Chapter 14 PHOTOGRAPHIC EQUIPMENT

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

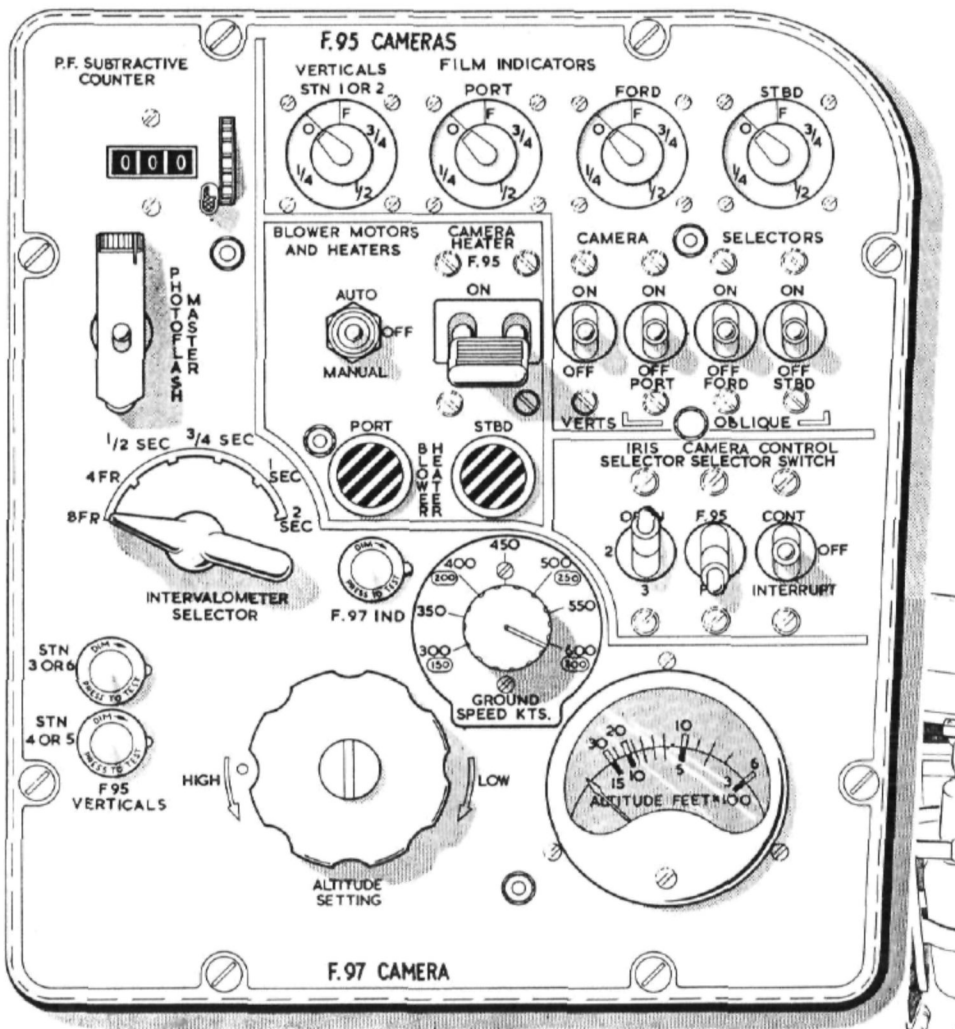
DESCRIPTION

General

1. When the aircraft is converted to a photographic reconnaissance role, the bomb door is equipped with a crate carrying vertically and obliquely-mounted cameras, ◀ and either a crate carrying photoflash discharger units or a lightweight fairing, depending on whether or not the reconnaissance is to be performed during daylight. A role control panel, housing the controls and instruments required to operate the photographic equipment, is also fitted to the observer's port console. The bomb distributor on the port wall of the cabin must be removed from the aircraft before the role control panel can be installed and the plugs normally connected to the distributor are attached instead to a special stowage plate fitted to the console. ▶

2. A list of the photographic reconnaissance role equipment – which is introduced ◀ by Mod 5006 and Mod 5183 – together with ▶ instructions for installing it on the aircraft, is in Cover 1, Sect. 2, Chap. 5B of this publication.

3. Installed in tandem and extending the full length of the bomb door, the two crates are shaped to blend with the external contour of the fuselage when the bomb door is open for taking photographs, and to clear the bomb bay structure when the door is ◀ rotated to the closed position. The aft crate, which contains photoflash units, is ▶



