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A.P.
2802A
VOLUME I

**AIRCRAFT
ROCKET INSTALLATIONS
SIGHTING & AMMUNITION
(R.A.F.)**

*Prepared by direction of the
Minister of Aircraft Production*

Harold Sate.

*Promulgated by order of the
Air Council*

[Signature]

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A.P.2802A, Vol. I

AIRCRAFT ROCKET INSTALLATIONS, SIGHTING, AND AMMUNITION (R.A.F.)

LIST OF SECTIONS

Note.—A list of Chapters appears at the beginning of each Section.

CONTENTS

SECTION 1—Installations

SECTION 2—Projectors

SECTION 3—Ammunition

SECTION 4—Sights and sighting

SECTION 5—Harmonisation

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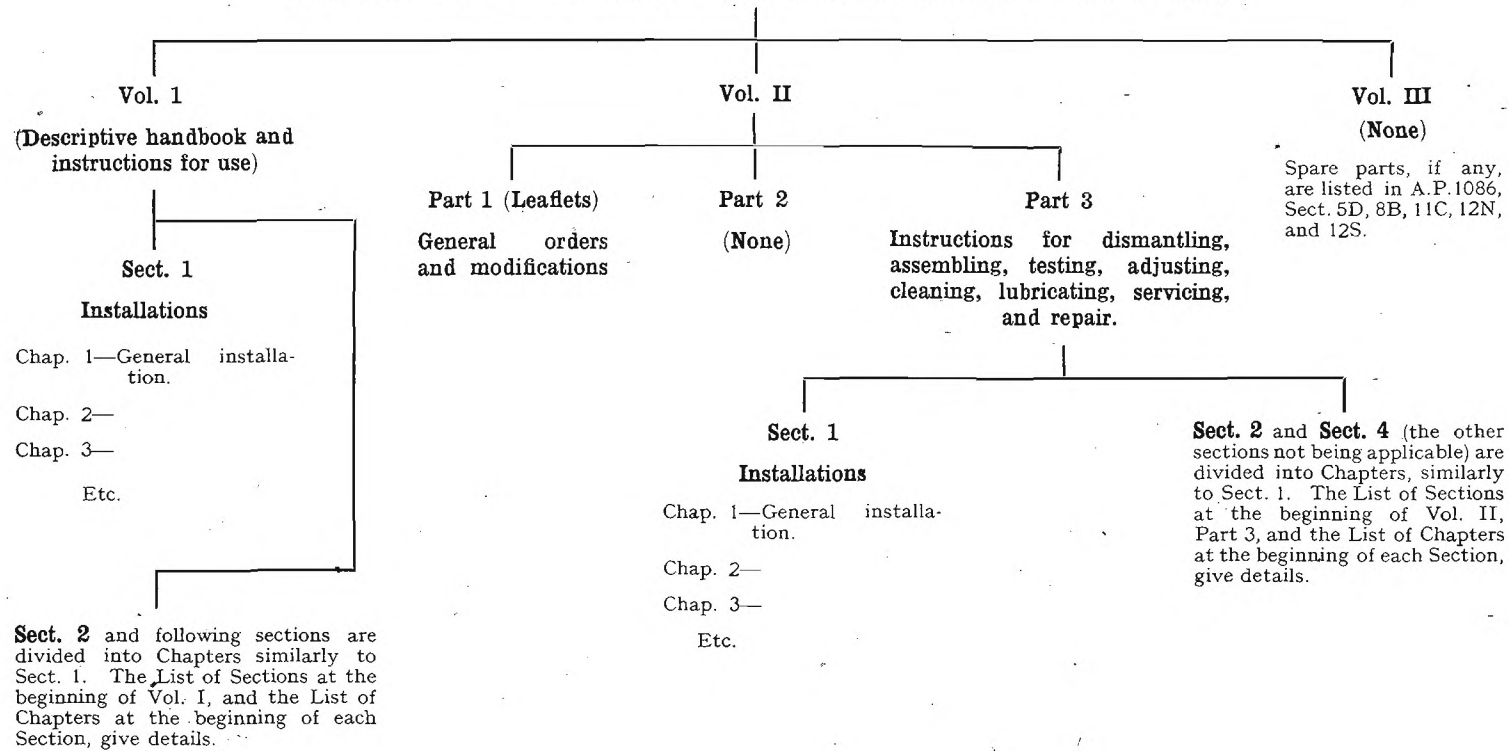
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AIRCRAFT ROCKET INSTALLATIONS, SIGHTING, AND AMMUNITION (R.A.F.)



LAYOUT TREE FOR A.P.2802A

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July, 1944*

A.P.2802A, Vol. I

Section 1

INSTALLATIONS

SECTION 1

INSTALLATIONS

LIST OF CHAPTERS

Note.—A list of contents appears at the beginning of each Chapter.

CHAPTER 1—General installation	<i>(To be issued later)</i>
CHAPTER 2—R.P. installations Mk. IB and IIIA in Mosquito aircraft	
CHAPTER 3—R.P. installation Mk. IA in Typhoon aircraft	
CHAPTER 4—R.P. installation Mk. IIIB in Typhoon aircraft	
CHAPTER 5—R.P. installations Mk. I and I/IIIA in Beaufighter aircraft	
CHAPTER 6—R.P. installation Mk. IIIA in Tempest aircraft	<i>(To be issued later)</i>
CHAPTER 7—R.P. installation Mk. VIII in Tempest aircraft	<i>(To be issued later)</i>
CHAPTER 8—R.P. installation Mk. VIII in Spitfire aircraft	<i>(To be issued later)</i>
CHAPTER 9—R.P. installation Mk. VIII in Brigand aircraft	<i>(To be issued later)</i>
CHAPTER 10—R.P. installation Mk. IX in Spitfire aircraft	<i>(To be issued later)</i>
CHAPTER 11—R.P. installation Mk. V in Mustang IV aircraft	<i>(To be issued later)</i>
CHAPTER 12—R.P. installation Mk. VI in Beaufighter X aircraft	<i>(To be issued later)</i>

CHAPTER 2

R.P. INSTALLATIONS Mk. IB and IIIA IN MOSQUITO AIRCRAFT

LIST OF CONTENTS

	<i>Para.</i>
Leading particulars	
Weight of R.P. installation	1
Stores Reference numbers	2
Introduction	3
General description	5
Mk. IB beam	6
Mk. IIIA beam	7
Front strut	8
Rear strut	14
Electrical wiring and equipment	19
R.P. cockpit controls	23
Sight	24
Instructions for use	
Installation of R.P. gear in the aircraft	26
Preparing the Mk. IIIA beam for use	27
Removing the projector from the aircraft	28
Loading	30
Mk. IB installation	31
Mk. IIIA installation (single rounds)	33
Mk. IIIA installation (tier-carriage rounds)	35
Unloading	39
Mk. IB installation	41
Mk. IIIA installation (single rounds)	42
Mk. IIIA installation (tier-carriage rounds)	43
Harmonisation procedure	44
Misfire procedure	46

LIST OF ILLUSTRATIONS

Fig.

- 1.—The Mk. IB R.P. installation in the Mosquito aircraft
- 2.—Mk. IIIA R.P. installation with tier-carriage loading and long-range fuel tanks
- 3.—Side and rear views of the Mk. IB projector
- 4.—Sectional view of the front strut (Mk. IB beam)
- 5.—Sectional view of the rear strut (Mk. IB beam)
- 6.—Mk. IIIA eyepieces
- 7.—Rear view of the Mk. IIIA projector with tier-carriage and long-range fuel tanks
- 8.—Wiring diagram (Mosquito)
- 9.—Loading the Mk. IB projector
- 10.—Loading the Mk. IIIA projector with tier-carriage rounds



FIG. 1. The Mk.IB R.P. installation
in the Mosquito aircraft

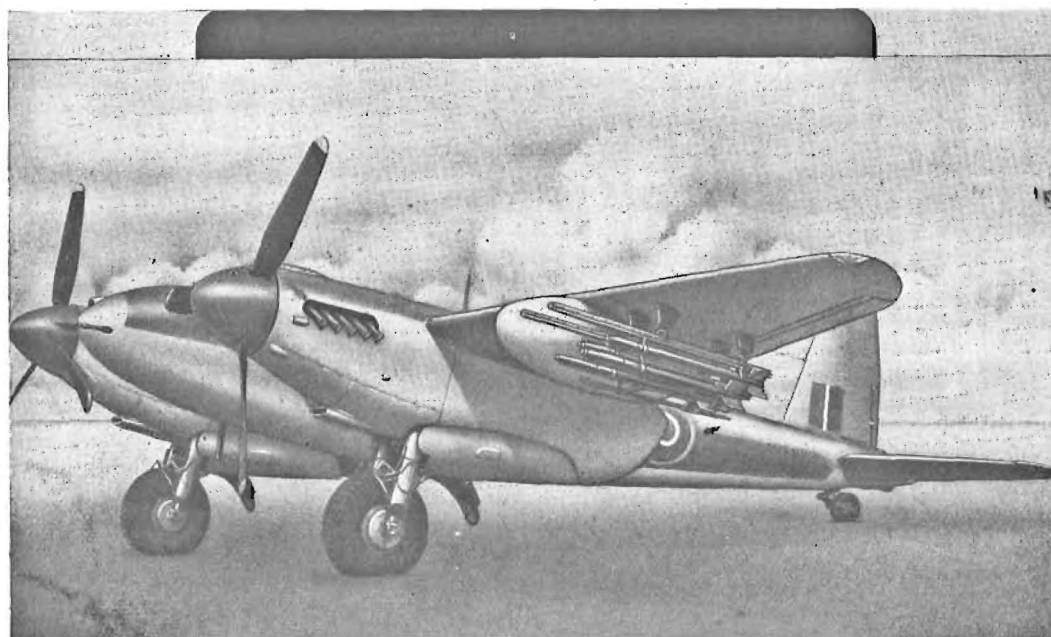


FIG. 2. Mk.IIIA R.P. installation with tier-carriage
loading and long-range fuel tanks

CHAPTER 2

R.P. INSTALLATIONS Mk. IB and IIIA IN MOSQUITO AIRCRAFT

Leading particulars

Weight of R.P. installation

1. Total weight of installation, unloaded :—

Mk. IB	...	...	...	...	...	...	...	...	...	...	360 lb. approx.
Mk. IIIA	...	...	...	...	...	...	...	...	...	...	308 lb. approx.

Weight of removable fittings :—

Mk. IB	...	...	...	...	...	...	...	...	...	...	350 lb. approx.
Mk. IIIA	...	...	...	...	...	...	...	...	...	...	298 lb. approx.

Permanent extra weight :—

Wing fixtures	...	...	...	...	...	...	...	...	...	...	Nil.
Wiring and switches	...	...	...	...	...	...	...	...	...	...	10 lb. approx.

Stores Reference numbers

2. The following Stores Ref. numbers have been allocated to these installations :—

- 11C/2724—Beam, R.P., Mk. IB (Mosquito)—8 per aircraft
- 11C/2646—Removable fittings, R.P., Mk. IB (Mosquito)—1 set per aircraft
- 11C/2648—Beam, R.P., Mk. IIIA—8 per aircraft
- 11C/2726—Eyepieces (for conversion of Mk. IB removable fittings to take Mk. IIIA beams)—1 set per aircraft.

Introduction

3. The Mk. IB and IIIA R.P. installations in the Mosquito VI, XVIII, 21, and 26, see fig. 1 and 2, consist of modified Mk. I box beams (Mk. IB), or Mk. IIIA beams, respectively, mounted directly on the underside of the aircraft wing on faired struts. There is no blast plate assembly as in the standard Mk. I projector described in A.P.2802A, Vol. I, Sect. 2, Chap. 1.

4. Four beams are usually mounted under each wing, but for long-range flights, the two inboard beams on each wing are removed and wing drop tanks fitted in their place. When drop tanks are fitted, a guard, see fig. 7, is fixed between the tanks and the R.P. beams to prevent damage to the R.P. installation when the tank is jettisoned. The normal load for the Mk. IB installation is eight rockets, but only four rockets can be carried when drop tanks are fitted. On the Mk. IIIA installation the following alternative loads may be carried :—

- (i) 8 rockets fitted with No. 3 saddles—8 beams
- (ii) 16 rockets fitted with No. 4 saddles (tier-carriage)—8 beams.
- (iii) 8 rockets fitted with No. 4 saddles (tier-carriage)—4 beams and 2 long-range fuel tanks.
- (iv) 4 rockets fitted with No. 3 saddles—4 beams and 2 long-range fuel tanks.

Important note—In connection with tier-carriage loading the following restrictions must be observed :—

- (a) Full salvo release of tier loads, that is, with pairs-salvo switch set to SALVO, is not recommended except in an emergency.
- (b) Tier-carriage rockets fitted with 60 lb. heads must not be fired in a dive of less than 30°.

General description

5. The only difference between the Mk. IB and IIIA installations, apart from the beams themselves, is in the front and rear attachment components, to accommodate the different attachment lugs on the two types of beam. In the Mk. IB installation both the front and the rear stirrup are Y-shaped, the arms fitting over the edges of the beam. A suspension bolt secures each stirrup to the beam. In the Mk. IIIA installation the stirrups are in the form of forked eyepieces which fit over the attachment lug on the beam and are secured by a suspension bolt.

Note.—The illustrations of the Mk. IIIA installation show the Mk. IIIA beams attached to Mk. IB stirrups by Mk. IIIA adapters (Stores Ref. 11C/2719), see Sect. 2, Chap. 2; this is an alternative to the Mk. IIIA eyepieces.

