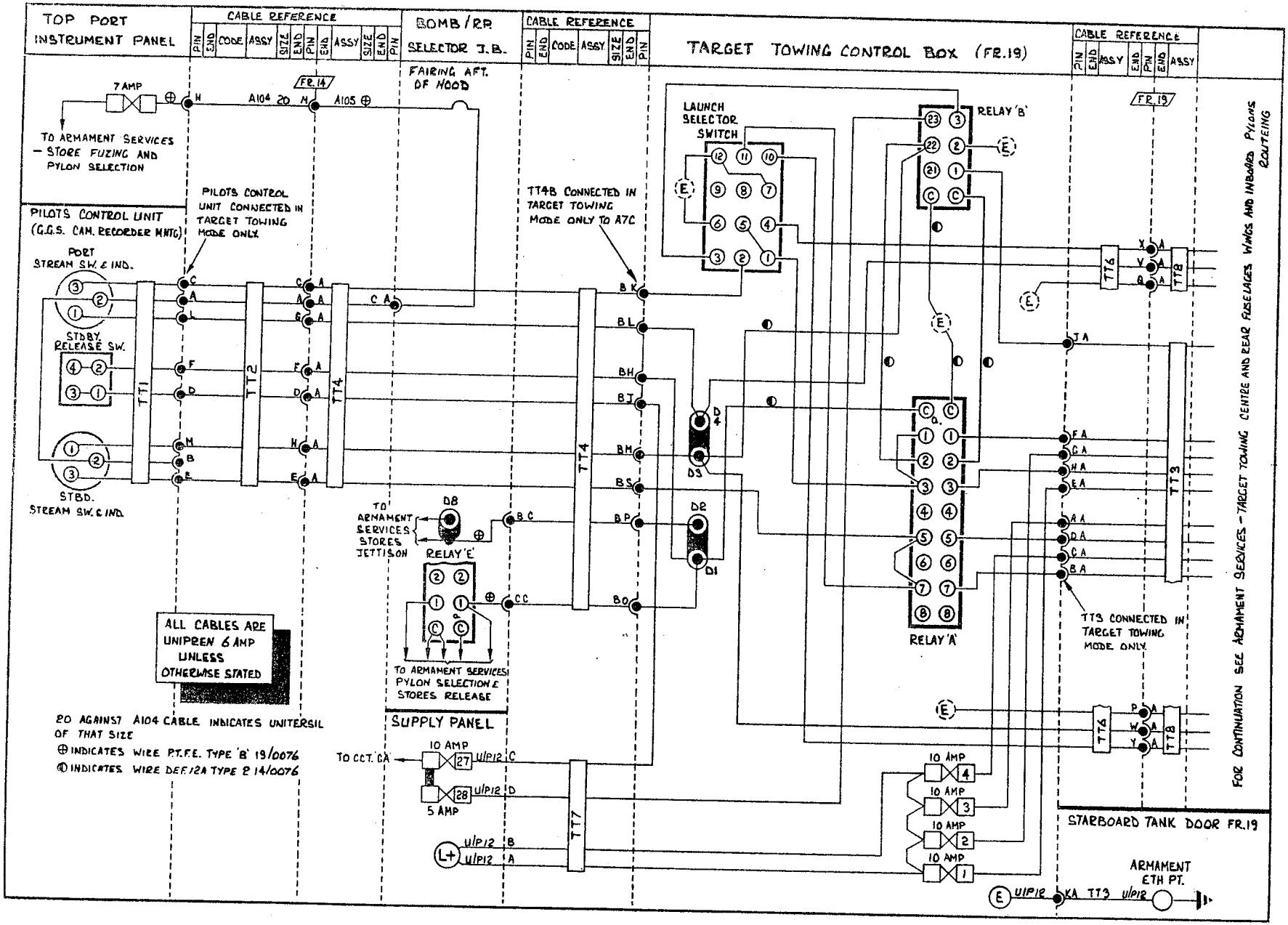

Fig.2 Target towing (routeing sheet 1)