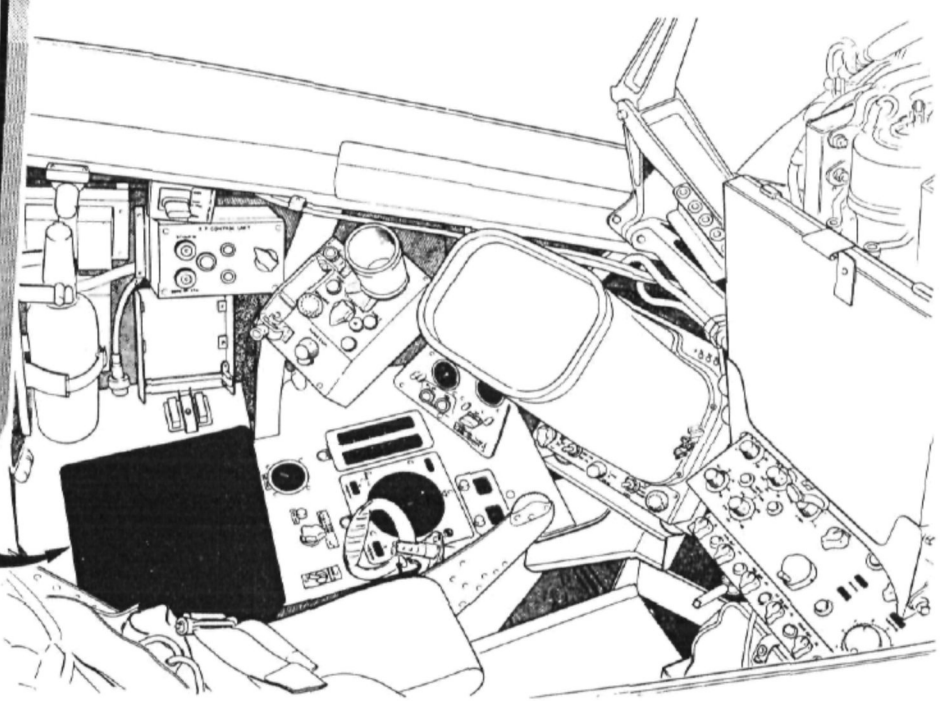


Fig. 1. Photographic role control panel

only used for nocturnal photography, its position on the bomb door being relieved in the event of daylight photography by a fairing (Mod 5183) which is shaped to blend with the external contour of the aircraft. Both crates are of light-alloy construction and are each provided with a large access door. The camera crate, which is mounted forward, is fitted with a self-contained hot air system which, although mainly designed to demist the camera windows, is also employed to maintain an optimum temperature within the crate. For daylight photography, various combinations of F95 cameras are used, while a single F97 camera in conjunction with the photoflash units is used for night photography.

4. Descriptions of the cameras, together with loading instructions and procedures before and after flight, are in A.P. 1355C, Vol. 1. Particulars of the photoflash discharger units and cartridges are in A.P. 1641H, Vol. 1 and A.P. 1661E, Vol. 1 respectively. A.P. 101B-1201-1B, Cover 2, Sect. 7, Chap. 7 of this publication contains full details of the electrical circuits associated with the camera and photoflash crates.

Controls and Instruments *(fig 1)*

5. In addition to the camera and photoflash operating controls and instruments the photographic role control panel also contains the following switch and indicators associated with the camera crate heating and de-misting system:-

(1) BLOWER MOTORS AND HEATERS switch. Marked AUTO – OFF – MANUAL, this switch controls both the port and starboard blower-heater units.

(2) BLOWER HEATER indicators. These indicators, marked PORT and STBD, show black and white diagonal stripes when the blower motors and heaters switch is OFF and change to black when the switch is selected to AUTO or MANUAL. In the event of over-heating (*para* 12), the related indicator will revert to black and white diagonal stripes.

Camera crate *(fig 2 - 2a)*

6. Covered with 18 s.w.g. skin panels, the camera crate primary structure comprises two side assemblies and seven bulkheads. Interspaced throughout the length of the crate, the bulkheads divide the interior into six separate compartments (A to F). The access door, at the top of the structure, extends from compartment B to compartment F between the side assemblies. With the exception of compartment A, which is covered by an access panel and houses heating and de-misting components (*para* 11), each compartment has structural provision for camera mounting equipment. The inside of the crate and access door are insulated with glass wool and glass cloth padding.

7. The access door consists of two side channels and six frames covered by a 20 s.w.g. skin. Hinged to the starboard side of the crate, the door is locked in the closed position by a handle-operated latch pin mechanism. With the door closed and the latch pins engaged, the handle can be locked in position by a quick-release pin inserted through the handle and adjacent brackets.

8. The camera windows on the undersurface of the crate, in the floors of compartments B, C, D, E and F, are specially ground optical flats, secured to the structure by frames. Three of the windows, in compartments B, C and D, are fitted centrally and horizontally to suit vertically-mounted cameras, while the remainder, for oblique cameras, are fitted one in a blister beneath compartment E and two in the floor of compartment F, one port and one starboard.

9. At the top of the crate, a hoisting beam bridges the access door at a point approximately coincident with the CG, being used in conjunction with the hydraulic winching arrangement when the crate is being installed or removed (*Cover* 1, *Sect.* 2, *Chap.* 5B), or lowered to a drooped position for servicing (*para* 18). The beam is secured to brackets on the two side assemblies and must be detached from the starboard side before opening the access door, the free end of the beam then being attached to a retractable fork fitting in the access door edge member to support the door in the open position.

Camera mounting equipment *(fig 2-2a)*

10. The number and type of cameras installed in the crate are varied to suit each particular operational requirement. Fig 5 shows the different camera combinations which may be used. A forward and rear mounting frame, supplied with the crate, must be fitted to the F97 camera to form a complete unit, before installing it in compartment D. *Mounting frames*, Part No. YB3-80-749, must also be fitted to all the F95 cameras prior to installation. Each of the five camera compartments is equipped as follows:-

(1) *Compartment B (Stn 1, 2 and 3).* Guide rails, bolted to both the bulkheads of this compartment, accommodate either one F95 camera with 4 in. lens or two F95 cameras with 12 in. lens. The mounting frame, bolted to each camera, is secured to