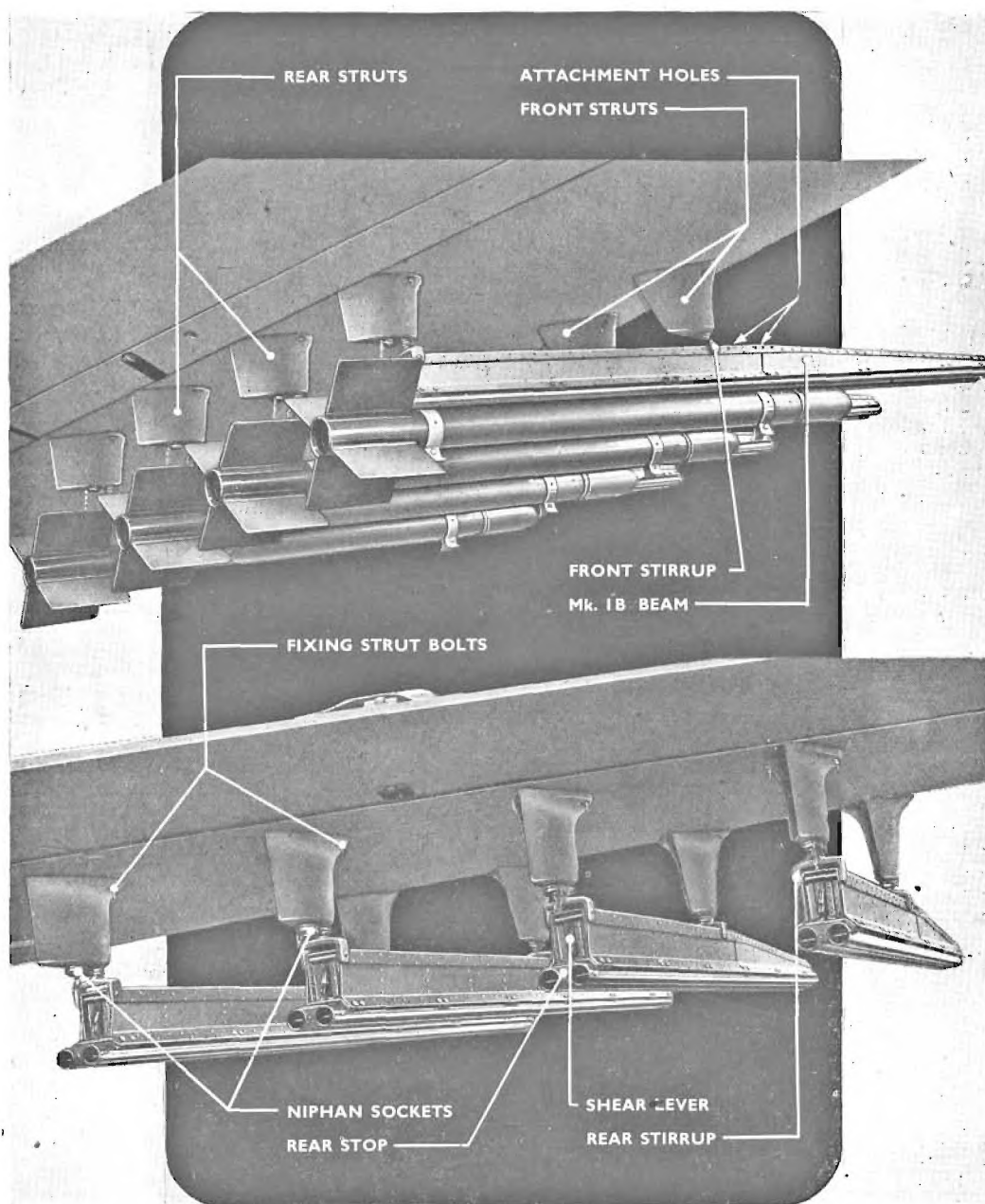


Fig. 3.—Side and rear views of the Mk. IB projector

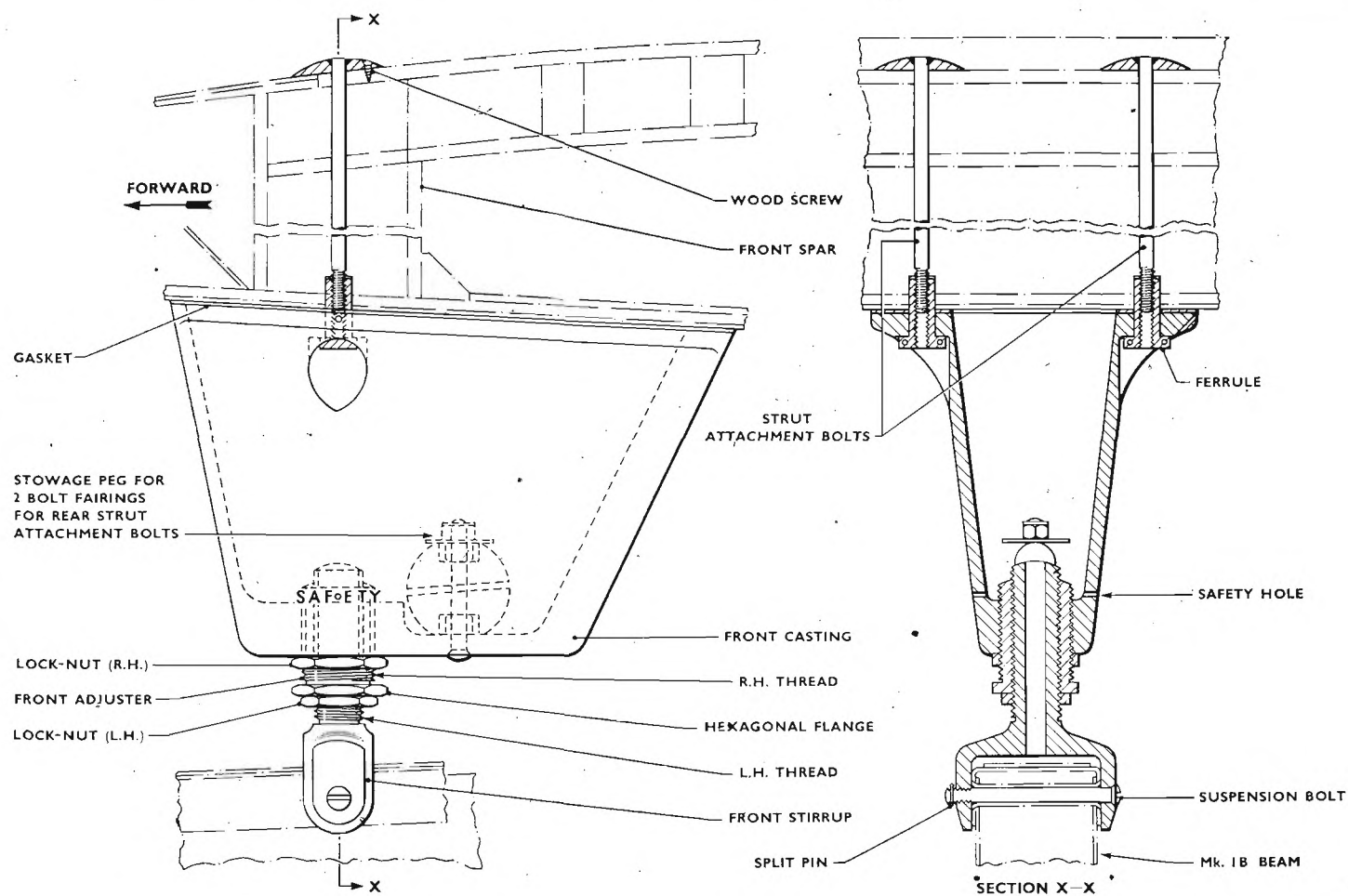


Fig. 4.—Sectional view of the front strut (Mk. IB beam)

Mk. IB beam, fig. 3

6. The Mk. IB beam used in the Mk. IB installation consists of a modified Mk. I box beam and differs from the standard Mk. I beam in having:—

- (i) Four additional transverse holes in the beam at the front attachment position to allow for the different spacing of the front and rear struts of the four beams. (The front and rear struts are mounted respectively on the front and rear spars of the wing which converge towards the wing tips). Including the original Mk. I hole, there are thus five holes at the front position. The Mk. I hole (second from the front) is not used.
- (ii) Only five internal diaphragm stiffeners in the beam.

Note.—Mk. I beams of recent manufacture are similarly modified.

Mk. IIIA beam, fig. 7

7. The Mk. IIIA beam used in the Mk. IIIA installation is standard, see Sect. 2, Chap. 2.

Front strut, fig. 3 and 4

8. The front strut consists of the front casting, the front adjuster, and the front stirrup or eyepiece.

9. The casting is of dural, is hollow, and is of streamline shape to reduce drag. It is shaped on its upper edge to fit the contour of the wing surface, a gasket being interposed between the two surfaces to ensure a good fit and to protect the wing skin.

10. The casting is secured to the wing by two hex./hd. ferrules screwing on to long attachment bolts passing through holes drilled through the front spar and extending through the entire wing section. Each bolt has a large circular plate head, set at an angle to conform to the wing contour, the head being fastened to the upper wing surface by a small csk./hd. wood screw. The length of the bolt is sufficient to reach, but not protrude from, the lower wing skin. Due to the variation in the shape of the wing section at each of the front strut positions, eight different lengths of bolt are provided for the front struts on each wing.

11. The front adjuster consists of a sleeve with a hexagonal flange at one end, and is threaded internally with a left-hand thread to accept the front stirrup or eyepiece, and externally with a right-hand thread to screw into a tapped hole in the base of the casting. A lock-nut (R.H.) is provided to lock the adjuster to the casting.

12. Both the stirrup (Mk. IB installation), see fig. 4, and eyepiece (Mk. IIIA installation), see fig. 6, are threaded (left-hand) for screwing into the adjuster, and are shaped, see para. 5, to fit the Mk. IB or IIIA beam, respectively. The beam (or Mk. IIIA adapter) is secured to the stirrup by the suspension bolt which passes through a hole in one arm of the stirrup or eyepiece, through the hole in the beam or beam lug into a threaded hole in the other arm. The bolt is locked by a split pin. A lock-nut (L.H.) locks the stirrup or eyepiece to the adjuster.

13. Thus by turning the hexagonal flange on the adjuster in a clockwise or anti-clockwise direction, the overall length of the strut is increased or decreased, respectively. To check that the adjuster is not screwed too far out of the casting, a safety hole is drilled through the casting so that a piece of wire may be inserted; it must not be possible to pass the wire right through the casting.

Rear strut, fig. 3 and 5

14. The rear strut is similar in construction to the front strut but differs in detail. The struts and their components are not interchangeable. The strut consists of a rear strut casting, a rear adjuster, and a rear stirrup, or eyepiece.

15. The casting is secured to the rear spar in the same way as the front casting is secured to the front spar, except that the long attachment bolts protrude through the lower wing surface and the casting is secured to these bolts by Aerotight nuts and washers. The holes in the casting for these bolts are slotted to allow for slight variations in the positioning of the bolts.

16. Since the ends of the attachment bolts protrude through the wing skin, wooden fairing plugs are provided for fitting when the R.P. installation is removed from the wing. When not in use these bolt fairings are stowed on a threaded peg in the inside of the front strut casting, see fig. 4.

17. Bolted to a recess in the base of the casting is a Niphan socket for the electrical connection to the rocket motor. Attached to this socket is a short length of Duce 4 cable with a 2-pin plug for connection to a 2-pin socket in the wing structure.

18. The rear adjuster and rear stirrup, or eyepiece, are identical to the corresponding components of the front strut except for their dimensions. The safety hole is also provided in the rear strut casting. The method of attachment of the beam to the rear stirrup, or eyepiece, is identical to that of the front strut.

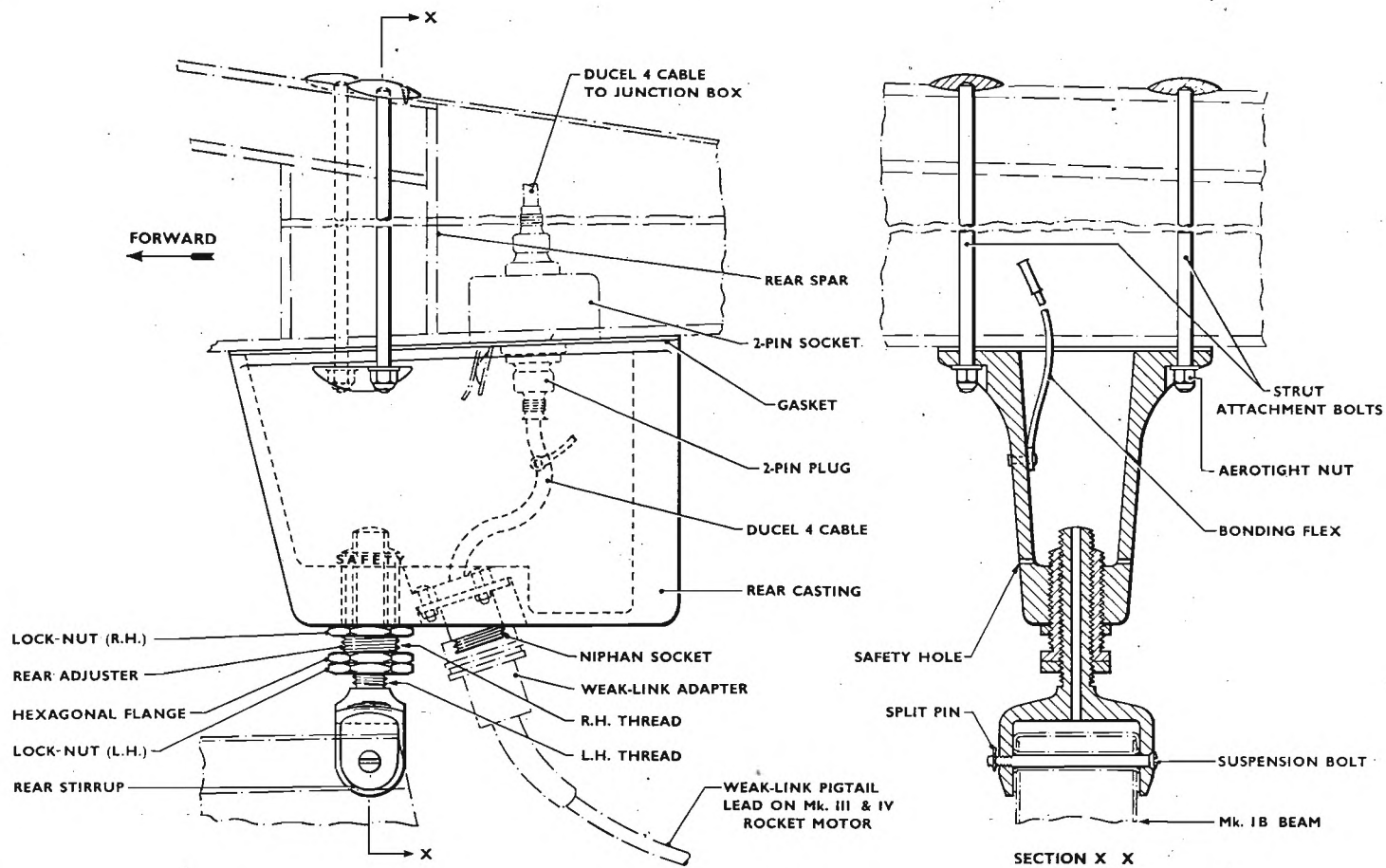


Fig. 5.—Sectional view of the rear strut (Mk. IB beam)

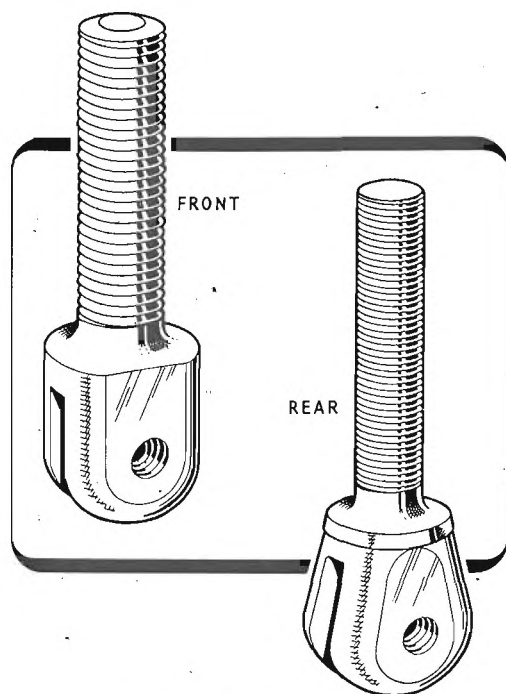


Fig. 6.—Mk. IIIA eyepieces

Electric wiring and equipment, fig. 5, 7 and 8

19. The Ducel 4 cable from the Niphan socket in the rear casting is taken to a 2-pin plug and socket connection in the wing structure, as described in para. 17. The Ducel 4 cable from each rear strut 2-pin socket is taken to a 5-way junction box, Type B, and from thence a length of Quincel 4 cable leads through the wing structure to a 5-way terminal block near the resistance relay box behind the wireless compartment. It should be noted that there is no 5-pin plug and socket connection in the wing root or wheel well as with other aircraft installations.

20. As the Mk. IIIA beam has a Niphan socket in its rear end, connection must be made between it and the Niphan socket on the rear casting. This is done by connecting a short length of Dumet 4 cable to the socket in the beam, running it along the inside of the beam, out through a hole in the top of the beam near the rear strut attachment lug, and fitting a 2-pin Niphan plug on its free end for connection to the Niphan socket on the rear strut.

21. For tier-carriage loading each beam Niphan socket must be fitted with a 2-way weak link adapter plug (Stores Ref. 5D/1409), see fig. 7. This adapter is provided with two dummy plugs to prevent the ingress of moisture to the plug

contacts, and should always be fitted when the aircraft is not operating. The use of these 2-way adapters in conjunction with the existing aircraft circuit, allows the firing of salvos of four rockets, with the pairs-salvo switch set to PAIRS. Full salvo firing, that is, with the pairs-salvo switch set to SALVO is not recommended, see para. 4.

22. A diagram showing the electrical wiring of the installation is shown in fig. 8. The 2-pole system of wiring is used in this aircraft with the master switch in the negative lead and all other components in the positive lead.

R.P. cockpit controls

23. The R.P. controls and their location in the cockpit are as follows :—

- (i) The R.P. firing switch is positioned on the throttle control lever and is of a special De Havilland design.
- (ii) The R.P. master switch is a general purpose switch, Type B (Stores Ref. 5C/543) and is situated on a bracket secured to the auto-selector switchbox on the port side of the pilot's cockpit.
- (iii) The pairs-salvo selector switch is a general purpose switch, Type B, and is mounted in a bracket attached to the scuttle below the windscreen.
- (iv) The 4-way auto-selector switchbox, 24 volt, Type C, No. 2 (Stores Ref. 5D/1297) is mounted in a bracket on the port side of the pilot's cockpit.
- (v) The resistance relay box, 24 volt (Stores Ref. 5D/1165), is mounted on a bracket behind the wireless compartment.
- (iv) The fuse of the R.P. circuit is a 10 amp fuse (Stores Ref. 5C/463) in a fuse box (Stores Ref. 5C/445), mounted on a bracket attached to the right-hand side of the auto-selector switchbox.