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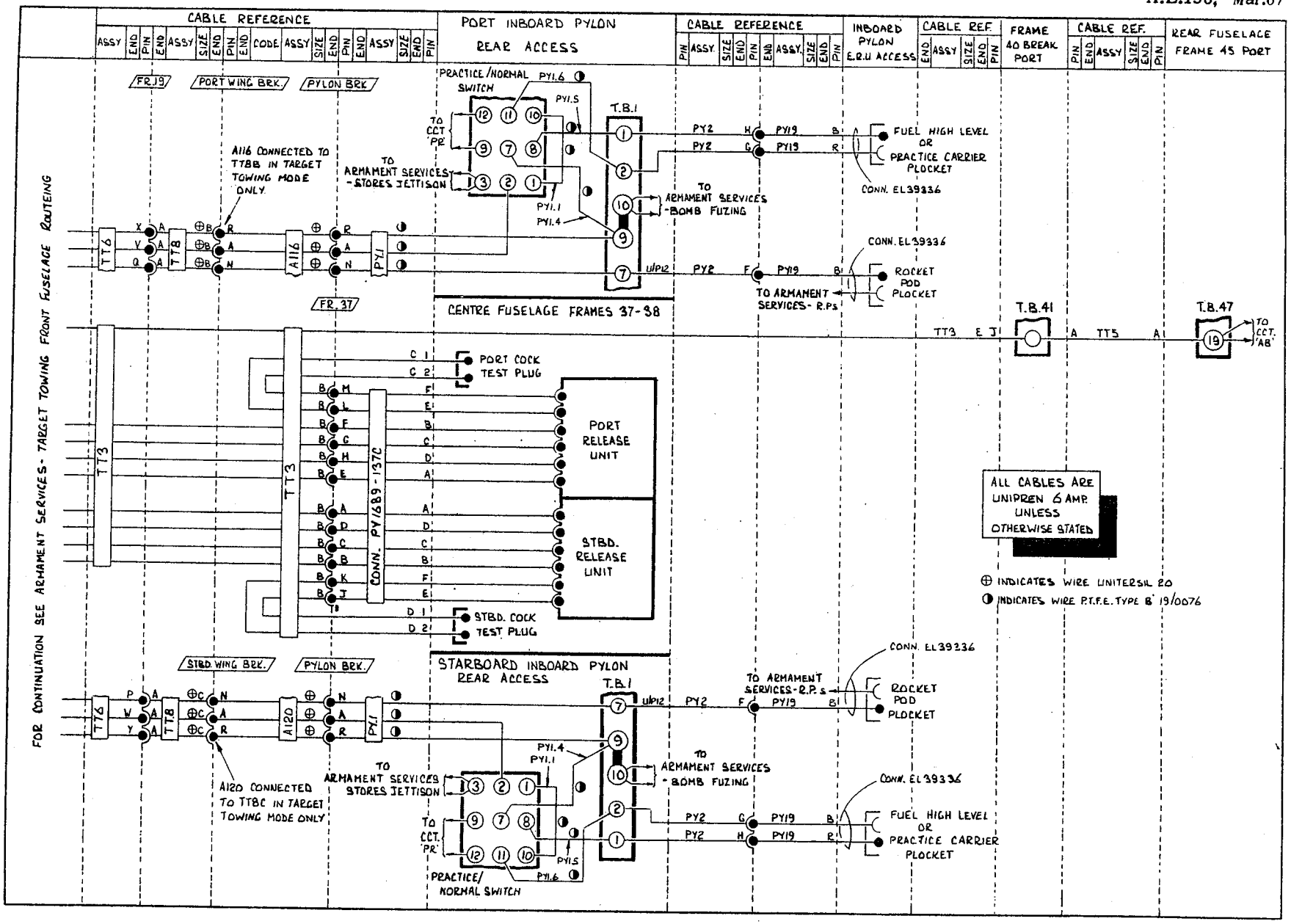

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Fig.3 Target towing (routeing sheet 2)

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switch is put to DRAG LAUNCH. The launch selector switch connects contacts on relay A and the negative line of the starboard indicator lamp to earth. The negative of the port indicator lamp is connected to a contact on relay B.

Operation

Wing launch—stream

11. When the port stream switch is depressed, supplies derived via the bomb master switch pass to the stream solenoid on the port side target container and also to the target towing control box. In the control box the supply is passed via contacts 2–2a of relay A to the coil of relay B which is energized. One of the contacts of relay B breaks the earth return connection from the air brake valve solenoid. The other contact connects the A+ line supply to the relay coil and as a result, relay B is held on, rendering the air brake inoperative. At the same time, the stream solenoid energizes, operating the release mechanism in the container. The target streams and, as the towrope leaves the container, it closes the stream indicator microswitch, thereby completing the earth return circuit for the port indicator lamp, via the fuel high level plocket on the pylon, thus causing the port indicator lamp to light.