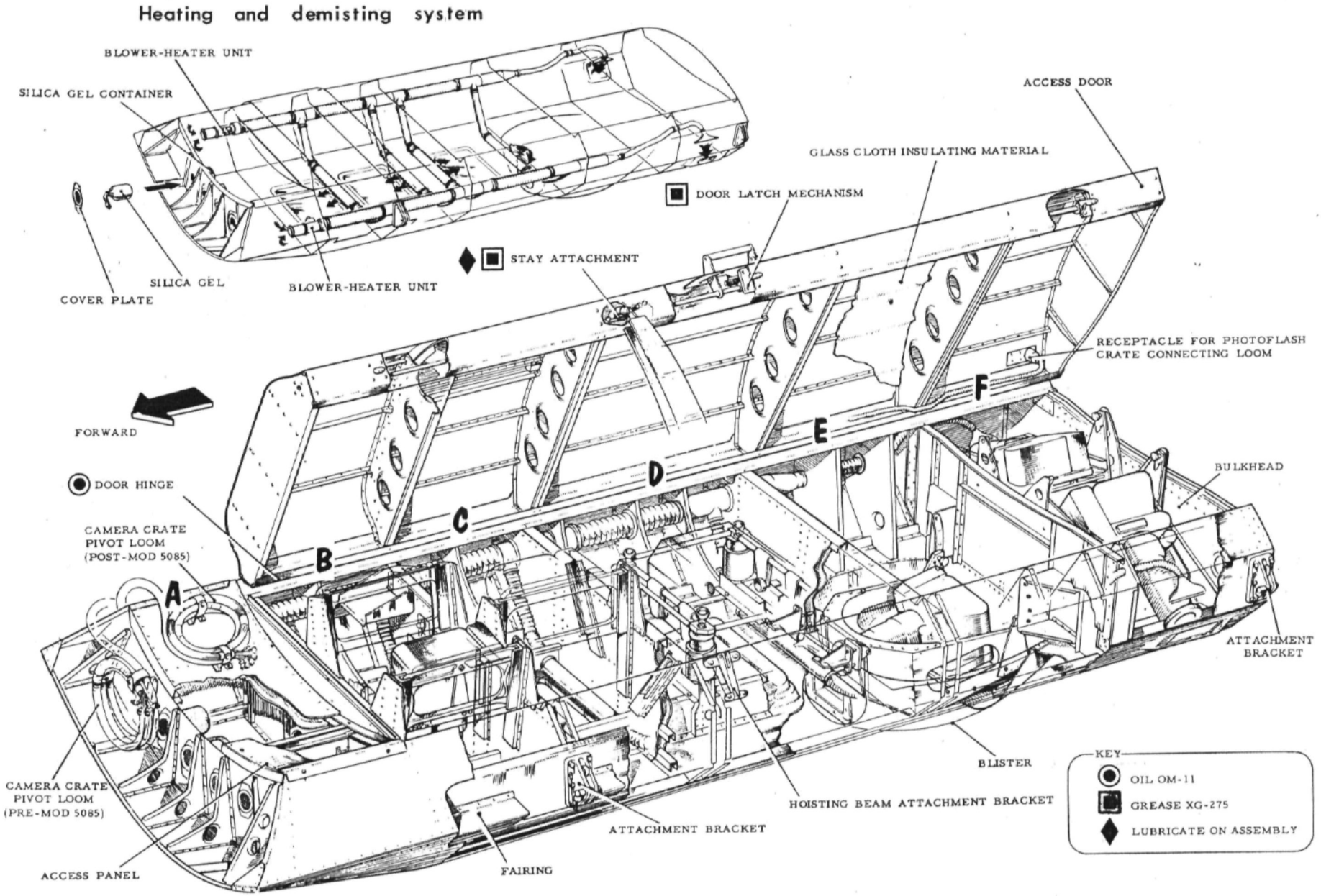
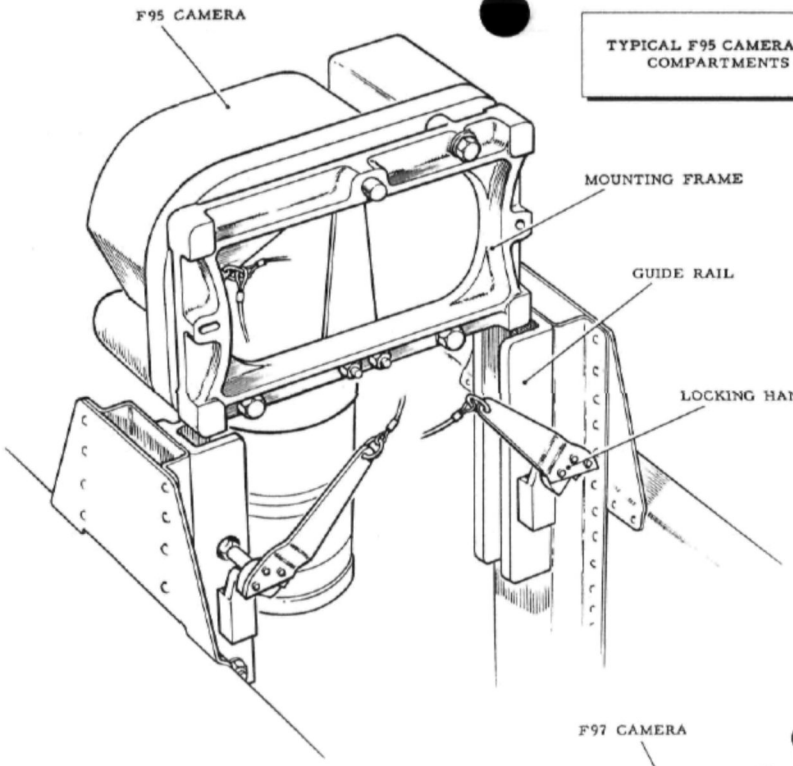
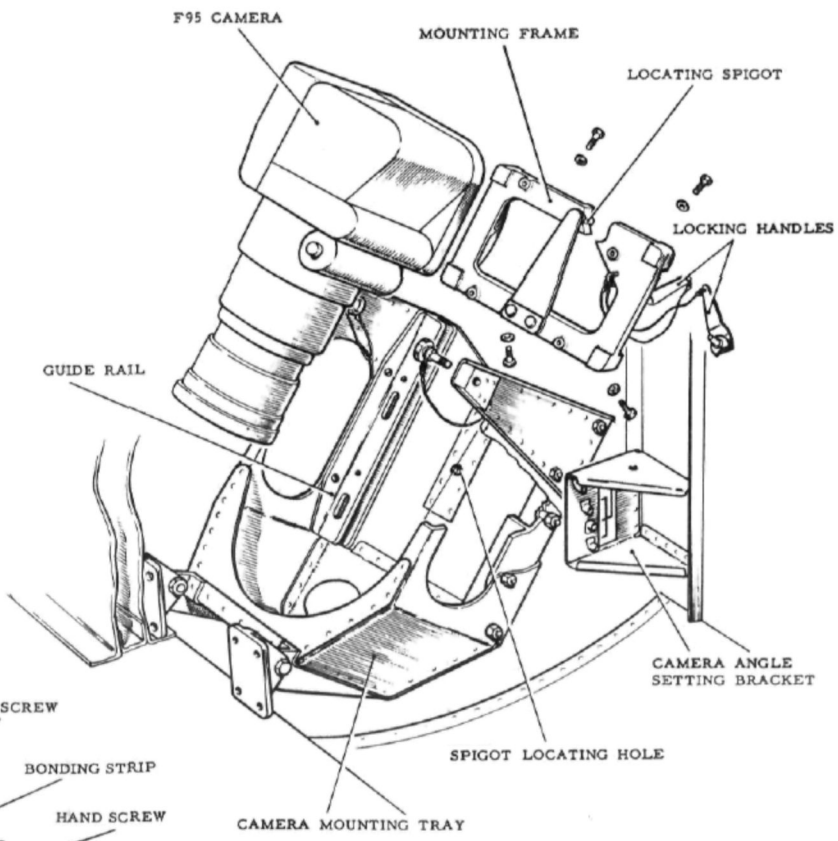