Sight

24. The sight used for R.P. is the gunsight projector, Type 1, Mk. I (Stores Ref. 8B/2519), with gunsight reflector, Type 1, Mk. II (Stores Ref. 8B/2517), originally known as the reflector gunsight Mk. IIL (Stores Ref. 8B/2483). This sight is basically the standard reflector gunsight, Mk. II, described in A.P.1730B, Vol. I, Chap. 2, but modified by having an adjustable reflector to permit depression of the line of sight from 0° to 5°.

25. The reflector screen is hinged to a rigid framework mounted on the outside of the standard sight bowl. Rotation of the reflector is effected by two radius arms mounted rigidly on the framework, these being actuated by pinions held on a transverse shaft at the rear of the sight bowl. This shaft also carries a

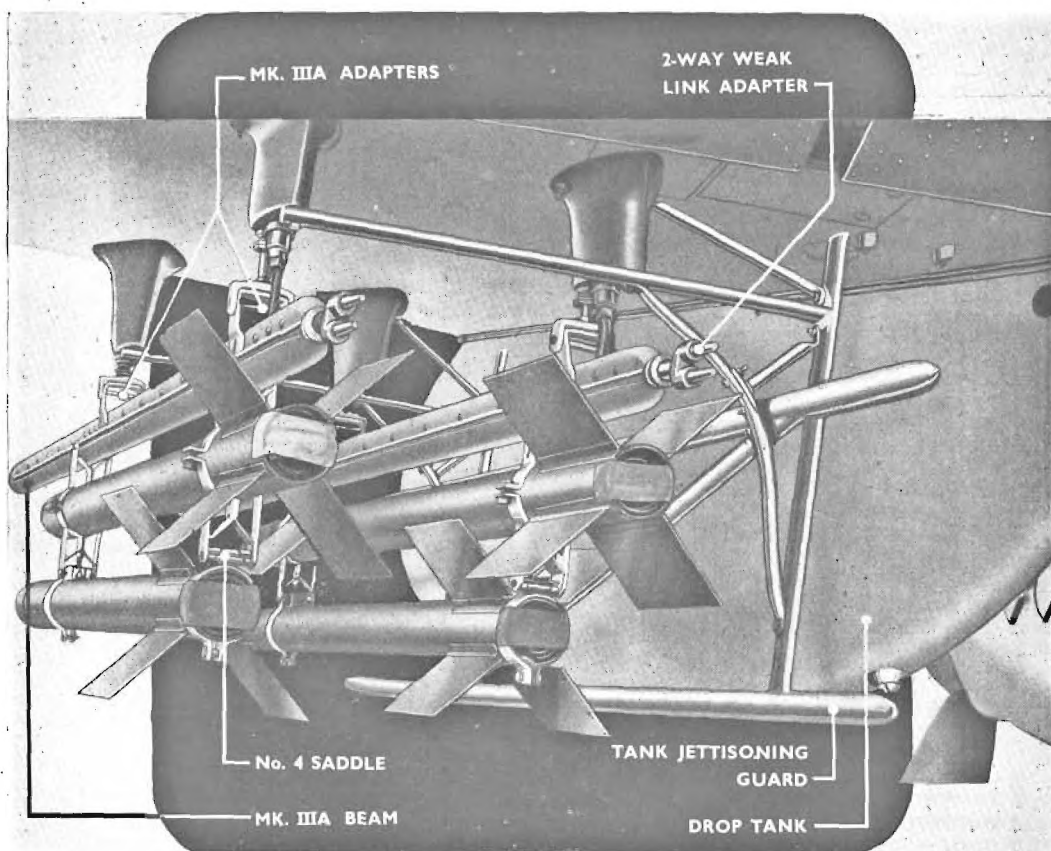


Fig. 7.—Rear view of the Mk. IIIA projector with tier-carriage and long-range fuel tanks

sector of a gear wheel which is engaged by a worm gear operated by a self-locking control knob located on the right-hand side of the sight. This operating knob has a circular scale calibrated in degrees and tenths of degrees from 0° to 5° .

Note.—A full description of the sight will be given, in due course, in Sect. 4, but pending the issue thereof, further information may be obtained from the Armament Officer or Adjutant.

Instructions for use

Installation of R.P. gear in the aircraft

26. Full details for the method of initial installation of the R.P. gear in the aircraft is given in A.P.2019E, Vol. II, Part 1, leaflet M10W, to which reference should be made.

Preparing the Mk. IIIA beam for use

27. When delivered to the Service, the stop assembly in each Mk. IIIA beam is protected by a coating of lanoline. Before the beams are

used this coating must be removed with metal de-greasant (Stores Ref. 33B/510, 511 or 512) and the entire stop assembly mechanism lubricated with corrosion inhibiting instrument oil, D.T.D. 561 (Stores Ref. 34A/131). Full instructions for removing the lanoline and applying the lubricant are given in Sect. 2, Chap. 2, to which reference must be made.

Removing the projector from the aircraft

28. Should it be required to fly the aircraft without the R.P. fitted, each beam can be removed, complete with its struts, by unscrewing the two ferrules on the front strut and the two Aerotight nuts on the rear strut, disconnecting the 2-pin plug and socket connection in the rear strut, and lifting the beam and struts away from the wing. The entire installation can be stripped from the aircraft by two armourers in 30 minutes. When the installation has been removed, the holes in the wing skin at the front strut position are to be covered with doped patches, and the protruding bolts at the rear strut position covered with the bolt fairings (stowed in the front strut).

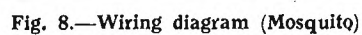


Fig. 8.—Wiring diagram (Mosquito)

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29. Removal of the beams from the struts for cleaning purposes is accomplished by withdrawing the split pins and removing the suspension bolts attaching the beams to the front and rear stirrups or eyepieces.

Note.—When Mk. IIIA beams are fitted, the electrical connection between the beam and the Niphan socket in the rear strut must be broken by removing the 2-pin plug from the Niphan socket.

Loading

30. Loading on the Mosquito is done from the rear. Before commencing to load, ensure that the functioning and electrical tests detailed in A.P.2802A, Vol. II, Part 3, Sect. 2, Chap. 1, have been completed.

WARNING—DURING ALL LOADING OPERATIONS ENSURE THAT PERSONNEL DO NOT STAND DIRECTLY IN FRONT, OR TO THE REAR, OF THE ROCKETS.

Mk. IB installation, fig. 9

31. (i) Ensure that the R.P. master switch in the pilot's cockpit is OFF, and that the pairs-salvo selector switch is set to PAIRS.
(ii) Remove the rear stop by withdrawing the rear stop retaining pin.

- (iii) Ensure that the pigtail lead is properly stowed in the venturi, and then lift the rocket up behind the beam to be loaded, holding it at the same angle as the rails (two men are required for this).

Note.—It is best to commence loading on to the inboard beam on each wing.

- (iv) Engage the front saddle and slide it up the rails.
(v) Engage the rear saddle and slide the rocket forward until there is room to replace the rear stop.
(vi) Replace the rear stop, and push the rocket forward to ensure freedom of movement along the rails.
(vii) Raise the shear lever by depressing its projecting arm and push the rocket back to ensure that the rear saddle abuts the rear stop. Allow the shear lever to fall in front of the rear saddle and insert a length of No. 10 S.W.G. annealed copper wire through the hole in the lever and its supporting bracket and bend the ends over to keep the lever in place. Alternatively, an aluminium snaphead rivet, $\frac{3}{4}$ in. $\times$ $1\frac{1}{4}$ in. (Stores Ref. 28Q/5454), may be used as a shear pin.

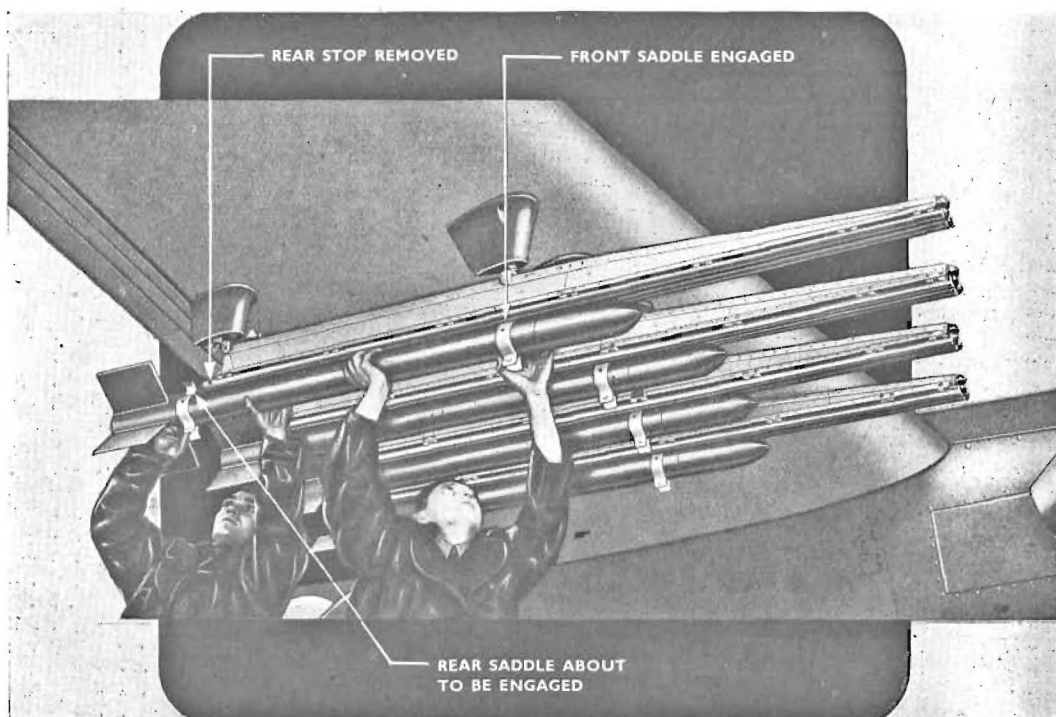


Fig. 9.—Loading the Mk. IB projector

Note.—If the rocket is difficult to load due to excessive friction between either the saddles and the rails or between the rocket head and the rails, the rocket should be set aside for re-gauging and fitting of other saddles. Faulty saddles should be marked and set aside for defect procedure.

(viii) Check that the saddle is between the rear stop and the shear lever by trying to push the rocket forward.

(ix) Repeat the procedure for all the beams.

32. The rockets are now ready for connecting up, which is to be done just prior to take-off, as follows:—

(i) Check that the master switch is OFF, and that the pairs-salvo selector switch is set to PAIRS.

(ii) Set the auto-selector switch to 1.

(iii) Uncoil the pigtail lead from the rear of the rocket and allow it to hang down. If a Mk. III/TH or IV/TH motor is used, fit an adapter plug (Stores Ref. 5D/1335) to the weak link plug on the pigtail; it is easier to do this than to make the connection with the adapter in position in the Niphan socket.

(iv) Plug the pigtail leads into their respective Niphan sockets.

WARNING—ENSURE THAT PERSONNEL ARE WARNED TO STAND TO THE SIDE OF THE ROCKETS WHEN MAKING THE CONNECTIONS GIVEN ABOVE.

Mk. IIIA installation (single rounds)

33. (i) Ensure that the R.P. master switch in the pilot's cockpit is OFF, and that the pairs-salvo selector switch is set to PAIRS.

(ii) Ensure that the beams are undamaged and free from grit, particularly along the grooves.

(iii) Ensure that the pigtail lead is properly stowed in the venturi, and then lift the rocket up behind the beam to be loaded, holding it at the same angle as the beam (two men are required for this).

Note.—It is best to commence loading on to the inboard beam of each wing.

(iv) Engage the front saddle in the grooves of the beam after first lining up the saddle shoes, and slide the rocket forward until the saddle abuts the rear stop.

(v) Actuate the stop assembly mechanism to raise the rear and front stops successively and allow the front saddle to pass the mechanism.

(vi) Continue sliding the rocket forward along the beam until the rear saddle can be similarly engaged in the saddle groove, and move the rear saddle up to the rear stop.

(vii) Actuate the stop assembly mechanism to raise the rear stop. Allow the shear lever of the rear saddle to pass into the space between the front and rear stops, and then release the rear stop.

Note.—(a) If desired, the front and rear saddles may be forced past the rear stop, since this stop is chamfered on its rear face and has a longitudinal slot for the free passage of the shear lever, the force being taken by the saddle itself. However, great care must be taken not to slam the shear lever against the rear face of the front stop.

(b) If the rocket is difficult to load on to the beam due to excessive friction between either the saddles and the beam, or between the rocket head and the beam, the rocket should be set aside for re-gauging and fitting of other saddles. Faulty saddles should be set aside for defect procedure.

(viii) Check that the shear lever is securely locked between the stops by applying reasonable pressure to the rocket, first in a forward and then in a backward direction.

(ix) Repeat the procedure for all the beams.

34. The rockets are now ready for connecting up, which should be done as stated in para. 32.

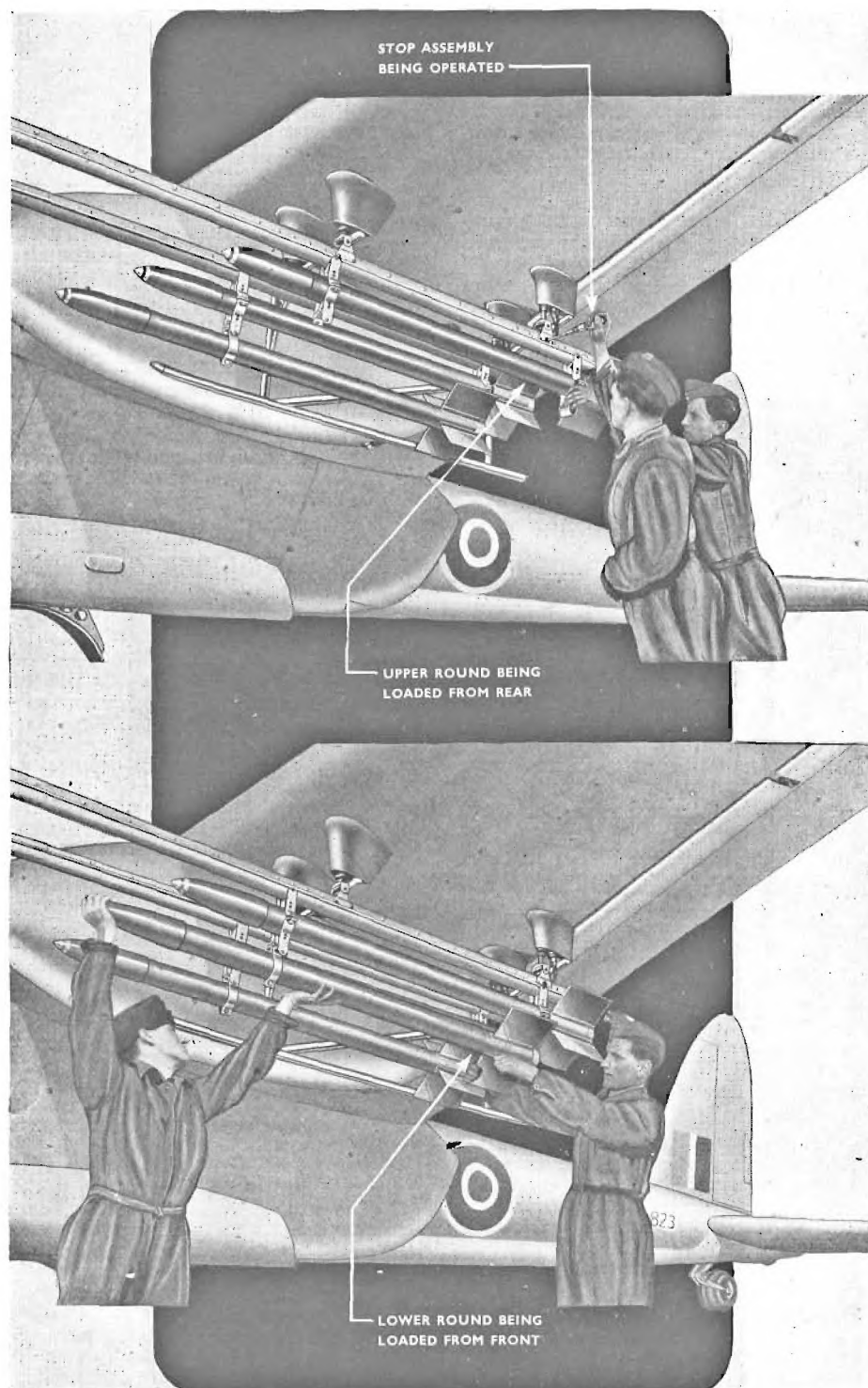
Mk. IIIA installation (tier-carriage rounds), fig. 10

35. When loading tier-carriage rounds, the upper round is loaded first—it is not recommended that the upper and lower rounds be loaded together—in the same way as described in para. 33 for single rounds. The portion of the upper No. 4 saddle marked "TOP" must be fitted to the beam with the arrow marked "FWD" pointing in the direction of projection.