Wing launch—release

12. With the bomb master switch in the ON position, when the bomb/R.P. firing push-switch is depressed, the bomb/R.P. firing relay is energized, and its contacts 1–1a pass a supply, derived via the bomb master switch, to the target towing control box, where it energizes relay A, whose contacts change over. This disconnects relay B's coil from the A+ supply and in addition, contacts 1–1a and 3–3a connect the negative lines of the port release unit solenoids to earth, the circuit being via contacts 5–4 of the launch selector switch to the practice/normal switch in the port pylon, and from there via pin 1 of the Type R plug and the container microswitch to the fuel high level plocket. Thus the solenoids are energized and the release unit operates to release the shackle. At the same time relay B, de-energized, opens its contacts, one of which reconnects the air brake valve solenoid to earth, thereby rendering the air brake operative.

13. The target can be released by operating the inboard pylon stores jettison push-switch, thereby energizing relay A, the subsequent operations being as described in para. 1?. Operation of the standby release push-switch also effects release of the target described, except that in this instance the initiating supply is derived from the A+ line, and is thus available in the event of failure of the armament circuit fuse. After the target has been released, the stream indicator lamp will remain lit; it can be extinguished by putting the bomb master switch to OFF.

Drag launching—target streamed

14. With a target loaded to the port release unit, when the bomb master switch is put to the ON position, the green stream indicator lamp will be lit indicating that the target from the starboard container has been expended. When, prior to take-off, the port stream push-switch is operated, supplies derived via the bomb master switch pass to the stream solenoid and also via contacts 2–2a of relay A to the coil of relay B. When relay B energizes, one of its contacts breaks the earth connection from the air brake valve solenoid and connects it via contacts 3–2 of the launch selector switch to the negative of the port indicator lamp; the other relay B contact connects a hold-on supply from the A+ line to the relay coil. Thus the port indicator lamp is lit and the air brake is inoperative.

Drag launching—target release

15. Release of the target is initiated by either of the methods described in para. 12 and 13, thereby energizing relay A, whose contacts change over. Contacts 2–2a disconnect the hold-on supply from relay B and contacts 1–1a and 3–3a complete the circuits for energizing the solenoids of the port release unit, via contacts 5–6 of the launch selector switch. When relay B de-energizes, its contact disconnects the earth connection from the negative of the port indicator lamp, and reconnects it to the negative line of the air brake valve solenoid. Thus the port indicator lamp is extinguished, indicating that the target has been released, and the air brake is again operable.

SERVICING

General

16. General servicing of the target towing installation consists in keeping the components clean and carrying out the normal routine tests for security and serviceability. In addition, the preparation and testing procedures given in the following paragraphs must be carried out.

Note . . .

Packing the targets and dispensers in the containers is described in A.P.1492A, Vol. 1, Sect. 2, Chap. 10.

Preparation for target towing (wing launch)

17. When fitting target containers to the inboard pylons, the pylons must be equipped with ejector release units, not electromagnetic release units.

Note . . .

If only one container is available, it should be loaded on the port side pylon. The starboard side pylon should be left unloaded.

The outboard pylons should be loaded with 100 gall. drop tanks. To prepare the aircraft for target towing, the procedure is as follows :—

(1) Render the aircraft electrically safe, as described in Group A.1 and ensure that the armament safety plug is disconnected.

(2) In the cabin, if not already done, remove the camera recorder from its position on the gunsight mounting and return it to its stowage. Fit the target towing switch unit to the position vacated by the recorder. Connect in cable TT1, from the control unit, with cable TT2 at the continuity socket.

(3) At the port wing break, disconnect cable assembly A116 from A115 and reconnect it to TT8B, fitting the blanking cap removed from TT8B to A115. At the starboard wing break, disconnect cable assembly A120 from A119 and reconnect it to TT8C, fitting the blanking cap removed from TT8C to A119.

(4) In the radio bay, disconnect cable assembly TT3 from its shorting plug stowage on frame 19 and connect it in to the target towing control box. Remove cable assembly TT4B from its stowed position and connect it to the plug coded A7C on the control box.

(5) If these are not already in the containers, fit the targets and rope packs to the containers, taking care to pass the rope from the containers to the release units through the stream/indicator microswitch arm on the side of each container.

(6) On each container, check visually that the container release unit is cocked.

(7) Load the target towing shackles on to the centre fuselage release units and check that the release units are cocked, using the standard cock test set as used on E.M.R.U.'s.

(8) In the port and starboard pylons put the practice/normal switches to PRACTICE.

(9) In the target towing control box put the launch selector switch to the WING LAUNCH position.

(10) Connect the armament safety plug prior to flight.

Preparation for target towing (drag launch)

18. The outboard pylons should be loaded with 100 gall. drop tanks and the inboard pylons with 230 gall. drop tanks; the latter may be fuelled as required. To prepare the aircraft for target towing proceed as follows :—

(1) Render the aircraft electrically safe, as described in Group A.1 and ensure that the armament safety plug is disconnected.