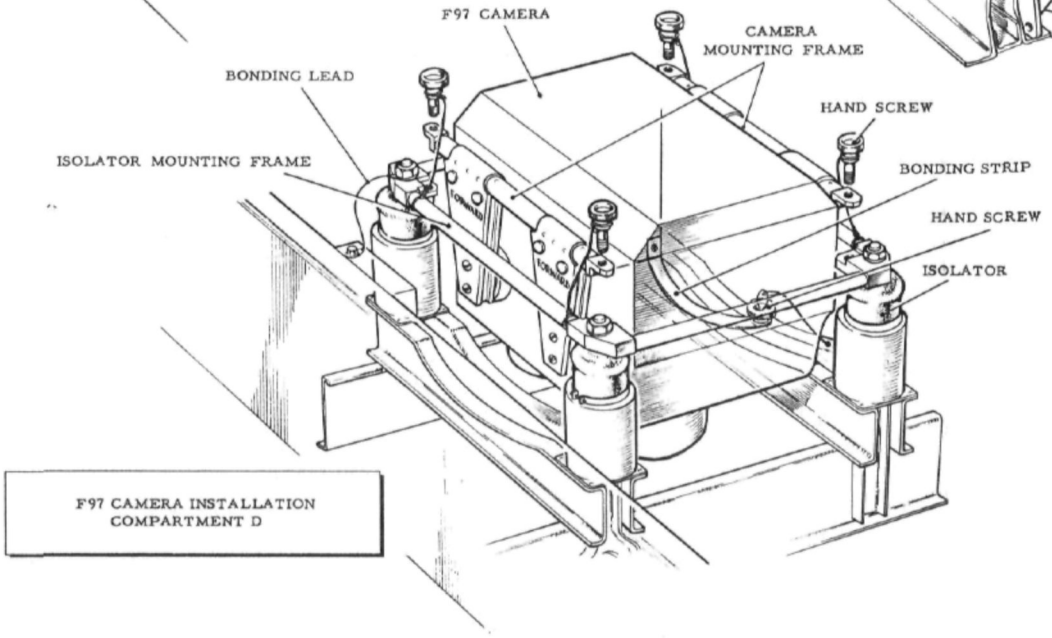
Fig. 2. Camera crate



TYPICAL F95 CAMERA INSTALLATION
COMPARTMENTS B AND C



TYPICAL F95 CAMERA INSTALLATION
COMPARTMENTS E AND F



F97 CAMERA INSTALLATION
COMPARTMENT D

Fig. 2a. Camera crate

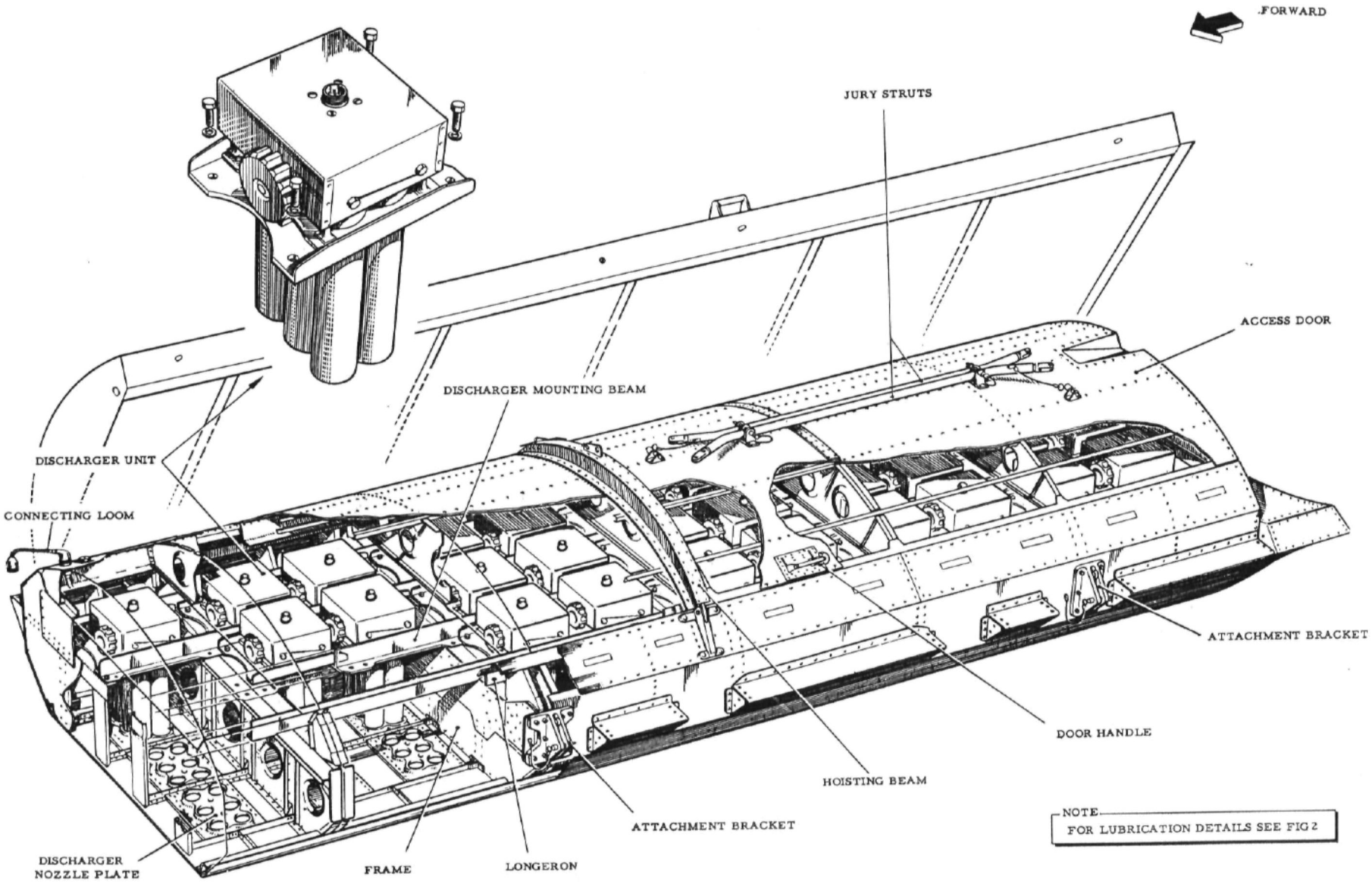


Fig. 3. Photoflash crate

the guide rails by quick-release locking handles.

(2) *Compartment C (Stn 4, 5 and 6).* The arrangement for mounting and securing the cameras in this compartment is similar to that of compartment B. In this case, however, the camera installation can be either one F95 camera with 12 in. lens or two F95 cameras with 4 in. lens.

(3) *Compartment D (Stn 7).* In this compartment, a tubular light-alloy mounting frame forms a platform for the F97 camera unit. Four shock-absorbing isolators, one at each corner of the mounting frame, are bolted to channels on the floor structure. The camera unit is secured to the isolator mounting frame by four knurled hand screws.

(4) *Compartment E (Stn 8).* The forward-facing oblique camera in this compartment, either F95 – 12 in. or 4 in. lens, is housed in a mounting tray which can be pivoted and set at any one of four angular positions (5, 10, 15 or 20 deg depending on the lens fitted). Two guide rails, bolted to the walls of the tray, accommodate the camera unit. Quick-release locking handles are provided to secure the unit within the guide rails.

(5) *Compartment F (Stn 9 and 10).* The side-facing oblique cameras in this compartment, both F95 – 12 in. or 4 in. lens, are housed in mounting trays which can be pivoted and set at any one of three angular positions (10, 15 or 20 deg). The mounting and method of adjustment are similar to that of the forward-facing oblique camera in compartment E.

Heating and de-misting system (fig 2)

11. The heating and de-misting system in the camera crate comprises two Plannair blower-heater units and an arrangement of flexible piping for distributing warm air over the six camera windows. Heating elements and fan blowers within the blower-heater units are automatically controlled by thermostats to deliver warm air when the prevailing ambient condition causes the crate temperature to fall below 15 ± 2 deg C. Fitted on the front bulkhead of compartment A, four intakes allow an influx of air to balance the crate pressure with that of ambient when the aircraft makes a rapid descent from altitude. Each intake incorporates a silica gel container to reduce the humidity of the air passing into the crate. The