Note.—The upper rounds should be fitted with Mk. III/TH or IV/TH rocket motors, but if the latter is used, the length of the pigtail lead must be adjusted to the length required using the clip provided.

36. The lower round, which must be fitted with a Mk. IV/TH motor, is loaded as follows:—

(i) Lift the round, on which the bottom No. 4 saddles have been assembled, so that the saddles are just forward of the respective upper No. 4 saddles already loaded on to the beam.



15 Fig. 10.—Loading the Mk. IIIA projector with tier-carriage rounds

- (ii) Move the rocket back so that the slots on the lower front saddle engage the shoes on the upper front saddle, and the curved tongue on the lower rear saddle engages the channel on the upper rear saddle.
 - (iii) Push the rocket back as far as possible and ensure that the hook on the shear lever on the lower front saddle engages the notch on the tongue on the upper front saddle.
 - (iv) Check that the round is firmly held.
37. Repeat the procedure detailed in para. 35 and 36 for each beam.

38. The rockets are now ready for connecting up which is to be done just prior to take-off, as follows:—

- (i) Check that the master switch is OFF, and that the pairs-salvo selector switch is set to PAIRS.
- (ii) Set the auto-selector switch to 1.
- (iii) Uncoil the pigtail lead from the rear of each rocket and allow it to hang down.
- (iv) Fit 2-way adapter plugs to the weak link plugs, in the following order on each wing (it is easier to do this than make the connections with the adapter plug in position in the Niphan socket):—
 - (a) Two lower outboard rounds to one 2-way adapter.
 - (b) Two lower inboard rounds to one 2-way adapter.
 - (c) Two upper outboard rounds to one 2-way adapter.
 - (d) Two upper inboard rounds to one 2-way adapter.
- (v) Plug the 2-way adapters into the Niphan sockets, on each wing, as follows:—
 - (a) Upper inboard pair to No. 4 Niphan socket.
 - (b) Lower inboard pair to No. 3 Niphan socket.
 - (c) Upper outboard pair to No. 2 Niphan socket.
 - (d) Lower outboard pair to No. 1 Niphan socket.

Important note.—As the lower rounds must be projected before the corresponding upper rounds, it is essential to connect up the rockets in this "reverse" order so that the leads from the lower rounds will be positioned to the rear of those from the corresponding upper rounds, thus minimising the risk of fouling the upper and lower round leads.

WARNING—ENSURE THAT PERSONNEL ARE WARNED TO STAND TO THE SIDE OF THE ROCKETS WHEN MAKING THE CONNECTIONS GIVEN ABOVE.

Unloading

39. BEFORE COMMENCING ANY UNLOADING OPERATIONS, THE R.P. MASTER SWITCH MUST BE SWITCHED OFF, AND THE ACCUMULATOR DISCONNECTED.

- 40. (i) Remove the plugs from the Niphan sockets.
- (ii) Coil the pigtail lead in the venturi, and seal the end of the motor with a suitable adhesive tape to keep the lead in this position.

Mk. IB installation

- 41. (i) Remove the rear stop.
- (ii) Remove the shear wire from the hole in the shear lever.
- (iii) Lift the shear lever by depressing its projecting arm and slide the rocket backwards off the rail. (Two men are required for this).
- (iv) Replace the rear stop.

Mk. IIIA installation (single rounds)

- 42. (i) Operate the stop assembly mechanism to lift the rear stop and slide the rocket carefully backward until the front saddle abuts the front stop.
- (ii) While still supporting the rear end of the rocket, again operate the stop assembly mechanism, first in one direction and then in the other, to raise the front and rear plungers successively, sliding the rocket backwards as this is being done to free the front saddle from the stop assembly mechanism. Then completely slide the rocket off the beam.

Note.—Two men are required for these operations.

Mk. IIIA installation (tier-carriage rounds)

- 43. (i) Depress the shear lever on the lower front saddle and slide the rocket forward until the lower saddles are clear of the upper saddles. (Two men are required for this).
- (ii) Unload the upper round in the same way as stated for single rounds in para. 42.

Harmonisation procedure

44. The method of adjusting the beams in elevation consists in slackening off the lock-nuts on the front and rear adjusters and stirrups (or eyepieces) and turning the hexagonal flange on the adjusters in a clockwise or anti-clockwise direction to shorten or lengthen the struts, respectively. After adjustment, a piece of wire must be inserted into the safety hole in the front and rear struts to ensure that the adjusters have not been screwed out too far. If the wire

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September, 1945*

can be pushed through either strut a fresh adjustment must be made. After this test, clamp the adjusters and stirrups (or eyepieces) with the lock-nuts.

45. There is no provision for azimuth adjustment.

Misfire procedure

46. In the event of an aircraft landing with misfired rockets, the following procedure is to be adopted :—

- (i) Switch OFF the R.P. master switch while the electrician disconnects the accumulator.
- (ii) Remove the plugs from all the rounds still on the beams, dealing first with any round which has obviously misfired.

AIR PUBLICATION 2802A
Vol. I, Sect. I, Chap. 2

- (iii) Unload the rockets as stated in para. 41, 42 or 43, as appropriate.
- (iv) Unscrew and remove the projectile from the motor.
- (v) Set aside the motor for inspection in accordance with A.P.2608A, App. 12.
- (vi) The electrician will test the complete installation and wiring to ensure that the misfire is not due to an electrical fault in the installation or aircraft circuits.

WARNING—ALL PERSONNEL MUST STAND TO THE SIDE OF THE ROCKET WHEN MAKING THE OPERATIONS DETAILED IN SUB-PARA. (ii) to (iv).

CHAPTER 3

R.P. INSTALLATION Mk. IA IN TYPHOON AIRCRAFT

LIST OF CONTENTS

	<i>Para.</i>
Leading particulars—	
Weight of R.P. installation	1
Stores Reference numbers	2
General description... ..	3
Mk. IA beam	5
Front strut	6
Rear strut	9
Electrical wiring and equipment	17
Landing lamp windows	19
R.P. cockpit controls... ..	20
Sight	21
Instructions for use—	
Loading	23
Unloading	25
Harmonisation procedure... ..	27
Misfire procedure	29

LIST OF ILLUSTRATIONS

- Fig.*
- 1—Typical view of the Mk. IA R.P. installation in the Typhoon (loaded)
 - 2—Broken sectional view of the rear strut
 - 3—Side and three-quarter rear views of the projector
 - 4—Wiring diagram

CHAPTER 3

R.P. INSTALLATION Mk. IA IN TYPHOON AIRCRAFT

Leading particulars

Weight of R.P. installation

- | | | | | | | |
|---|-----|-----|-----|-----|-----|-----------------------|
| 1. Total weight of installation, unloaded | ... | ... | ... | ... | ... | 360 lb. approximately |
| Weight of removable fittings and beams | ... | ... | ... | ... | ... | 340 lb. approximately |
| Permanent extra weight :— | | | | | | |
| Wing fixtures | ... | ... | ... | ... | ... | 8 lb. approximately |
| Wiring and switches | ... | ... | ... | ... | ... | 12 lb. approximately |

Stores Reference numbers

- The following Stores Ref. numbers have been allocated to this installation :—
11C/2462—Beam, R.P. Mk. IA (Typhoon)—8 per aircraft
11C/2643—Removable fittings, R.P. Mk. IA (Typhoon)—1 set per aircraft

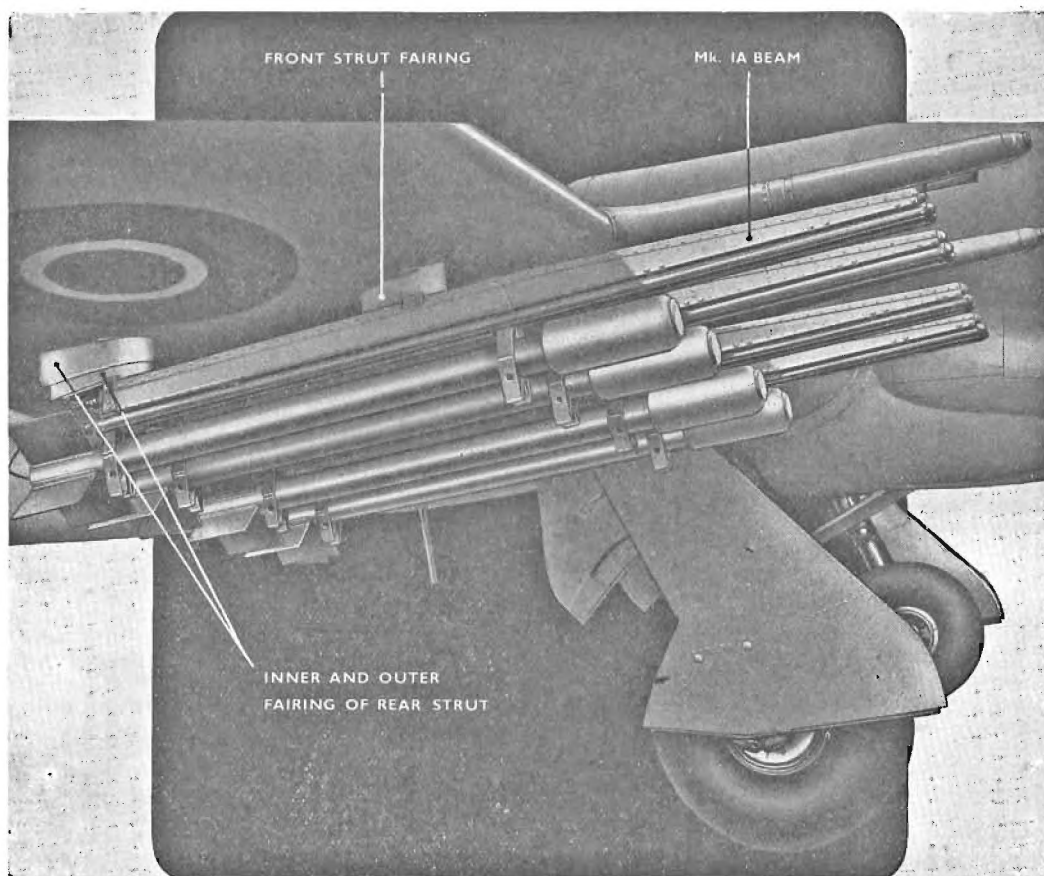


Fig. 1.—Typical view of the Mk. IA R.P. installation in the Typhoon (loaded)

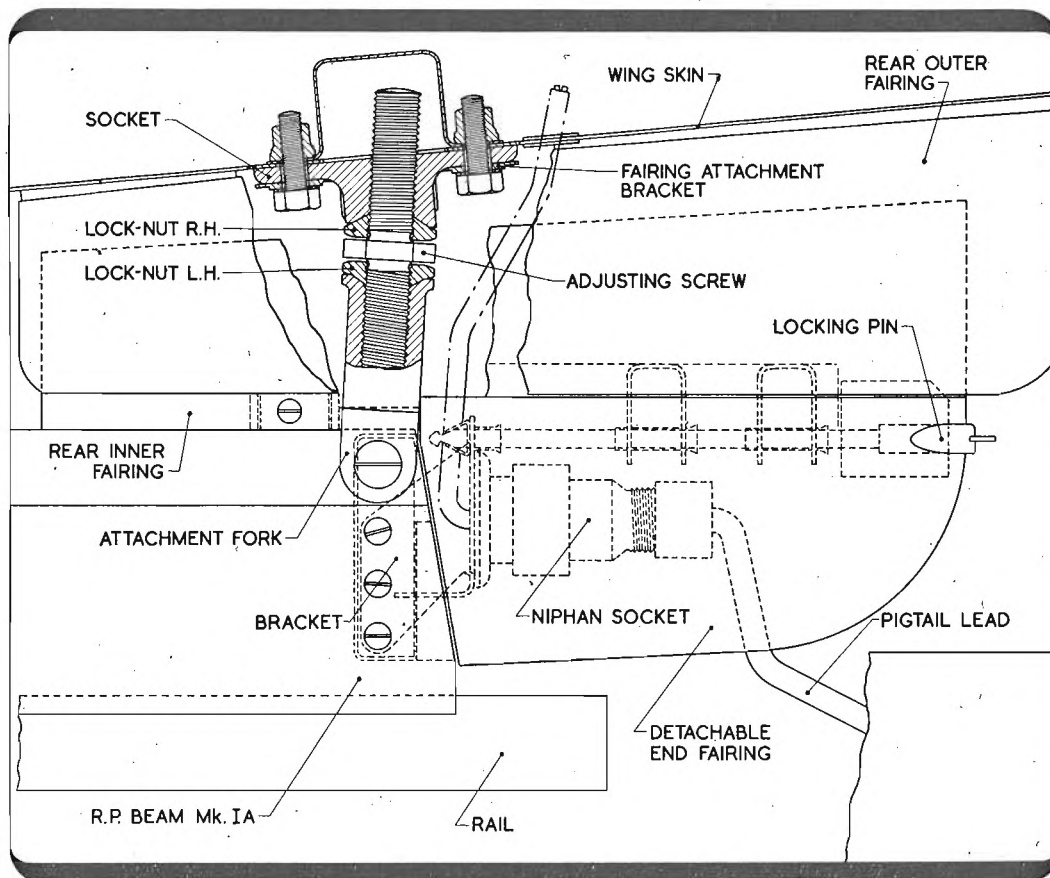


Fig. 2.—Broken sectional view of the rear strut

General description

3. The Mk. IA R.P. installation in the Typhoon aircraft consists of modified Mk. I box beams (Mk. IA) individually mounted directly on the underside of the aircraft wing on struts. There is no blast plate assembly as in the standard Mk. I projector described in Sect. 2, Chap. 1.

4. Four beams are mounted under each wing. Stream-lined fairings are fitted over the struts to reduce drag.

Mk. IA beam, fig. 1 and 3

5. The Mk. IA beam used in this installation is a Mk. I box beam modified as follows:—

- (i) The Niphan socket is mounted in a bracket on the rear end of the beam.
- (ii) Two ears are provided on the rear end of the beam to secure the inner rear fairing.

(iii) The front attachment lug is differently positioned.

(iv) The ducel 4 cable from the socket is led up through the fairing of the rear strut through a hole in the wing skin.

Front strut, fig. 1 and 3

6. The front strut consists of a spigot secured to the wing structure by two $\frac{1}{8}$ in. bolts screwing into anchor nuts inside the wing. Bolted to the top of the R.P. beam is an attachment fork which mates with the lower end of the spigot. A hole is drilled through the fork and spigot for a pin connecting the two parts together. The pin is locked in position by a safety pin.

