Group 1 DESCRIPTION

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WARNING . . .

Voltages in excess of 100v a.c. or d.c. can be dangerous under certain circumstances. Personnel should therefore ensure that the electrical system is electrically safe before any servicing is attempted. Where it is essential that tests or adjustments are to be made with the electrical power switched on, the greatest care must be exercised.

Introduction

1. This chapter gives brief notes on the B/K Mk. 1 and the B/K/PR Mk. 1 aircraft as a receiver and on the conversion of the aircraft to the tanker role and gives circuit operation and servicing details for both roles. Lists of circuit breakers and fuses, together with details of additional power supplies are given in Chapter 1. Full details of items of equipment are given in the relevant Air publication. Information ou the layout and interpretation of the schematic circuit diagrams can be found in the General information group contained in Book 2 immediately after Section 5 marker card. Also to be found in the General information group are all the general modifications applicable to all aircraft and general information on servicing and safety procedures.

DESCRIPTION AND OPERATION

The aircraft

2. The B/K/PR Mk. 1 aircraft is a standard B/PR Mk. 1 aircraft with the necessary additional fixed fittings incorporated during manufacture to enable it to be refuelled in flight or to be converted to a tanker.

RECEIVER ROLE

3. The aircraft is fitted with a refuelling probe in the nose which feeds into a 'ring main' fuel system serving all tanks. The probe is vented to atmosphere except during the refuelling operation. Immediately prior to refuelling, de-icing fluid is pumped into the probe via the vent pipe. All tanks can be filled in the air simultaneously, the air-to-air refuelling switches on the starboard coaming panel being in parallel with the ground refuelling switches. All the ground refuelling switches are at the two fuselage refuelling points; the wing tanks on this aircraft are refuelled from the fuselage points, the wing refuelling points being deleted.

4. Extra illumination is provided for the starboard coaming panel to provide for the air-to-air refuelling switches. A refuelling lamp indicator is mounted below these switches and contains a lamp for each tank. With the refuelling switches ON, the lamps go out when the associated tanks are full. The bomb bay and transfer tanks have a common lamp, the lamp going out when both tanks are full; rectifiers are used to prevent feedbacks between the two circuits. **The air-to-air refuelling tanks full indicators for the fuselage tank cells No. 1 and reserve tanks will operate when the aircraft is flying other than during the refuelling operation whenever the pilot transfers fuel from the bomb bay and transfer tanks.** Mod. 2684 introduces a fuel pressure gauge in the probe fuel pipe to the 'ring main' so that independent indication is given to the receiver pilot that fuel is being received.

TANKER ROLE

Fixed equipment for tanker role

5. The fixed equipment fitted to the aircraft to enable it to be converted to the tanker role consists of the following:—

In the bomb bay, plug and socket break points are provided for the hose drum unit (H.D.U.) and bomb bay tank. Also, a connector block panel and wiring terminating in plugs (covered in polythene bags when they are not in use) are provided for the tanker role air turbine booster pump air valves and pressure switches.

6. In the fuel service bays, fuel shut-off cocks are provided to enable the fuselage tank No. 3 cells to be isolated from the

aircraft's fuel system and relay rectifier units are provided for the fuselage No. 3 cell gauges when operating as a tanker. The rectifier units for the transfer tank are in different positions from the B, Mk. 1 and B/PR Mk. 1 aircraft.

7. In the cabin, the relays used for controlling the underwing tanks, either as a bomber/P.R. or tanker aircraft, are located on a panel behind the pilot's hood coaming together with the relays for the No. 3 cell shut-off cocks, the relay used to interlock the bomb doors with the H.D.U. when operating as a tanker, is mounted in the starboard console. The contents gauge oscillator unit, used for the fusalage tank No. 3 cells and bomb bay tank in the tanker role, is mounted with its junction box on the port side of the radio crate port support. The mounting for the control panel is on the starboard wall of the cabin together with the break plug and socket panel and cable ducting.