flexible piping includes two gallery pipes, one from each blower-heater unit, which pass along the sides of the crate and incorporate branches extending to metal diffusers adjacent to the camera windows. In each of compartments B, C, D and E, two branches, one from each gallery, are joined to their respective diffuser to provide an integrated supply. Diffusers at the side windows in compartment F are supplied through branches from the ends of the galleries. The integration of supplies from the two galleries ensures adequate heating and de-misting in the event of a single blower-heater unit failure.

12. When the blower motors and heaters switch is selected to AUTO, the heating elements and blower fans are thermostatically controlled to deliver warm air to the camera windows when necessary. A MANUAL selection operates in a similar manner except that only the heater elements are thermostatically switched on and off; the blower fans will remain operative. If an electrical fault in one of the blower-heater units causes the elements to exceed their normal operating temperature, the current to the elements is automatically cut off by an overheat thermostat within the blower-heater unit, thus leaving the blower fan still running and the other blower-heater unit operating normally.

Camera window guards

13. To prevent damage to the camera crate windows while the aircraft is on the ground, the special guards listed below must be fitted one to each window immediately the aircraft returns from a flight:-

(1) YB3-88-477 – vertical windows (3)

(2) YB3-88-478 – side-facing oblique windows (2)

(3) YB3-88-479 – forward-facing oblique window

Photoflash crate (fig 3)

14. The photoflash crate forms a compact housing for thirty-three photoflash discharger units and their associated electrical equipment. The crate structure, covered with 18 s.w.g. skin panels, comprises two longerons, two end frames and five intermediate frames. Diaphragms, struts and stiffeners add further strength to the main structure. Incorporated in the floor structure of the crate are thirty three plates each having six holes for the location of the photoflash discharger unit nozzles. Hinged to the starboard longeron, a large access door extends the full length of the crate, and incorporates a handle-operated latch pin mechanism similar to that fitted to the camera crate door. The hoisting beam, attached to brackets on the port and starboard longerons, is also similar to that fitted to the camera crate.