7. The front strut is not capable of adjustment for harmonisation purposes.

8. The front fairing is shaped to fit around the spigot and fork, and has its top and bottom

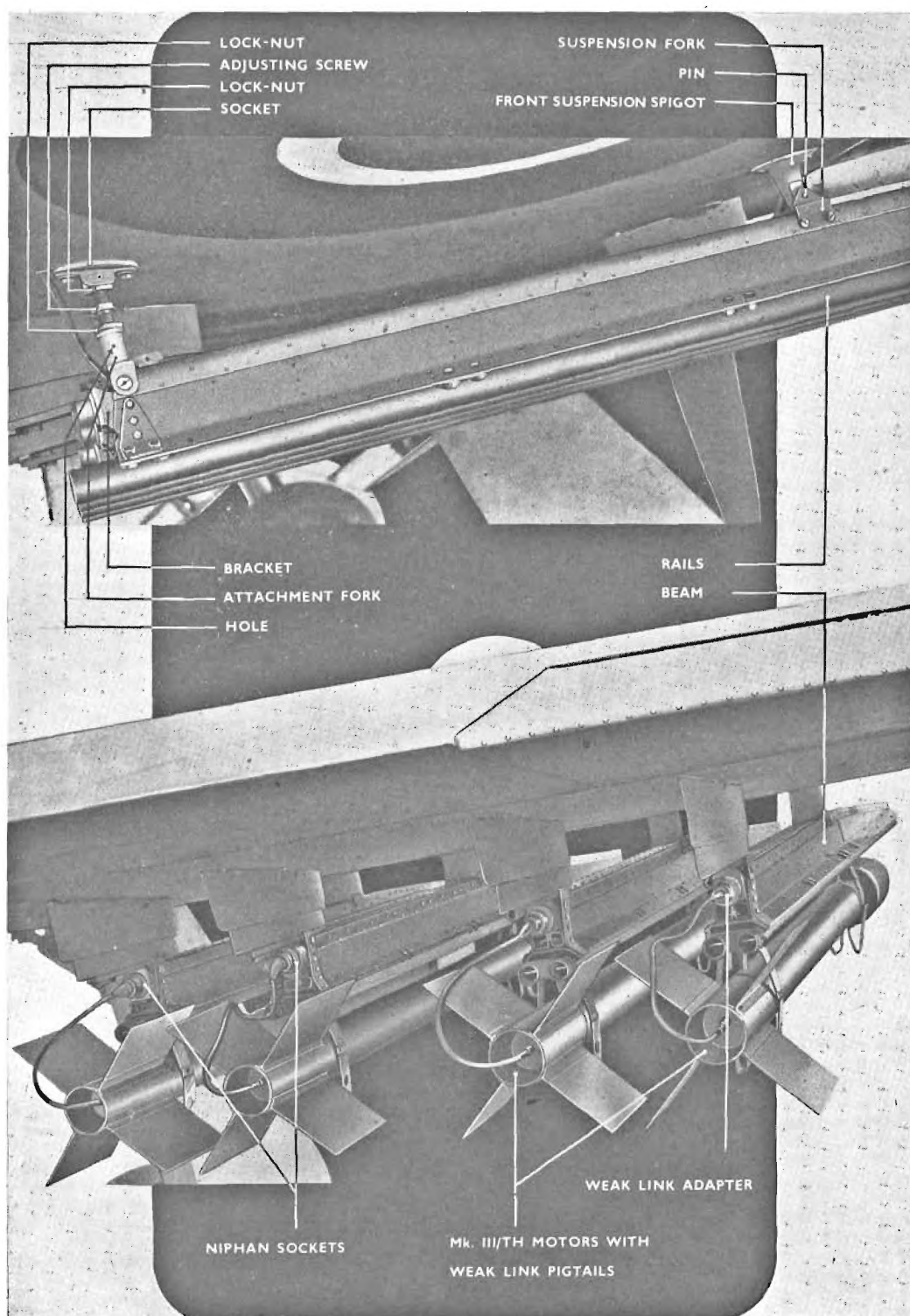


Fig. 3.—Side and three-quarter rear views of the projector

edges faced with asbestos strip for protection, and to ensure a snug fit. The fairing is of aluminium, is stream-lined, and is secured in position by a single bolt screwing into a Simmonds anchor bolt mounted on one side of the fairing.

Rear strut, fig. 2 and 3

9. The rear strut is adjustable in azimuth and elevation for harmonisation purposes; and consists of a socket, an adjusting screw, and an attachment fork.

10. The socket consists of a circular plate with a boss on the underside which is threaded to take the adjusting screw. The socket is secured to the underside of the mainplane by two $\frac{1}{8}$ in. bolts and nuts. To allow the socket to be adjusted in azimuth, the holes for the securing bolts are slotted; this gives a movement of approx. $\frac{1}{2}$ in. on either side of the centre line of the strut.

11. The adjusting screw is 4.25 in. long, giving a vertical adjustment of approx. $2\frac{1}{2}$ in., and has a hexagonal flange, or circular flange with two flats, in the middle. On either side of the flange the screw is threaded; one side being a right-hand thread and the other left-hand. The right-hand thread screws into the socket, a specially shaped lock nut being provided between the flange and the socket.

12. The attachment fork is bolted to the rear end of the beam by a single bolt and nut passing through the arms of the fork and the beam. The upper portion of the fork is formed as a threaded socket to take the left-hand threaded portion of the adjusting screw. A lock-nut is also provided on the screw between the adjusting flange and the fork for clamping the screw in its final position.

13. A small hole is drilled in the attachment fork through which a pin or piece of wire may be passed to ensure that the adjusting screw has not been screwed too far out of the fork. If the pin or wire can be pushed right through the hole, the screw is too far out and the beam unsafe for use.

14. The fairing for the rear strut is in three parts; inner fairing, outer fairing, and detachable end fairing. The inner fairing is U-shaped in plan and fits around the lower part of the rear strut with the arms of the U to the rear. The two arms are then fastened together by a screw passing through one arm into an anchor nut in the other. The fairing edge is suitably shaped to fit flush against the top of the beam, the contacting edges being faced with asbestos tape. The fairing is secured to a bracket on the attachment fork by two screws.

15. The outer fairing is similar in shape, and fits over the upper half of the inner fairing, extending up to and fitting close against the wing skin. It is secured by two screws which screw into a bracket fixed to the socket, the two arms being secured together in the same manner as the inner fairing. The contacting edges of the outer fairing are also faced with asbestos tape.

16. The detachable end fairing fits over the rear end of the inner fairing and extends over the Niphan socket at the rear of the beam. It is secured to the inner fairing by a $7\frac{1}{2}$ in. long Oddie pin which passes through brackets on each fairing into a spring clip on the Niphan plug mounting bracket.

Electrical wiring and equipment, fig. 4

17. The Dumet 4 cables from the Niphan sockets in the ends of the beams are taken up through the fairing of the rear strut, through a hole in the wing skin fitted with a grommet, to a 5-way terminal block (Stores Ref. 5C/868) attached to the intermediate stiff rib. From the terminal block a length of quintocel 4 cable runs through the wing structure to the wheel well, and terminates in a 5-pin plug (Stores Ref. 5D/515) coloured red, for connection to a 5-pin socket in the wheel well.

18. A diagram showing the electrical wiring of the installation is shown in fig. 4. The two-pole system of wiring is used in this aircraft with the master switch in the negative lead and all other components in the positive lead.

Landing lamp windows

19. To prevent damage to the landing lamp windows by blast and debris, blanking-off plates are fitted over them when R.P.s are carried on the aircraft.

R.P. cockpit controls

20. The R.P. controls and their situation in the cockpit are as follows:—

- (i) The R.P. firing switch is the existing throttle lever firing switch and is of the push-button type.
- (ii) The Pairs-Salvo selector switch and the R.P. master switch are both general purpose switches, Type B (Stores Ref. 5C/543), and are mounted together, one above the other, in a bracket on the port side of the pilot's cockpit. The switches are marked "SELECTOR," "PAIRS-SALVO" and "R.P. MASTER" "OFF-ON," respectively.

- (iii) The 4-way auto-selector switch, 24 volt, Type C, No. 2 (Stores Ref. 5D/1297) is mounted in a bracket on the top of the

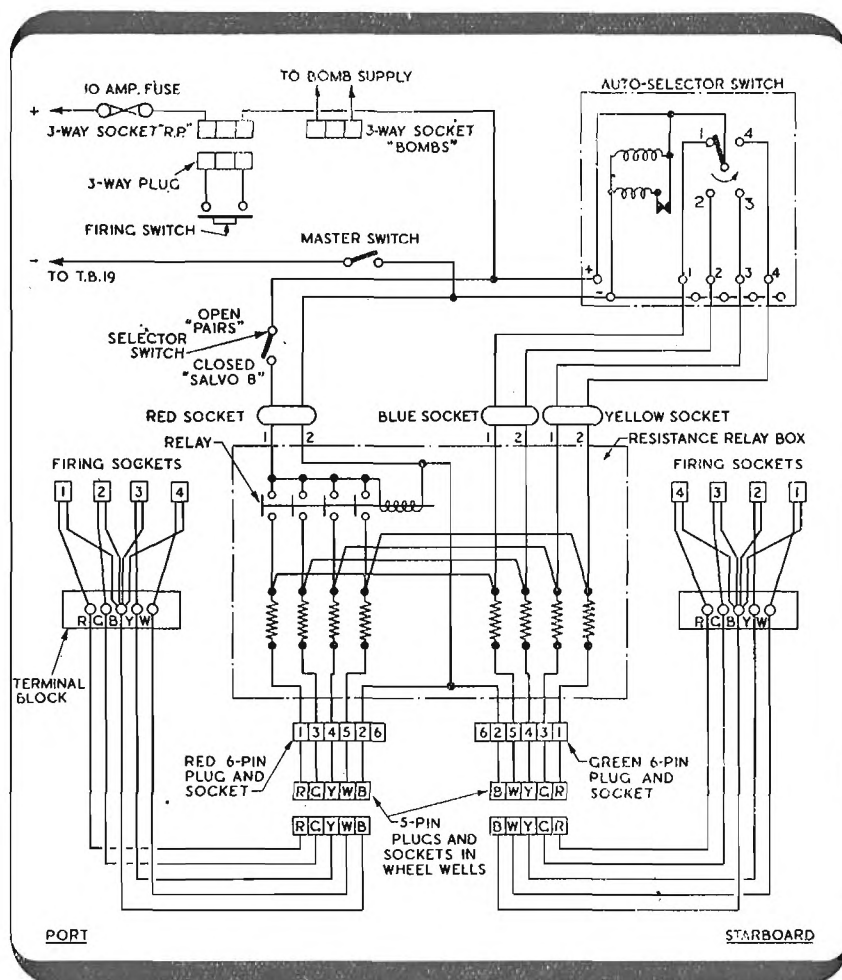


Fig. 4.—Wiring diagram

dashboard just below and to the right of the sight.

- (iv) The resistance relay box, 24 volt (Stores Ref. 5D/1165) is mounted on brackets secured to struts "N-H" and "C-K" on the port side of the fuselage under the floor of the cockpit, beneath J.B.1. It is reached by removing the panel on the outside of the fuselage.
- (v) The fuse for the R.P. circuit is a 10 amp. fuse and is one of the fuses in the forward 8-way fuse box on the starboard side of the fuselage under the outer removable panel.

Sight

21. The sight used for R.P. is the gunsight projector, Type 1, Mk. I or Type 1, Mk. III, with windscreen reflection. In the Type 1, Mk. I projector the adjustable bars of the graticule

are arranged vertically and the top of the lower bar is used as the aiming mark. Alteration of the height of this bar has the effect of elevating or depressing the line of sight. The projector Type 1, Mk. III, is a non-computing R.P. sight, the depression of the sighting line being obtained by moving the graticule inside the sight.

22. Full details of these sights will be given in due course in Sect. 4.

Instructions for use

Loading

23. Before commencing to load, ensure that the functioning tests detailed in Vol. II, Part 3, Sect. 1, Chap. 3 have been completed.

WARNING—DURING ALL LOADING OPERATIONS ENSURE THAT PERSONNEL DO NOT STAND DIRECTLY IN FRONT OR TO THE REAR OF THE ROCKETS.

24. (i) Ensure that the master switch in the pilot's cockpit is OFF, that the pairs-switch is set to PAIRS and that the red 5-pin plug is disconnected from the socket in each wheel well.
- (ii) Lift the rocket in front of the rail to be loaded, holding it at the same angle as the rail (Two men are required for this).
Note.—It is best to commence loading with the inboard rail on each wing and work outwards.
- (iii) Engage the rear saddle between the rails and slide it gently down, taking care to guide the pigtail lead carefully between the rails or ensure that it is coiled in the venturi.
- (iv) Whilst still supporting the forward end of the rocket, engage the front saddle.
- (v) The armourer who has been supporting the forward end of the rocket must now go to the rear of the projector and lift the shear lever tongue by depressing its projecting arm.
- (vi) The rocket is now slid fully backwards until the rear saddle abuts the rear stop. The tongue is then permitted to fall in front of the rear saddle, and the shear wire, consisting of a short length of No. 10 S.W.G. annealed copper wire or an aluminium snaphead rivet, $\frac{1}{8}$ in. $\times$ $1\frac{1}{2}$ in. (Stores Ref. 28Q/5454), is inserted through the hole and bent over to keep the lever in place.
Note.—If the rocket is difficult to load on to the projector due to excessive friction between either the saddles and the rails or between the shot or shell and the rails, the rocket should be set aside for re-gauging and fitting of other saddles. Faulty saddles should be marked and set aside for defect procedure.
- (vii) Ensure that the rear saddle is securely held between the rear stop and the shear lever tongue, by trying to push the rocket forward.
- (viii) When all rockets have been loaded, plug the pigtail leads into the sockets in the rear end of the beams.

IMPORTANT NOTE.—Owing to the proximity of the two outboard rails on each wing to the ailerons, only rockets having motors (Mk. III/TH or IV/TH), fitted with weak-link pigtail leads must be used in these positions, to obviate any damage to the ailerons by the remnant of the pigtail lead after

firing. Preferably, Mk. III/TH or IV/TH motors should be used on all rails, when supply permits.

- (ix) Set the auto-selector switch to "1."
- (x) Just prior to the aircraft taking off, the 5-pin plugs are to be plugged into the sockets in each wheel well.

WARNING—ENSURE THAT PERSONNEL ARE WARNED TO STAND TO THE SIDE OF THE PROJECTOR, AND CLEAR OF THE NOSE OF THE ROCKETS AND THE BACKS OF THE MOTORS WHEN MAKING THE CONNECTIONS GIVEN IN SUB-PARA. (viii) and (x).

Unloading

25. BEFORE COMMENCING ANY UNLOADING OPERATIONS, THE R.P. MASTER SWITCH MUST BE SWITCHED OFF, AND THE ACCUMULATOR DISCONNECTED.

26. (i) Remove the two 5-pin plugs from the sockets in the wheel wells, and the eight firing plugs from the projectors.
- (ii) Remove the shear wire or rivet from the hole in the shear lever.
- (iii) Coil the pigtail lead in the venturi, and seal the end of the motor with a suitable adhesive tape to keep the lead in this position.
- (iv) Lift the shear lever by depressing the projecting arm and slide the rocket carefully off the rails. (Two men are required for this).
- (v) Replace the dust caps on the Niphan sockets.

Harmonisation procedure

27. The harmonisation diagram and full details of the sight setting for different speeds and angles of attack are given in Sect. 5.

28. The method of adjusting the rails for harmonisation are as follows:—

- (i) Remove the fairings from the rear strut on each rail.
- (ii) Slacken off the two lock-nuts on the adjusting screw.
- (iii) Slacken the two securing bolts of the socket to allow the rear end of the beam to be moved for azimuth adjustment. The amount of adjustment is limited by the length of the slotted holes in the socket.
- (iv) After adjustment in azimuth, tighten up the securing bolts.

- (v) Adjust the elevation of the rear end of the beam by turning the adjusting screw clockwise or anti-clockwise as necessary.

Note.—When adjusted, test that the adjusting screw has not been screwed too far out of the attachment fork by inserting a piece of wire in the small hole in the side of the fork and check that it cannot be passed right through the fork. If it can, a fresh adjustment must be made to ensure that a sufficient number of threads are engaged between the screw and the fork.

- (vi) When adjusted, clamp the adjusting screw with the two lock-nuts.
- (vii) Replace the fairings.