(2) In the cabin, proceed as described in para. 17, sub-para. (2).

(3) In the radio bay, proceed as described in para. 17, sub-para. (4).

(4) Place the launch selector switch in the target towing control box to the DRAG LAUNCH position.

(5) Load the target towing shackle to the port release unit, applying the cocking test, as described in para. 17, sub-para. (7).

(6) Connect the armament safety plug.

Test procedure (wing launch)

19. The tests listed below require that the aircraft's condition should be as follows :—

(1) The gun package disconnected, fuel drop tanks loaded on the outboard pylons and target containers without banners and ropes loaded on the ejector release units (*not electro-magnetic release units*) on the inboard pylons.

(2) The safety plockets on the inboard and outboard pylons disconnected, with test lamps connected to the wing wiring side of the safety breaks.

(3) The practice/normal switches in the inboard pylons in the PRACTICE position.

(4) The stream/indicator microswitches in the containers set to NORMAL position.

(5) Banner shackles fitted to port and starboard centre fuselage release units and cocking tests carried out, using a standard test set.

(6) The fuzing selector switch in the OFF position.

(7) The air brake IN.

(8) The bomb master switch in the ON position.

(9) The armament safety plug connected.

(10) Hydraulic rig connected and running.

(11) External supply connected and battery master switch ON.

(12) The launch selector switch in the target towing control box to WING LAUNCH. Check that the stream indicators are not illuminated.

Functioning tests (wing launch)

20. To test the functioning of the target towing circuit and equipment proceed as follows :—

(1) Select the air brake test switch to OUT. The air brake should function normally.

(2) Load the test shackles to the port and starboard centre fuselage release units. Depress the inboard pylon stores jettison push-switch. The centre fuselage release units should *not* operate. Also

(*a*) Inboard and outboard pylon jettison circuits should not be energized.

(*b*) Depress outboard pylon stores jettison push-switch. Outboard pylon jettison circuits only should be energized.

(3) Apply the load to the container test shackles. On the target towing control panel, depress the port stream/indicator switch. The port container release unit should operate, allowing the shackle to fall free. Manually operate the port container stream/indicator microswitch. The port stream indicator lamp should light and should remain lit during the ensuing tests. Check that the starboard container circuit has not operated.

(4) Select the air brake test switch to OUT. The air brake should not operate.

(5) Apply the load to the banner shackles on the centre fuselage release units. Select the butt test switch to TEST. Operate the bomb/R.P. firing push-button on the control column handgrip. The port release unit should operate, allowing the shackle to fall free. Check that the starboard release unit has not operated.

(6) Select the air brake test switch to OUT. The air brake should function normally.

(7) Apply the load to the starboard container test shackle. On the target towing control panel, depress the starboard stream switch/indicator. The starboard container release unit should operate, and allow the shackle to fall free. Manually operate the starboard container stream/indicator microswitch. The starboard stream indicator lamp should light and should remain lit during the ensuing tests.

(8) Select the air brake test switch to OUT. The air brake should not operate.

(9) Apply the load to the banner shackle on the starboard centre fuselage release unit. Operate the bomb/R.P. firing push-button on the control column. The starboard release unit should operate, allowing the shackle to fall free.

(10) Select the air brake test switch to OUT. The air brake should function normally.

(11) Shut down the hydraulic rig.

(12) Return the butt test switch to OFF. Select the bomb/master switch to OFF. The port and starboard stream indicator lights should be extinguished. Return the bomb/master switch to the ON position. Check that both the stream indicators are illuminated.

(13) Reload the test shackle on to the port centre fuselage release unit and check for correct cocking.

(14) Apply the load to the shackle and operate the inboard pylon jettison switch. The release unit should operate, allowing the shackle to fall free. The jettison circuits should function as in sub-para. (2) (*a*).

(15) Disconnect the armament safety plug.

(16) Reload the shackle to the port centre fuselage release unit and check for correct cocking.

(17) Apply the load to the shackle. On the target towing control panel, depress the standby release push-button. The release unit should operate, allowing the shackle to fall free. The pylon jettison circuits should not be energized.

(18) Reload the banner shackles to the port and starboard centre fuselage release units and check for correct cocking.

(19) In the target towing control box remove fuses No. 1 and No. 3. On the target towing control panel, depress the standby release button. Both release units should operate, allowing the shackles to fall free. Replace fuses No. 1 and No. 3 in the control box.