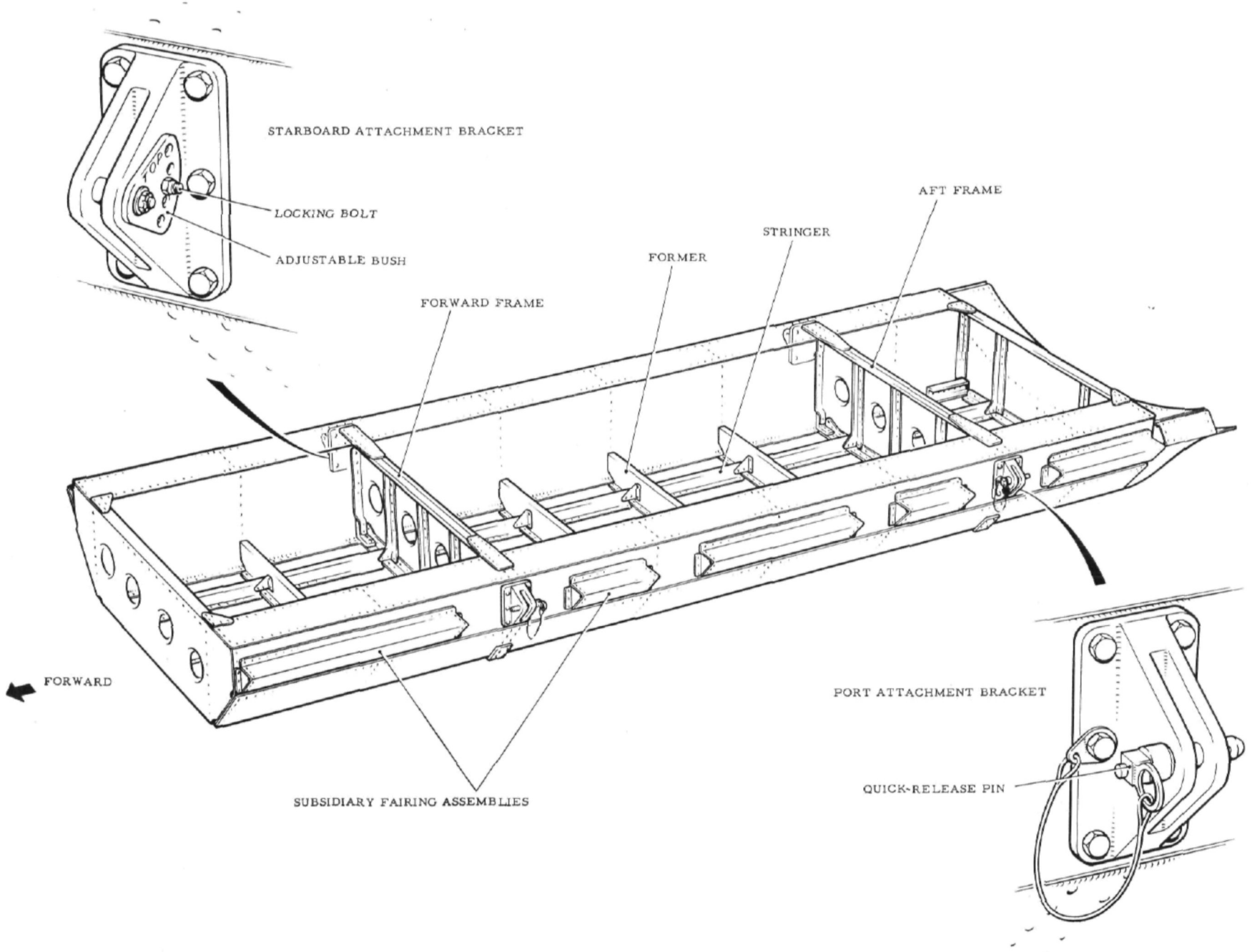


Fig. 4. Bomb door fairing

Discharger unit mounting

15. The discharger units are mounted in threes – port, centre and starboard – in eleven rows identified by the letters A to H and J to L, starting from the forward end of the crate, and the cartridges are numbered in their firing order A1 to L198 from port to starboard. 1.75 in. No. 2, Mk. 1 type discharger units are used and are each secured to longitudinally-mounted support beams by four bolts. The support beams are secured to the main crate structure at each frame by the discharger attachment bolts, which pass through the beams at these positions, and screw into anchor nuts in the frames.

◀ *Bomb door fairing (fig 4)*

16. The bomb door fairing (Mod 5183) is a lightweight construction which replaces the photoflash crate on the bomb door when the crate is not required for use in the photographic reconnaissance role. The fairing consists of a light-alloy structure in the form of a main centre section and two reclining side sections, the underside of the main section being covered in 20 s.w.g. skin, while its upper surface is open structure. Five formers and two frames are laterally positioned and interspaced by stringers to compose the basic framework of the fairing. The four fairing attachment brackets, which locate with the photoflash crate mounting brackets on the bomb door, are bolted, two on each side of the fairing, each port side bracket being accompanied by a single quick-release pin which is anchored to the fairing by a 6 in. long wire cable. The two starboard side attachment brackets are each supplied with a trunnion, nut and adjustable bush, which are fitted following the identical procedure for the camera and photoflash crate. Five subsidiary fairing assemblies are attached at intervals along each side of the fairing and eliminate any airflow into the bomb bay past the side of the fairing. ▶

SERVICING

17. The only servicing required is on the camera and photoflash crates and is a periodic examination of the silica gel air driers and lubrication of the hinges and latch pin mechanisms on the access doors. Servicing instructions for the F95 and F97 cameras are in A.P. 1355C, Vol. 1.

Lowering the crates to the servicing position

18. To enable the access doors to be opened for servicing operations, both crates can be lowered to a drooped position from their port attachments and secured in this ◀ position by jury struts (*fig 6*) which are ▶ normally stowed on top of the doors. If the weight of the crates and the number of personnel available prohibit manual lowering, the hydraulic winching arrangement used for installing and removing the crates (*Cover 1, Sect. 2, Chap. 5B*), may also be used to lower the crates to the servicing position.

Note...

The hoisting beam embodies two holes through which the lifting hook, Ref No. 26NA/95154, is attached. When it is required to lower a crate to the servicing position, the hook must be attached through the starboard hole (this will be at the port side when the bomb door is closed for attaching the hook), the other hole being used only when installing or removing the crate.

Replacement of silica gel

19. The silica gel, Ref No. 33C/790, contained in the four camera crate air-intakes, is of an indicator type initially coloured cobalt blue. When the silica gel becomes saturated with moisture, the colour will change to pink, thus indicating that replacement is necessary.