Misfire procedure

29. In the event of an aircraft landing with misfired rockets, the following procedure is to be adopted :—

- (i) Switch OFF the R.P. master switch while the electrician disconnects the accumulator.
- (ii) Remove the 5-pin plugs from the sockets in the wheel wells.
- (iii) Remove the firing plugs from all rounds still on the rails, dealing first with any round which has obviously misfired.
- (iv) Unload the rocket as stated in para. 26.
- (v) Unscrew and remove the projectile from the rocket motor.
- (vi) Set aside the motor for A.I.D. inspection.
- (vii) The electrician shall test the complete installation and wiring to ensure that the misfire is not due to an electrical fault in the installation or aircraft circuits.

WARNING—ALL PERSONNEL MUST STAND TO THE SIDE OF THE ROCKET WHEN MAKING THE OPERATIONS DETAILED IN SUB-PARA. (ii) to (v) ABOVE.

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MINISTRY
April, 1945

This is A.L. No. 13 to A.P. 2802A, Vol. I and concerns Sect. 1
Delete " (To be issued later) " after title of Chap. 4 in the List of Chapters,
write " A.L. 13 " in the outer margin of the list, insert this chapter, and
make an entry in the Amendment Record Sheet at the beginning of the
Volume.

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April, 1945

AIR PUBLICATION 2802A
Vol. I Sect. I

CHAPTER 4

**R.P. INSTALLATION Mk. IIIB IN
TYPHOON AIRCRAFT**

LIST OF CONTENTS

	Para.
Leading particulars	
Weight of R.P. installation	1
Stores reference numbers	2
General description	3
Mark IIIB beam	5
Front strut	6
Front fairing	8
Rear strut	9
Rear fairings	15
Electrical wiring and equipment	17
Landing lamp windows	19
R.P. cockpit controls	20
Sight	21
Instructions for use	
Attaching the projector to the aircraft	23
Removing the projector from the aircraft	27
Preparing the beam for use	28
Loading	30
Unloading	32
Harmonisation procedure	34
Misfire procedure	36

LIST OF ILLUSTRATIONS

- Fig.
1. Typical views of the Mk. IIIB R.P. installation in the Typhoon aircraft (loaded)
 2. Side view of the beams with strut fairings removed
 3. Details of the front strut assembly
 4. Details of the rear strut assembly
 5. Wiring diagram

ARMAMENT

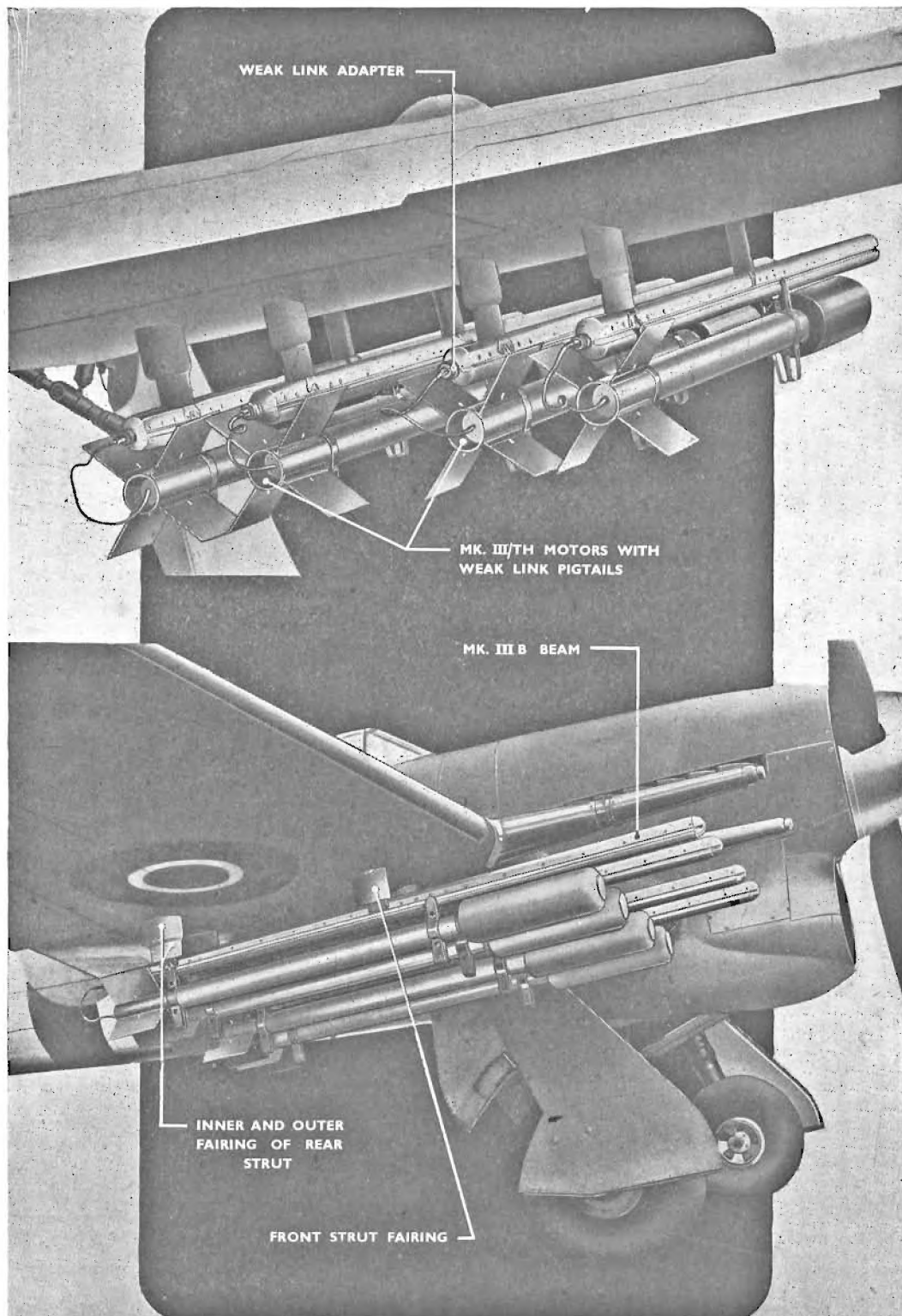


Fig. 1.—Typical views of the Mk. IIIB R.P. installation in the Typhoon aircraft (loaded)

CHAPTER 4

R.P. INSTALLATION Mk. IIIB IN TYPHOON AIRCRAFT

Leading particulars

Weight of R.P. installation

1. Total weight of installation, unloaded	254 lb. approx.
Weight of removable fittings and beams	233 lb. approx.
Permanent extra weight :—	
Wing fixtures	11½ lb. approx.
Wiring and switches	9¼ lb. approx.

Stores Reference numbers

- The following Stores Ref. numbers have been allocated to this installation :—
11C/2720—Beam, R.P., Mk. IIIB (Typhoon)—8 per aircraft
11C/2698—Removable fittings R.P. Mk. IIIB (Typhoon)—1 set per aircraft.

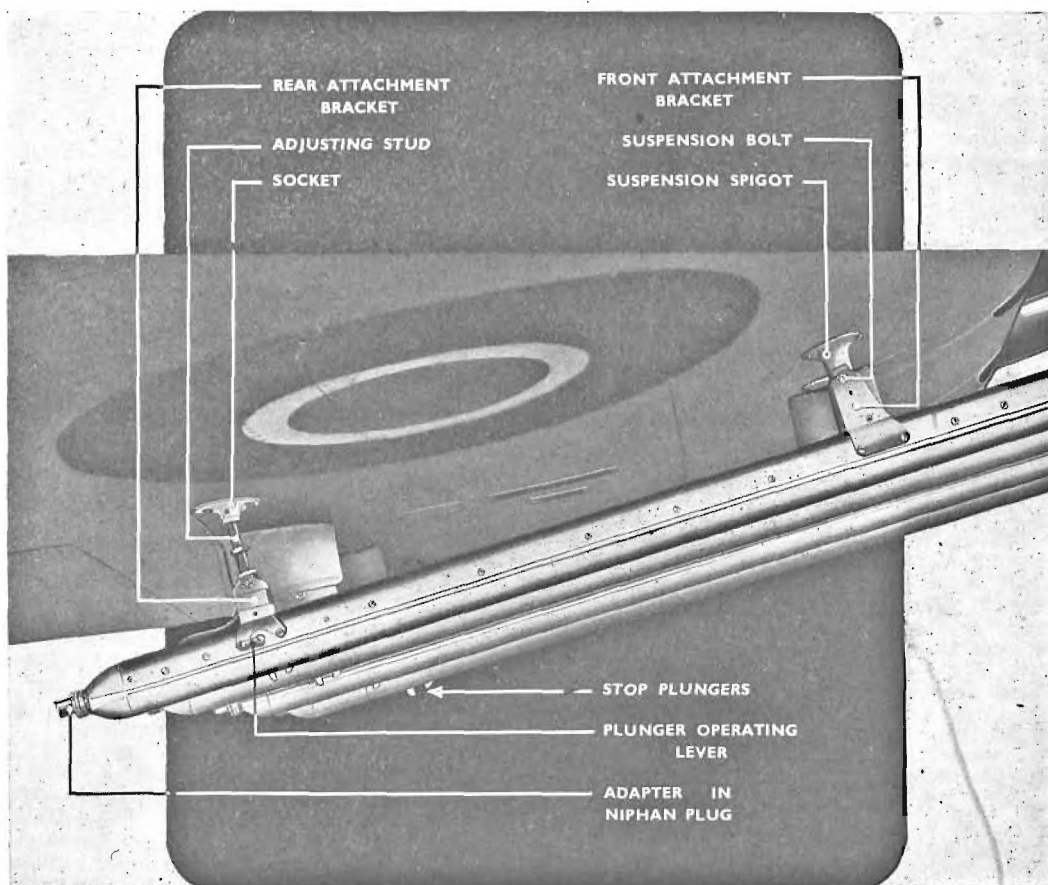


Fig. 2.—Side view of the beams with strut fairings removed

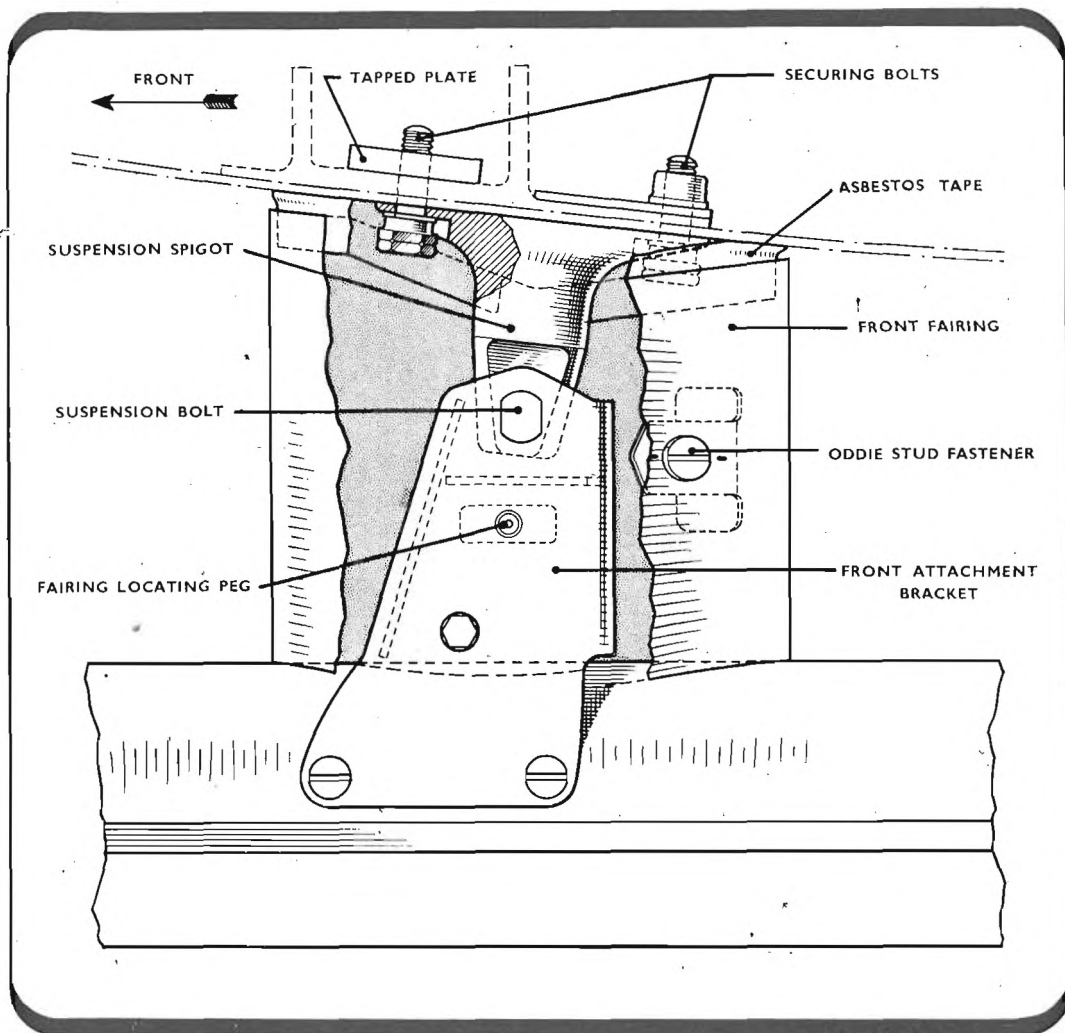


Fig. 3.—Details of the front strut assembly

General description, fig. 1

3. The Mk. IIIB R.P. installation in the Typhoon aircraft consists of Mk. IIIB beams individually mounted directly on the underside of the aircraft wing on faired struts. There is no blast plate assembly as in the standard Mk. I projector described in Sect. 2, Chap. 1.

4. The installation is similar, in principle, to the Mk. IB R.P. installation described in Chapter 3, four beams being mounted under each wing, but the beams, struts, and fairings are of different designs and are not interchangeable between the two installations.

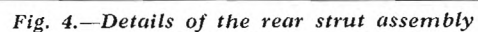
Mk. IIIB beam, fig. 1 and 2

5. The Mk. IIIB beam used in this installation is described in detail in Sect. 2, Chap. 2. It has a Niphan socket mounted in the rear end of the beam, the Ducel 4 cable from which is

led up through a hole in the top of the beam, inside the fairing of the rear strut, and through a hole in the wing skin, to a 5-way terminal block in the wing structure.

Front strut, fig. 2 and 3

6. The front strut consists of a spigot secured to the front spar of the wing structure by two $\frac{1}{8}$ in. special bolts; the rearward bolt is secured with a Simmonds nut and shakeproof washer, and the forward bolt screws into a drilled and tapped plate in the channel section of the spar. Bolted to the top of the R.P. beam is the front mounting bracket. This is drilled at the top for a bolt which passes through the hole and another in the lower end of the spigot thus connecting the two parts together. The bolt is secured by a nut and is securely riveted over on assembly.



and to ensure a snug fit. The word " FRONT " is stencilled in black on the side of the fairing.

Rear strut, fig. 2 and 4

9. The rear strut is adjustable in azimuth and elevation for harmonisation purposes, and consists of a socket, an adjusting stud, and a trunnion which fits into the rear mounting bracket of the beam.

10. The socket consists of a circular plate with a boss on the underside which is threaded to take the adjusting stud. The socket is secured to the underside of the mainplane by two $\frac{3}{8}$ in. special bolts, shake-proof washers and Simmonds nuts. To allow the socket to

be adjusted in azimuth, the holes for the securing bolts are slotted; this gives a movement of approx. $\frac{1}{2}$ in. on either side of the centre line of the strut.

11. The adjusting stud is 5.63 in. long, giving a vertical adjustment of approx. 3 in. and has a hexagonal collar near the middle. On either side of the flange the stud is threaded; one side being a right-hand thread and the other left-hand. The right-hand thread screws into the socket, a specially shaped lock-nut being provided between the flange and the socket for clamping the stud in its adjusted position.

12. The rear mounting bracket of the Mk. IIIB beam is secured to the beam by four screws. The upper part of the bracket is rectangular in section and carries on each of its longitudinal sides a special bolt and nut. The heads of the bolts are on the inside of the bracket and are specially shaped to engage the trunnion block. Each bolt has a stepped head so that it can be rotated after tightening the securing nut. To prevent the nut working loose the bolt is securely riveted over on assembly.