Tanker equipment

8. The transferable fuel is contained in the fuselage tank No. 3 cells, transfer tank, bomb bay tank and underwing tanks. Fuel from all except the unserwing tanks is pumped by air turbine booster pumps, which are fitted to the tank cell doors (these doors are different from those on B, Mk. 1 and B/PR Mk. 1 aircraft), via removable pipes on the bomb bay roof to the H.D.U. delivery pump and then to the hose. Fuel from the fuselage No. 3 cells is isolated from the aircraft usable fuel by the shut-off cocks between the cells and the fuselage pump housing when the associated control switch is at OPERATOR. The electric fuel pump in the bomb bay tank is still connected to the pilot's controls, but on no account should this pump be operated when flying as a tanker.

9. Fuel from the underwing tanks is transferred by an electric pump in each tank in conjunction with an electro-pneumatically controlled nitrogen pressure system and is fed via the 'ring main' and a short length of removable piping to the H.D.U. delivery pump. When the underwing tanks are used by the pilot for aircraft use, fuel is transferred in the normal way to the wing tanks by the pump alone with the nitrogen system as an emergency in case of pump failure. The control circuits for these tanks are so arranged that the pilot can take over control at any time from the tanker operator by using the switches on his fuel panel.

10. With the control panel master switch ON, the tanker transferable fuel system is controlled from the control panel, the switches in the panel isolating the system from the pilot control when they are set to OPERATOR. None of the transfer pumps can be operated, nor can the hose be paid out, until the bomb doors are open when associated limit switches operate relays on the panel to connect the positive supplies to the control switches.

11. On the control panel, each tank has a master PILOT-OPERATOR switch, pump START and STOP switches and a contents gauge. With the master switches at PILOT, the pilot can use the transferable fuel for his own aircraft and all fuel contents read on the gauges on his fuel panel with the exception of the bomb bay tank for which he has no gauge. The turbine pumps cannot operate under this condition, the underwing tanks operate in the normal way, and fuselage No. 3 cells feed into the aircraft system.

12. With the master switches at OPERATOR, the transferable fuel cannot be used by the pilot for his aircraft and none of his fuel contents gauges will read for the tanks concerned, the gauges for the fuselage tanks will totalize on Nos. 1 and 2 cells only. The contents for the transferable fuel tanks is now read on gauges on the control panel.

13. The hose payout and tension and the fuel delivery rate are selected on the control panel. Full details of the H.D.U. control are given in A.P.4611, Vol. 1.

14. When the bomb doors are open, the booster pump START and STOP switches become operative. Once the START switch is operated and the low pressure warning lamp has gone out, the pumps will be kept running via the associated pressure switches until either the STOP switches are operated or the L.P. pressure switch opens when the tanks are emptied. In either case the L.P. warning lamp on the panel will light. An exception is that when the pumps are running, and the MASTER switch is selected OFF, in an emergency, all pumps are shut down and need to be reset as the warning lamps will light when the MASTER switch is again selected ON.

15. In the case of the underwing tank, the nitrogen pressure system will increase pressure as soon as the bomb doors are open.

16. The bomb doors are further interlocked with the H.D.U. control circuits so that they cannot be closed until the hose is fully stowed. In this condition, a relay in the *close* line to the bomb doors becomes reset and completes the circuit.

Conversion kits

17. The B/K/PR Mk. 1 aircraft is a standard B/PR Mk. 1 fitted with Mod. 197 providing fixed fittings which enable the aircraft to operate as a receiver and to be fitted with the tanker equipment.

18. To convert to the tanker role, the following conversion kits have to be fitted.

Mod 527—Removable equipment for tanker, and associated modifications.
Mod. 1345—Underwing stalk.
Mod. 1512—Underwing fuel tank.
Mod. 1513—Suspension links for underwing fuel tank.
Mod. 1514—Bomb bay fuel tank.

Fixed equipment (Mod. 197)

19. Mod. 197 introduces the following electrical equipment:—

(1) Plug panel in the cabin to which the control panel is connected, together with associated ducting and panel mounting structure.
(2) Modified instrument inverter torque switch box in the cabin, having an additional socket for supplying a.c. power to the H.D.U. control circuits.
(3) Relay in the starboard console for interlocking bomb doors with H.D.U. control.
(4) Oscillator unit and junction box on the radio crate port support for the fuselage No. 3 cells and bomb bay tank fuel contents gauges in the tanker role.
(5) Relays for controlling the underwing

tanks, for both bomber/P.R. and tanker roles, on a panel behind the pilot's hood coaming. Also on this panel are the relays for the fuselage No. 3 cell shut-off cocks.