INSTALLATION AND REMOVAL

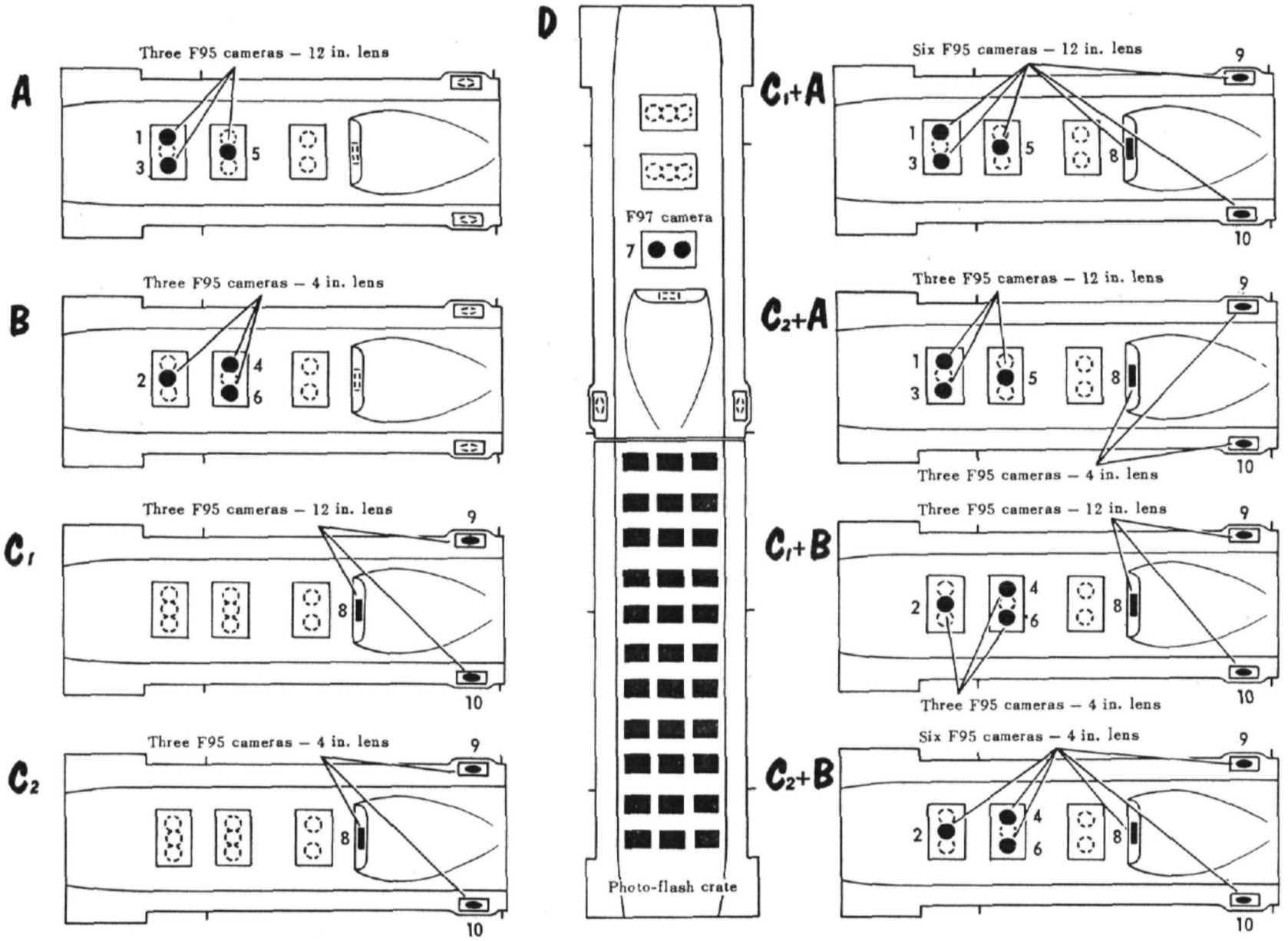
Camera – installation

20. Mounting frames must be bolted to all cameras prior to installation (*para* 10). The attachment of a mounting frame to a camera, forming a complete unit, is shown in fig 2a. With the armament master safety break disconnected (*Cover* 3, *Sect.* 5, *Chap.* 4) each unit is installed as follows:-

Note...

The F95 cameras are supplied fitted with a horizontal entry adapter. Before installation, this adapter must be removed and replaced with the vertical entry adapter supplied in the camera transit case. The changeover is effected by disconnecting the Cannon connector from the vertical entry adapter, removing the adapter, replacing it with the vertical entry adapter, and connecting the Cannon connector to the new adapter. The adapter's grub screw is then used to align, and secure, the connector's key-way so that it points towards the narrowest point of the adapter, i.e., towards the magazine, on the line of film travel.

(1) *Compartments B and C (Stn 1 to 6).* The camera units in these compartments are each fitted by inserting the unit into the respective guide rails and fitting the locking handles, turning them in a clockwise or anti-clockwise direction as appropriate, to positively se-