13. The trunnion block fits into the top of the rear mounting bracket, is rectangular in shape, and has a transverse groove on its side faces to engage the heads of the bolts in the bracket. To assemble the block to the bracket, the bolts are turned so that their specially shaped heads have their smaller dimension facing vertically, the trunnion, held with its grooves vertical, is slid over the bolt heads, and is then turned through 90 deg. to secure it. A hole is drilled in the centre of the trunnion block and is threaded with a left-hand thread. The lower half of the adjusting stud screws into this hole, a lock-nut being provided to lock the stud in its adjusted position.

14. A $\frac{1}{2}$ in. dia. inspection hole is drilled in each side of the bracket so that the amount of the adjusting stud engaged by the trunnion can be seen. The end of the stud must be visible through this hole otherwise the beam is unsafe for use.

Rear fairings, fig. 1 and 4

15. There are two rear fairings; an inner fairing and an outer fairing. They are similar in construction to the front fairing, see para. 8, but differ in shape and size. The rear inner fairing fits around the lower part of the adjusting stud and abuts the top of the beam. The contacting edges are faced with asbestos tape. The fairing is located by two pegs engaging in holes provided in each side of the rear mounting bracket, and is secured by an Oddie stud fastener.

16. The rear outer fairing is very similar and fits around the upper part of the adjusting

stud, overlapping the top of the inner fairing and abutting the socket and wing skin. It is located by pegs engaging holes in the socket.

Electrical wiring and equipment, fig. 5

17. The Ducl 4 cables from the Niphan sockets in the ends of the beams pass along the inside of the beam, up through the hole in the top of the beam, through the fairing of the rear strut, through a hole in the wing skin fitted with a grommet, to a 5-way terminal block (Stores Ref. 5C/868) attached to the intermediate stiff rib. In aircraft in which Typhoon Mod. 376 has been incorporated, a Type R, 2-pin plug and socket connection is interposed between the terminal block and the wing skin, the hole in the wing skin being enlarged sufficiently to allow the plug to be withdrawn through it when removing the R.P. installation from the wing. From the terminal block a length of Quintocel 4 cable runs through the wing structure to the wheel well, and terminates in a 5-pin plug (Stores Ref. 5D/516) coloured red, for connection to a 5-pin socket in the wheel well.

18. A diagram showing the electrical wiring of the installation is shown in fig. 5. The two-pole system of wiring is used in this aircraft, with the master switch in the negative lead and all other components in the positive lead.

Landing lamp windows

19. To prevent damage to the landing lamp windows by blast and debris, blanking-off plates are fitted over them when R.P.s are carried on the aircraft.

R.P. cockpit controls

20. The R.P. controls and their situation in the cockpit are as follows:—

- (i) The R.P. firing switch is the existing throttle lever firing switch and is of the push-button type.
- (ii) The pairs-salvo selector switch and the R.P. master switch, are both general purpose switches, Type B (Stores Ref. 5C/543), and are mounted together, one above the other, in a bracket on the port side of the pilot's cockpit. The switches are marked "SELECTOR," "PAIRS-SALVO" and "R.P. MASTER" "OFF-ON," respectively.
- (iii) The 4-way auto-selector switch, 24 volt, Type C, No. 2 (Stores Ref. 5D/1297) is mounted in a bracket on the top of the dashboard just below and to the right of the sight.
- (iv) The resistance relay box, 24 volt (Stores Ref. 5D/1165) is mounted on brackets secured to struts "N-H" and "C-K" on the port side of the fuselage under the floor of the cockpit, beneath JB.1. It is reached by removing the panel on the outside of the fuselage.

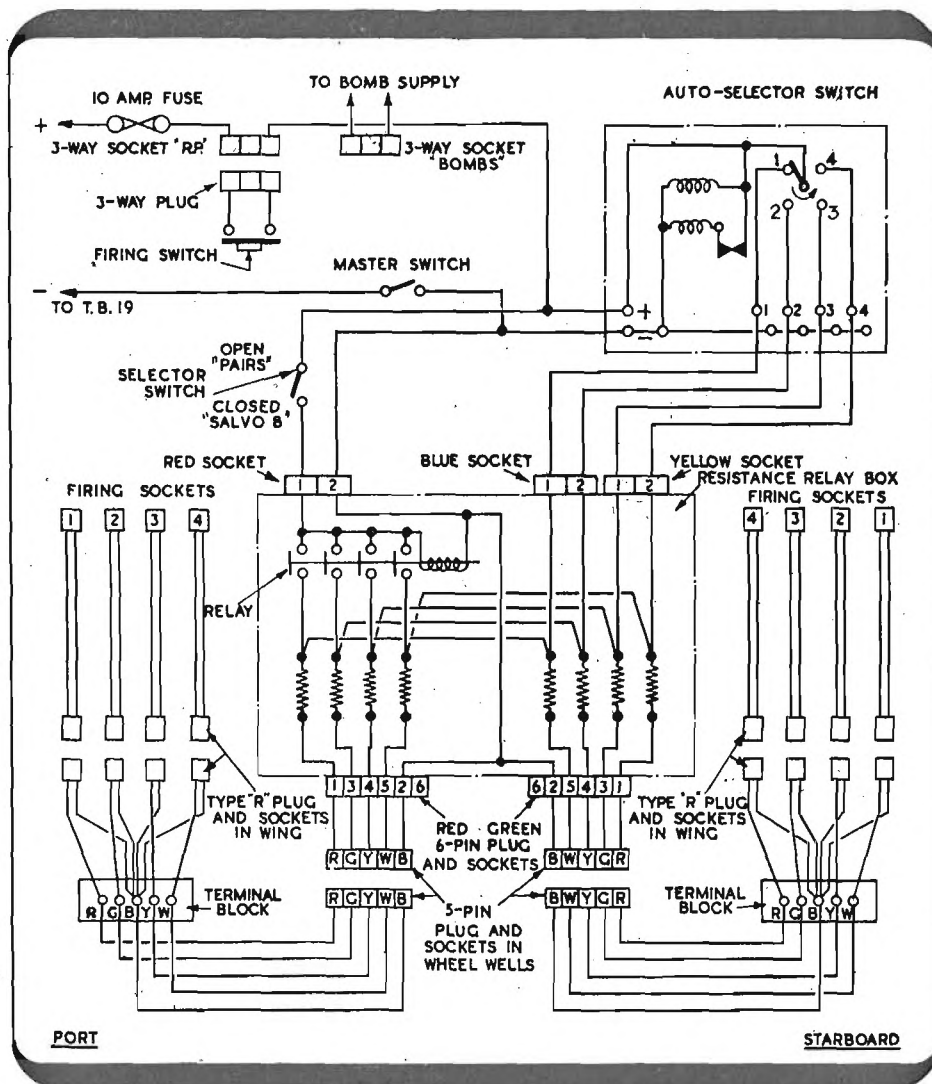


Fig. 5.—Wiring diagram

- (v) The fuse for the R.P. circuit is a 10 amp. fuse and is one of the fuses in the forward 8-way fuse box on the starboard side of the fuselage under the outer removable panel.

Sight

21. The sight used for R.P. is the gunsight projector, Type 1, Mk. I or Type 1, Mk. III, with windscreen reflection. In the Type 1,

Mk. I projector, the adjustable bars of the graticule are arranged vertically and the top of the lower bar is used as the aiming mark. Alteration of the height of this bar has the effect of elevating or depressing the line of sight. The projector, Type 1, Mk. III is a non-computing R.P. sight, the depression of the sighting line being obtained by moving the graticule inside the sight.

22. Full details of these sights will be given in due course in Sect. 4.

Instructions for use

Attaching the projector to the aircraft

23. Connect up the Niphan socket at the rear end of the beam, if not already done, as follows :—

- (i) Remove the rear fairing of the beam by unscrewing the two 2 B.A. rd./hd. screws securing it to the beam.
- (ii) Remove the Niphan socket from the fairing by unscrewing the securing grub-screw.
- (iii) Dismantle the socket, and connect one end of an appropriate length of Ducel 4 cable to the socket by soldering. The length of the cable should be sufficient to lead either (a) from the socket to the 5-way terminal block in the wing structure, or (b) from the socket to the appropriate Type R socket in the wing, if Typhoon Mod. 376 has been incorporated, see para. 17.
- (iv) Assemble the socket and replace it in the end fairing.
- (v) Pass the free end of the cable along the inside of the beam and up through the middle one of the three holes in the top of the beam to the rear of the rear mounting bracket.

24. Assemble the rear strut to the beam in the following manner :—

- (i) Rotate the bolts in the top of the rear mounting bracket so that their specially shaped heads have their smaller dimension facing vertically.
- (ii) Slide the trunnion block over the heads of the bolts, and turn the trunnion block through 90 deg. so that its tapped hole is vertical with the chamfered portion of the hole uppermost.
- (iii) Screw the left-hand threaded portion of the adjusting stud into the trunnion block, after first ensuring that the lock-nut is in position on the adjusting stud with its chamfered face downwards. The stud should be screwed about half-way into the trunnion block.
- (iv) Ensure that the lock-nut is in position on the upper, right-hand threaded portion of the stud, with its chamfered face upwards, and screw on the socket.

Note.—The adjusting stud should be screwed into the trunnion and socket about equal amounts.

25. Assemble the front strut to the beam as follows :—

- (i) Attach the front suspension spigot, with its deeper side to the front, to the front attachment bracket, using the special suspension bolt and nut.

- (ii) If the nut does not fully tighten up on to the bracket a suitable washer must be added. When tightened, the nut must be locked by securely riveting over the end of the bolt.

26. The assembled beam and struts can now be fitted to the wings as follows :—

- (i) Screw the front suspension spigot to the wing with the two special bolts provided. The forward bolt screws into a threaded plate in the channel portion of the front spar. The rear bolt is fitted with a shakeproof washer and secured by a Simmonds nut.
- (ii) Pass the end of the Ducel 4 cable (fitted with a Type R 2-pin plug if Typhoon Mod. 376 has been incorporated) through the hole in the wing skin.
- (iii) Attach the socket to the wing with its deeper side to the rear, using the two special hex./hd. bolts, and secure with Simmonds nuts and shakeproof washers.
- (iv) Plug in the Type R plug to its appropriate socket, or connect the electric cable to the appropriate terminal of the 5-way terminal block in the wing structure, see fig. 5.
- (v) Bind the cable to the rear attachment bracket with a length of adhesive tape.
- (vi) Place the fairings in position over the front and rear struts.

Removing the projector from the aircraft

27. It is easier to remove the complete beam and strut assembly from the wing than to remove the beam from the struts. It should be done as follows :—

- (i) Disconnect the Type R plug and socket, or the Ducel 4 cable from the terminal block.
- (ii) Remove the fairings from the struts.
- (iii) Remove the complete assembly from the wing by unscrewing the four bolts securing the front suspension spigot and the rear socket.
- (iv) Carefully withdraw the Ducel 4 cable from the wing.

Preparing the beam for use

28. When delivered to the Service, the stop assembly in each Mk. IIIB beam is protected by a coating of lanoline. Before the beams are used in Service this protecting coating must be removed with metal de-greasant (Stores Ref. 33B/510, 511 or 512), and the entire stop assembly mechanism lubricated with corrosion inhibiting instrument oil, D.T.D.561 (Stores Ref. 34A/131).

29. Full instructions for removing the lanoline and applying the lubricant is given in Sect. 2, Chap. 2, to which reference must be made.

Loading

30. Loading on the Typhoon is best done from the front. Before commencing to load, ensure that the functioning tests detailed in Vol. II, Part 3, Sect. 1, Chap. 4, have been completed.

WARNING.—DURING ALL LOADING OPERATIONS ENSURE THAT PERSONNEL DO NOT STAND DIRECTLY IN FRONT OR TO THE REAR OF THE ROCKETS.

31. (i) Ensure that the master switch in the pilot's cockpit is OFF, set the pairs-salvo-switch to PAIRS, and disconnect the red 5-pin plug from the socket in each wheel well.

(ii) Ensure that the beams are undamaged and free from grit, particularly the grooves in which the shoes of the No. 3 saddles run.

(iii) Lift the rocket in front of the beam to be loaded, holding it at the same angle as the beam (two men are required for this).

Note.—It is best to commence loading with the inboard beam on each wing and work outwards.

(iv) Engage the rear saddle on to the beam, after first lining up the saddle shoes and ensuring that the pigtail lead is coiled in the venturi, slide the rocket down the beam until the front saddle can be similarly engaged, and continue to slide the rocket along the beam until the rear saddle abuts the forward face of the front stop plunger.

Note.—In doing this ensure that the shear lever of the rear saddle is not slammed against the forward face of the front stop plunger.

(v) Operate the stop assembly mechanism to raise the front plunger, and allow the shear lever of the rear saddle to pass into the space between the two plungers.

Note.—(a) Do not attempt to force the shear lever past the front plunger without raising the latter since it is possible in so doing to break or weaken the shear rivet.

(b) If the rocket is difficult to load on to the projector due to excessive friction between either the saddles and the rail or between the shot or shell and the rails, the rocket should be set aside for re-gauging and fitting of other saddles.

Faulty saddles should be marked and set aside for defect procedure.

(vi) Check that the shear lever is securely locked between the stop plungers by applying reasonable pressure to the rocket, first in a forward and then in a backward direction.

(vii) When all rockets have been loaded, plug the pigtail leads into the sockets in the rear end of the beam. If Mk. IV/TH motors are used, the length of the pigtail lead must be suitably adjusted with the clip provided.

Important Note.—Owing to the proximity of the two outboard rails on each wing to the ailerons, only rockets having motors (Mk. III/TH or IV/TH) fitted with weak-link pigtail leads must be used in these positions, to obviate any damage to the ailerons by the remnant of the pigtail lead after firing. Preferably, however, Mk. III/TH or IV/TH motors should be used on all beams when supply permits.

(viii) Set the auto-selector switch to "1."

(ix) Just prior to the aircraft taking off, the 5-pin plugs are to be plugged into the sockets in each wheel well.

WARNING. — ENSURE THAT PERSONNEL ARE WARNED TO STAND TO THE SIDE OF THE PROJECTOR, AND CLEAR OF THE NOSE OF THE ROCKETS AND THE BACKS OF THE MOTORS WHEN MAKING THE CONNECTIONS GIVEN IN SUB-PARA. (VII) AND (IX).

Unloading

32. BEFORE COMMENCING ANY UNLOADING OPERATIONS, THE R.P. MASTER SWITCH MUST BE SWITCHED OFF, AND THE ACCUMULATOR DISCONNECTED.

33. (i) Remove the two 5-pin plugs from the sockets in the wheel wells, and the eight firing plugs from the projectors.

(ii) Coil the pigtail lead in the venturi, and seal the end of the motor with a suitable adhesive tape, or replace the transit cover, to keep the lead in this position.

(iii) Operate the stop assembly mechanism to lift the front plunger, and slide the rocket forward off the beam. (Two men are required for this).

Harmonisation procedure

34. The harmonisation diagram is given in Sect. 5.

35. The method of adjusting the rails for harmonisation is as follows :—

- (i) Remove the fairings from the front and rear struts on each rail.
- (ii) Slacken off the two lock-nuts on the adjusting stud.
- (iii) Slacken the two securing bolts of the socket, and the rear securing bolt of the front suspension spigot, to allow the rear end of the beam to be moved for azimuth adjustment. The amount of adjustment is limited by the length of the slotted holes in the socket.
- (iv) After adjustment in azimuth, tighten up the securing bolts.
- (v) Adjust the elevation of the rear end of the beam by turning the adjusting stud clockwise or anti-clockwise as necessary.

Note.—When adjusted, test that the adjusting stud has not been screwed too far out of the trunnion block by checking that the end of the stud is visible through the inspection hole in the rear mounting bracket. If it cannot be seen, a fresh adjustment must be made to ensure that a sufficient number of threads are engaged between the screw and the trunnion.

- (vi) When adjusted, clamp the adjusting stud with the two lock-nuts.
- (vii) Replace the fairings over the struts.

Misfire procedure

36. In the event of an aircraft landing with misfired rockets, the following procedure is to be adopted :—

- (i) Switch OFF the R.P. master switch while the electrician disconnects the accumulator.
- (ii) Remove the 5-pin plugs from the sockets in the wheel wells.
- (iii) Remove the firing plugs from all rounds still on the beams, dealing first with any round which has obviously misfired.
- (iv) Unload the rocket as stated in para. 33.
- (v) Unscrew and remove the projectile from the rocket motor.
- (vi) Set aside the motor for action in accordance with A.P.2608A, App. 12.
- (vii) The electrician shall test the complete installation and wiring to ensure that the misfire is not due to an electrical fault in the installation or aircraft circuits.