(20) Reload the banner shackles to the centre fuselage release units and check for correct cocking.

(21) Remove fuses No. 2 and No. 4 from the control box. Depress the standby release button. Both release units should operate and the shackles fall free. Replace fuses No. 2 and No. 4 in the control box.

(22) On completion of the foregoing tests, if the outboard drop tanks are full, remove fuses No. 4 and No. 13 from the cabin starboard shelf and check that the drop tank empty indicators show WHITE. Replace the fuses.

(23) If the drop tanks are empty, short-circuit terminals No. 1 and No. 2 at T.B.1 in each outboard pylon. Check that the drop tank empty indicators show BLACK.

(24) Reconnect the gun package. Remove the test lamps from the pylon jettison circuit wiring. Reconnect the safety plockets in the outboard pylons and check the cocking of the release units.

Test procedure (drag launch)

21. The ensuing functioning tests require that the aircraft's condition should be as follows :—

(1) The gun package disconnected; 230 gall. drop tanks loaded on the inboard pylons.

(2) The target towing shackle fitted to the port release unit and a cocking check carried out using a standard test set.

(3) The safety plockets on the inboard and outboard pylons disconnected, with test lamps connected to the wing wiring side of the safety breaks.

(4) The practice/normal switches in the inboard pylons to NORMAL.

(5) In the target towing control box, the launch selector switch to the WING LAUNCH position.

(6) The fuzing selector to OFF.

(7) The bomb/master switch to ON.

(8) The air brake IN.

(9) The armament safety plug connected.

(10) Hydraulic rig connected and running.

(11) External supply connected and battery master switch ON.

(12) Port and starboard stream indicators illuminated.

Functioning tests (drag launch)

22. To test the functioning of the target towing circuit, proceed as follows :—

(1) Place the launch selector switch to DRAG LAUNCH. Check that the port stream indicator lamp is extinguished and that the starboard indicator remains illuminated.

(2) Depress the port stream switch. Check that the port stream indicator is illuminated.

(3) Place the bomb/master switch to OFF. Both stream indicator lamps should be extinguished.

(4) Place the bomb/master switch to ON. Check that both stream indicators are illuminated.

(5) Select the air brake test switch to OUT. The air brake should not operate.

(6) Apply the load to the shackle on the release unit and place the butt test switch to TEST. Operate the bomb/R.P. push-switch on the control column. The release unit should operate, allowing the shackle to fall free. Check that the port stream indicator lamp is extinguished and that the starboard indicator remains illuminated. Return the butt test switch to OFF.

(7) Select OUT on the air brake test switch. The air brake should function normally. Shut down the hydraulic rig.

(8) Reload the shackle to the port release unit and check the cocking. Depress the port stream switch. Check that both stream indicators are illuminated.

(9) Apply the load to the shackle. Depress the inboard pylon stores jettison switch. The release unit should operate allowing the shackle to fall free. The port stream indicator lamp should be extinguished. The starboard indicator remains illuminated during the remaining tests. Also the inboard pylon jettison circuits should be energized.

(10) Depress the outboard pylon stores jettison switch. The outboard pylon jettison circuits should be energized.

(11) Disconnect the armament safety plug.

(12) Reload the shackle to the port release unit and check the cocking.

(13) Apply the load to the shackle. Depress the standby release switch. The release unit should operate and the shackle fall free.

(14) Load the shackles to the port and starboard release units and check the cocking.

(15) Apply the load to the shackles. Remove fuses No. 1 and No. 3 from the target towing control box. Depress the standby release switch. Both release units should operate and the shackles fall free. Replace fuses No. 1 and No. 3.

(16) Load the shackles to the port and starboard release units and check cocking.

(17) Apply the load to the shackles. Remove fuses No. 2 and No. 4 from the control box. Depress the standby release switch. Both release units should operate and the shackles fall free. Replace fuses No. 2 and No. 4.

(18) On completion, if outboard drop tanks are fitted and full of fuel, remove fuses No. 4 and No. 13 from the starboard shelf. Check that the drop tank empty indicators show WHITE. Replace the fuses.

(19) If the drop tanks are empty, short-circuit terminals No. 1 and No. 2 at T.B.1 in the outboard pylon. The indicators should show BLACK.

(20) Reconnect the gun package. Remove the test lamps from the pylon jettison circuit wiring. Reconnect the safety plockets in the outboard pylons and check the cocking of the release units. Arm the ejector release units in the inboard pylons.

REMOVAL AND ASSEMBLY

General

23. The removal and assembly of the components of the target towing installation call for no special instructions. The location of, and the means of access to the components are illustrated in Group A.3.