(6) Air-to-air refuelling switches and lamp indicator on the starboard coaming panel.

(7) Additional lighting for the starboard coaming panel.

(8) Plug and socket break point in the battery bay connected by fixed wiring to the H.D.U. connector panel in the rear bomb bay.

(9) Connector panel in the battery bay connected by fixed wiring to the turbine pump air valve and pressure switch connectors at their respective positions on the bomb bay roof.

(10) Connector panel in the battery bay for the bomb bay tank.

(11) Rectifiers, for the transfer and bomb bay tank refuelling lamp indicator circuit, in a box mounted above panel Z in the bay above the nosewheel.

(12) Shut-off cocks in the fuel servicing bays to isolate the fuselage No. 3 cells from the aircrafts fuel system in the tanker role.

(13) Relay rectifiers and junction boxes for the fuselage No. 3 cell control panel fuel contents gauges and for the adjustment of the pilot's fuselage tank contents gauge to totalize on Nos. 1 and 2 cells only.

(14) A rectifier unit and tank unit are fitted to the bomb bay tank and are used for the tanker role only. Stowage connectors are provided on the tank for these items when they are not required.

(15) Jumper connectors are supplied to complete the contents gauge lines for the reserve, transfer and underwing fuel tanks when the tanker control panel is removed.

(16) A modified starboard 112-volt bus-bar panel, for panel J, with extra fuses.

(17) Deletion of the wing refuelling points ; the ground refuelling switches are now fitted at the fuselage refuelling points.

(18) De-icing equipment in nose for the refuelling probe, including fluid pump and suppressor and a vent valve actuator.

(19) Extra fuses on panel Z for control panel supplies.

Removable equipment (Mod. 527)

20. Mod. 527 includes the following removable electrical equipment :—

(1) Control Panel.

(2) Air turbine packages which include air valves and solenoids and fuel pressure switches. These are for the fuselage tank No. 3 cells, transfer tank cells and the bomb bay tank. Those for the fuselage tanks are fitted to the tank doors and that for the bomb bay tank is fitted to a mounting provided on the tank after removal of the cover plate.

(3) Hose control gear as part of the hose drum unit.

Installation of removable equipment

21. The fitting of Mod. 527 is described in Book 1, Sect. 2, Chap. 6, the following notes refer to the electrical work necessary.

(1) After fitting the control panel, remove the contents gauge jumper connectors, and connect up the panel connectors to the plug break panel according to the colour coding. Be sure to replace the contents gauge jumper connectors after removing the panel. When the control panel is fitted, the jumper connectors are to be stowed in the stowage bag provided by Mod. 2643.

(2) When the air turbine packages have been fitted, remove the polythene protective covers from the plugs on the fixed wiring and connect the plugs to the sockets on the turbine packages. Be sure to replace the protective bags to the plugs when the air turbine packages are removed.

(3) Remove from their junction boxes the inter-connectors between the fuselage No. 3 cell contents gauge tank units and the starboard relay rectifiers and reconnect them to the additional relay rectifiers.

(4) After the H.D.U. has been fitted, connect its connectors to the plug and socket panel provided in the rear bomb bay on the starboard side.

(5) After the bomb bay tank has been fitted, connect its connectors (including those for the electrical fuel pump) to the plug and socket panel provided in the forward bomb bay on the starboard side ; the plugs for the contents gauge system will have to be removed from their stowages in the tank and connected to the panel.

(6) The underwing tank connections are made by butt connectors between the tank and wing stalk and by connecting up to the wing/stalk junction box aft of the rear spar for the stalk to wing connections.

LIST OF APPENDICES

Appendix 1

REMOVABLE EQUIPMENT—MOD. 527 (POST MOD. 3050)

LIST OF CONTENTS

Introduction

1. This appendix describes the alteration to installation of removable equipment effected by Modification 3050 (Chap. 4, Group 2, App. 1) and should be read in conjunction with Group 1, para. 21.

DESCRIPTION AND OPERATION

Installation of removable equipment

2. Before connecting the underwing tank to the aircraft, the pump motor 10 ohm resistance in the wing stalk must be checked against the value indicated on the resistance setting label at the motor, and re-set if necessary (Chap. 4, Group 2, App. 1).