INVERTED PLAN VIEW

Fig. 5. Camera arrangements

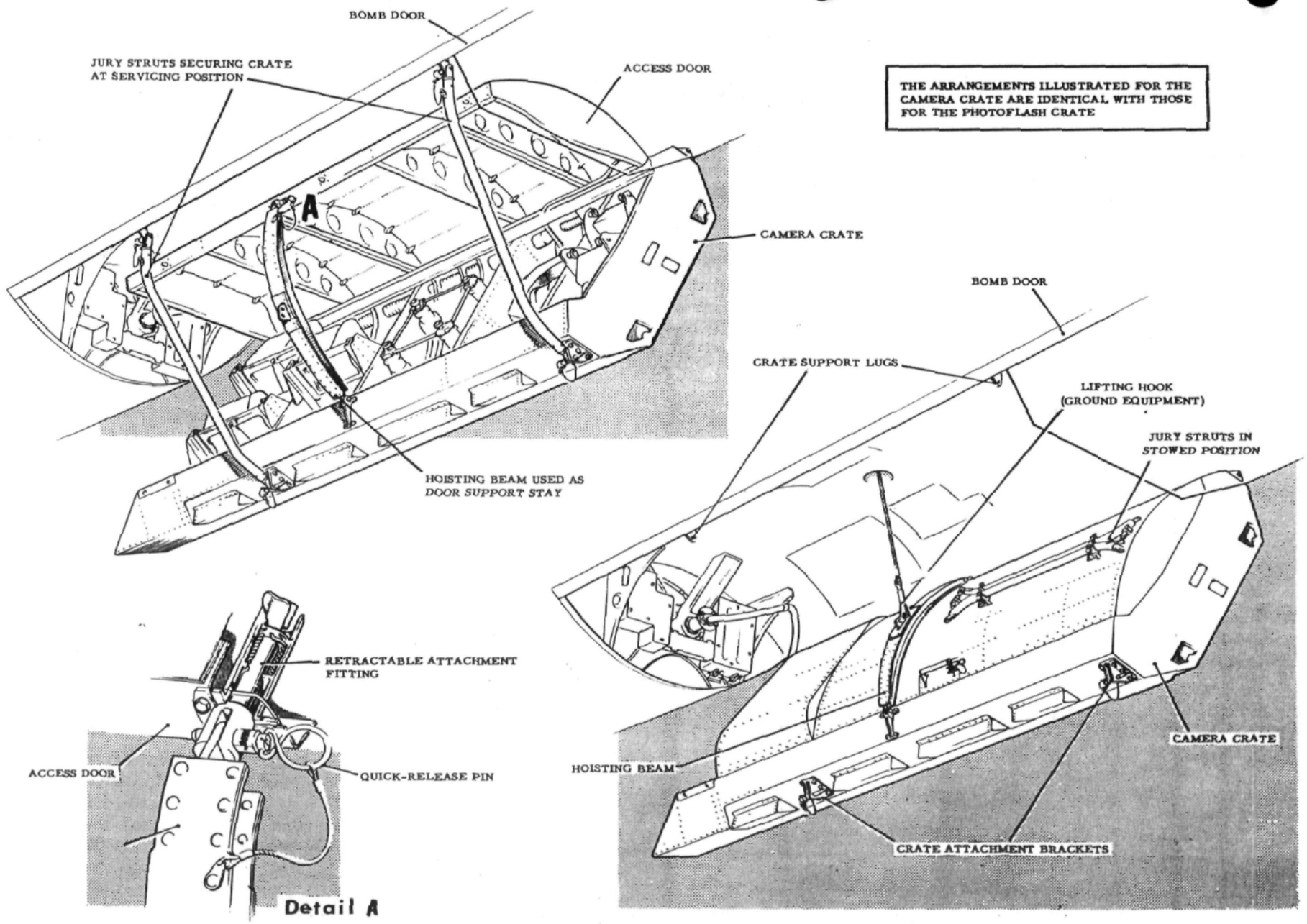


Fig. 6. Servicing facilities

cure the camera unit in position.

(2) *Compartment D (Stn 7).* The F97 camera unit is secured to its mounting frame by four knurled hand-screws one at each corner of the unit.

Note...
On post-Mod 5085 crates, the bonding strip at the rear of the camera must also be secured to the rear mounting channel member with the hand-screw provided.

(3) *Compartments E and F (Stn 8 to 10).* The three camera units in these compartments are each installed as follows:-

(a) Lift the tray and insert the camera unit into the guide rails.

(b) Secure the unit with the locking handles as in operation (1).

(c) Lower the tray and secure it in the required position, using the knurled hand-screws provided.

(4) When the camera installation is complete, connect the electrical plugs and sockets, and stow those not in use on the appropriate dummy receptacles. Function test the cameras as instructed ◀ in A.P. 101B-1201-1B, Cover 2, Sect. ▶ 7, Chap. 7.

Camera – removal

21. In all cases the cameras can be removed by reversing the installation procedure, providing that the electrical circuits to the cameras are first isolated by disconnecting the armament master safety break.

Discharger unit – installation

22. Each photoflash discharger unit is installed with its knurled hand-wheel facing forward, and is secured to support beams within the crate structure by four bolts (*fig* 3). The anchor nuts to which the discharger units are secured, are staggered to prevent incorrect installation. After installation, connect the Cannon plugs to their respective sockets on the dischargers and perform the function test detailed in ◀A.P. 101B-1201-1B, Cover 2, Sect. 7, Chap. ▶ 7.

Discharger unit – removal

23. Before removing one or more of the discharger units, the PHOTOFLASH MASTER switch must be in the OFF position and all cartridges withdrawn. If the dischargers have been operated in conjunction with the F97 camera, allow a period of 30 seconds to elapse before withdrawing the cartridges, examining each one as it is taken from its barrel; any misfired cartridges must be stowed in a safe place and reported in accordance with current regulations. To remove a discharger unit, disconnect the electrical Cannon plug and remove the four attachment bolts (*fig* 3).

WARNING...
If the above procedure is not observed any remaining cartridges may be ejected if the camera is inadvertently operated on the ground. These cartridges will explode almost immediately and could seriously injure personnel or damage the aircraft.

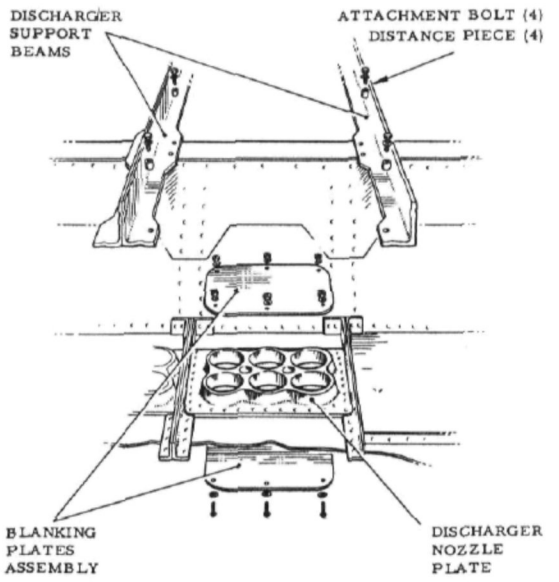


Fig. 7. Photoflash discharger nozzle plates – blanking

24. Whenever the discharger units are not installed, the discharger nozzle plates in the floor structure of the crate must be ◀ blanked off as shown in fig 7, using the ▶ blanking plate assemblies, Part No. YB3-80-1663, supplied with the crate. In addition, a distance piece, Part No. AS.2309/025 or YB3-80-1665, must be fitted to each discharger attachment bolt, and the bolts replaced in their respective anchor nuts.