WARNING.—ALL PERSONNEL MUST STAND TO THE SIDE OF THE ROCKET WHEN MAKING THE OPERATIONS DETAILED IN SUB-PARA. (II) TO (V) ABOVE.

CHAPTER 5

R.P. INSTALLATIONS Mk. I and I/IIIA IN BEAUFIGHTER AIRCRAFT

LIST OF CONTENTS

	<i>Para.</i>
Leading particulars	
Weight of R.P. installation	1
Stores Reference numbers	2
General description	3
Blast plate assembly	6
Electrical wiring and equipment	10
Landing lamp windows	13
R.P. cockpit controls	14
Sight	15
Instructions for use	
Fitting the projector to the aircraft	18
Preparing the Mk. IIIA beam for use	25
Loading	27
Mk. I beams	28
Mk. IIIA beams	30
Unloading	32
Mk. I beams	33
Mk. IIIA beams	34
Harmonisation procedure	35
Misfire procedure	41

LIST OF ILLUSTRATIONS

Fig.

- 1.—The Mk. I R.P. installation on the Beaufighter aircraft (loaded)
- 2.—Front three-quarter view of the projector (Mk. I beams)
- 3.—Side and rear views of the projector (Mk. IIIA beams)
- 4.—Wiring diagram (Beaufighter VIC and XIC aircraft)
- 5.—Wiring diagram (Beaufighter X aircraft)
- 6.—Loading the projector (Mk. IIIA beams)

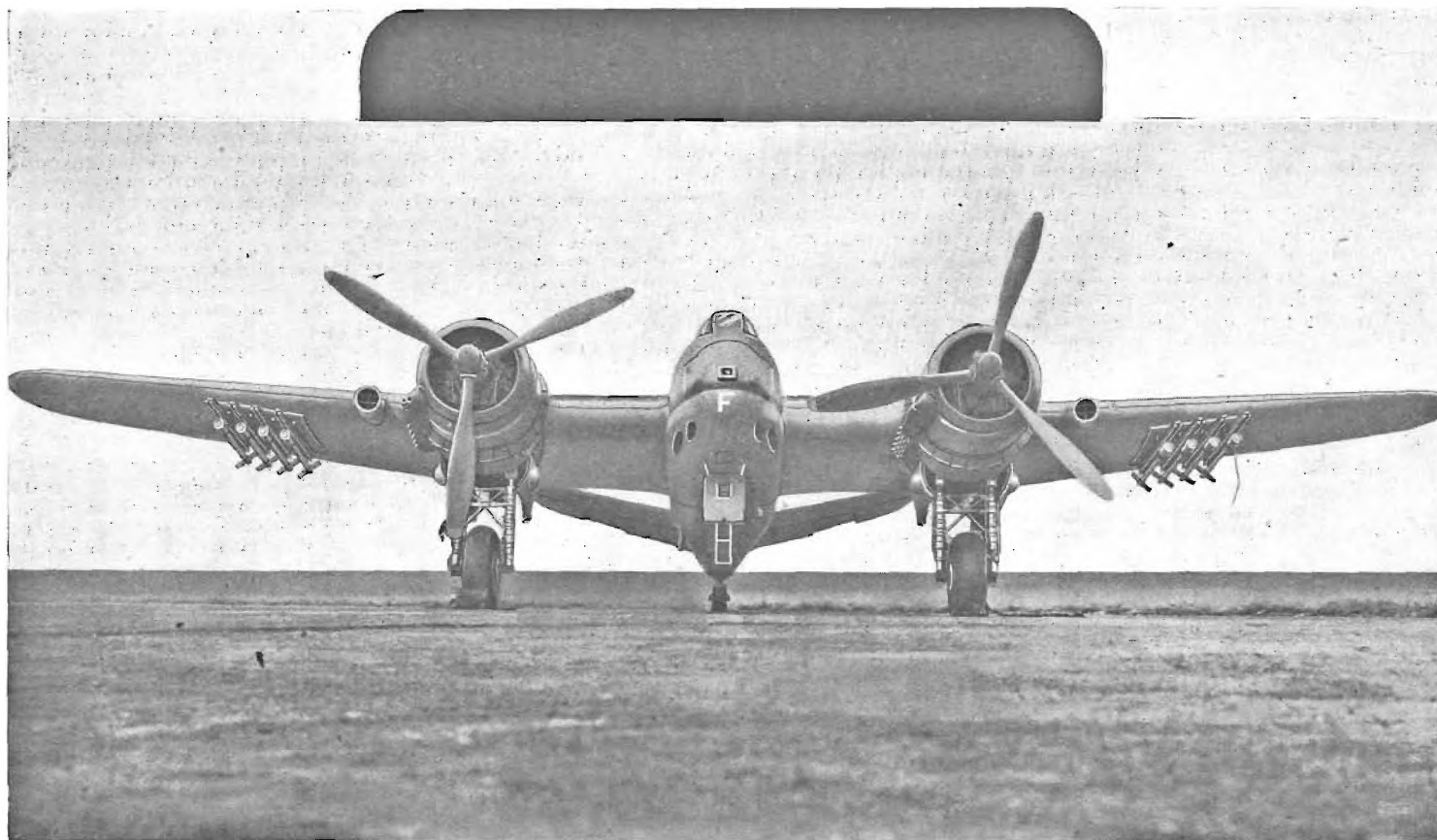


FIG. 1
The Mk. I R.P. installation
on the Beaufighter aircraft (loaded)

CHAPTER 5

R.P. INSTALLATIONS Mk. I and I/IIIA IN BEAUFIGHTER AIRCRAFT

Leading particulars

Weight of R.P. installation

1. Total weight of installation, unloaded :—	
Fitted with Mk. I beams	410 lb. approx.
Fitted with Mk. IIIA beams	290 lb. approx.
Weight of removable fittings and beams :—	
Mk. I beams	393 lb. approx.
Mk. IIIA beams	273 lb. approx.
Permanent extra weight :—	
Wing fixtures	10 lb. approx.
Wiring and switches	7 lb. approx.

Stores Reference numbers

2. The following Stores Reference numbers have been allocated to this installation :—	
Aircraft rocket projector, Mk. I (Beaufighter)—port	11C/2683
Aircraft rocket projector, Mk. I (Beaufighter)—starboard	11C/2684
R.P. beam, Mk. I	11C/2628
R.P. beam, Mk. IIIA	11C/2648
Adapter, Mk. IIIA	11C/2719

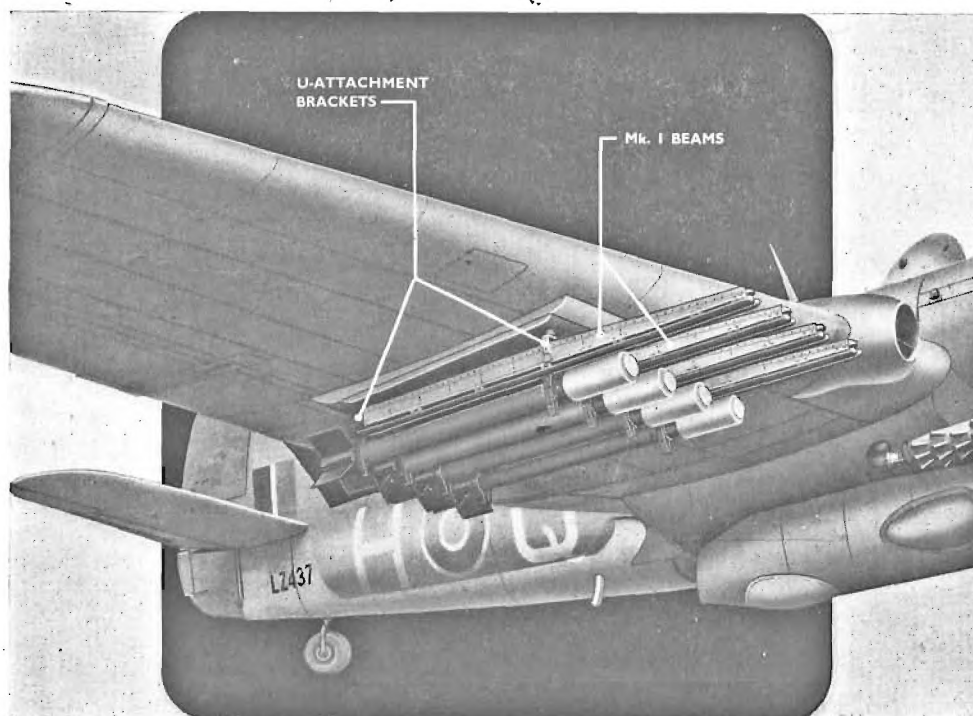


Fig. 2.—Front three-quarter view of the projector (Mk. I beams)

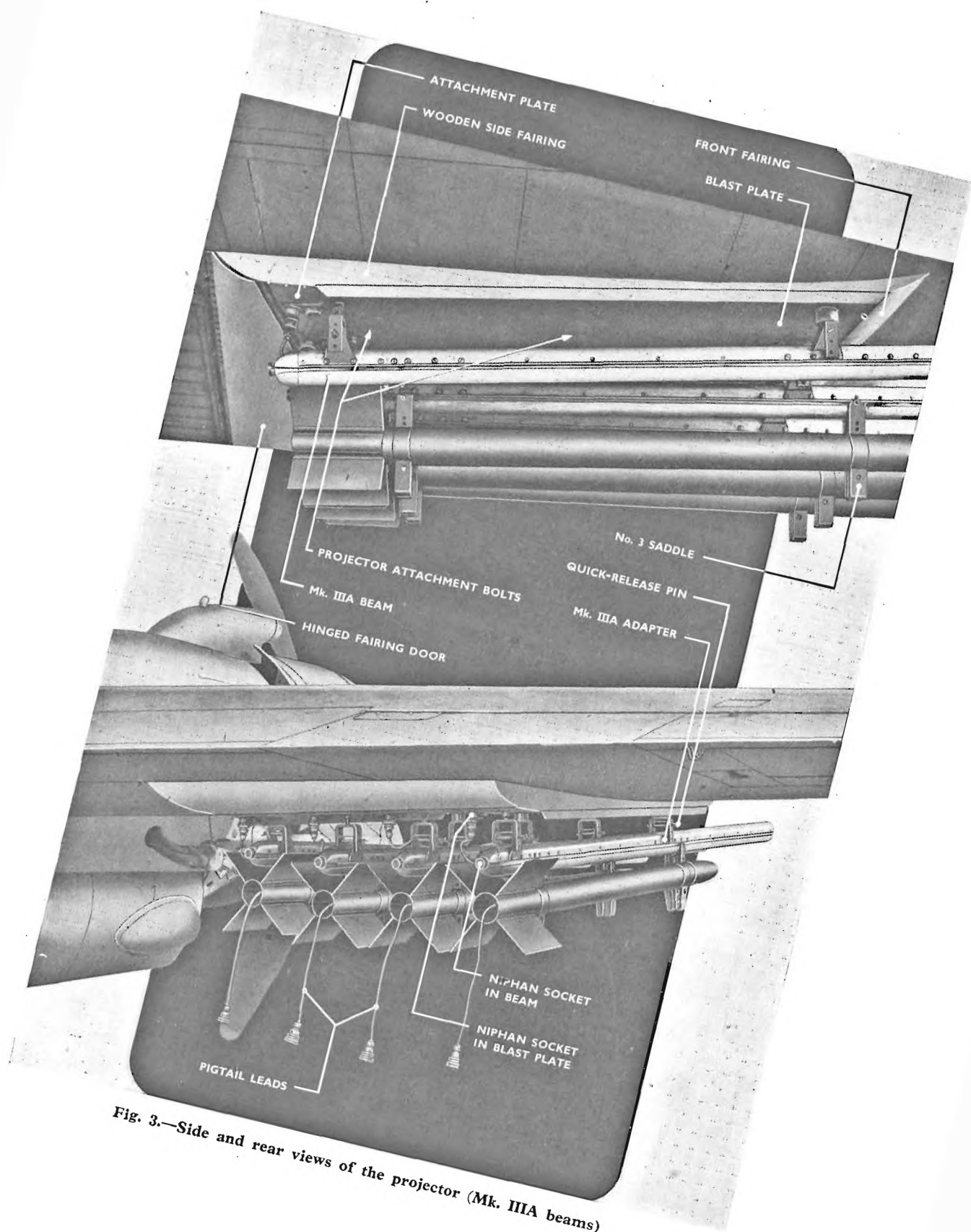


Fig. 3.—Side and rear views of the projector (Mk. IIIA beams)

General description, fig. 1 to 5

3. The R.P. installation in the Beau-fighter aircraft consists of a standard Mk. I projector mounted under each mainplane outboard of the landing light so that the inboard rocket on each projector is 1 ft. clear of the propeller disc. The Mk. I projector is identical with that described in Sect. 2, Chap. 1, with the addition of front, rear and side fairings to improve its aerodynamics. R.P. are fitted to Beau-fighter VIC, X and XIC aircraft.

4. To reduce weight and further to improve its aerodynamics, the Mk. I box beams may be replaced by Mk. IIIA beams and Mk. IIIA adapters, see Sect. 2, Chap. 2.

5. The normal loading of the installation is eight rockets but with tier-carriage loading it is possible to carry twice that number, that is two rockets on each Mk. IIIA beam, using No. 4 saddles.

Blast plate assembly, fig. 2 and 3

6. The blast plate is secured to the wing by eleven $\frac{1}{4}$ in. B.S. F. bolts; four near the forward edge, three near the centre, and four near the rear edge. The bolts screw into nut plates fixed inside the wing, and are fitted with chamfered washers and tab washers for locking purposes. Three laterally arranged wooden distance pieces are interposed between the blast plate and the wing skin at the three securing bolt positions.

7. The leading edge of the blast plate is faired into the leading edge of the wing, and wooden side panels, secured to the front and rear distance pieces by No. 4 $\times \frac{3}{4}$ in. csk/hd. wood screws, close the gap between side edges of the blast plate and the wing skin.

8. An attachment plate is bolted to the rear edge of the blast plate by ten screws, extending about 2 in. beyond the rear edges of the Niphan socket brackets, and is suitably shaped to fit round these brackets and the junction box mounting bracket. To the rear edge of the attachment plate is riveted a hinged fairing door which swings up to and is secured to the wing skin by seventeen 2 B.A. rd/hd. screws. The blast plate is therefore faired into the wing skin on all sides.

9. The port blast plate has a rectangular hole cut in it and the starboard

plate has three; these holes are for the ejection of the ammunition belt links when wing guns are fitted. If the guns are not fitted, these holes are covered by plates, each secured by ten 2 B.A. rd/hd. screws, screwing into Simmonds anchor nut plates on the blast plate. The cover plates are stencilled in red "COVERS TO BE REMOVED WHEN WING GUNS ARE FITTED."

Electrical wiring and equipment, fig. 4 and 5

10. The electrical wiring and equipment of the R.P. installation differs slightly with the mark of aircraft, but is generally similar to that described in Sect. 2, Chap. 1. One important difference is that the normal 5-pin plug and socket connection between the projector and the mainplane is not accessible, since it is covered by the blast plate.

11. The electrical installation in Beaufighter VIC and XIC aircraft is identical, see fig. 4, except that VIC aircraft pre Mod. 1022 (not retrospective) have no breeze plug and socket connection at the joint between the mainplane and the centre section of the fuselage. The two-pole system of wiring is used, with a double-pole master switch.

Note.—The fitting of a double-pole master switch is covered by a retrospective modification (June 1945).

12. The electrical installation in Beau-fighter X aircraft, see fig. 5, differs from that in the Beaufighter VIC and XIC aircraft in the following respects:—

- (i) A 5-pin safety plug and socket connection is provided in each wheel well, between the wing break connection and the auxiliary junction box.
- (ii) The connections in the auxiliary junction box are different.

Note.—(a) These differences may not necessarily be found on Beaufighter X aircraft which have been converted from Beaufighter VIC aircraft.

- (b) The note to para. 11 applies also to the Beaufighter X.

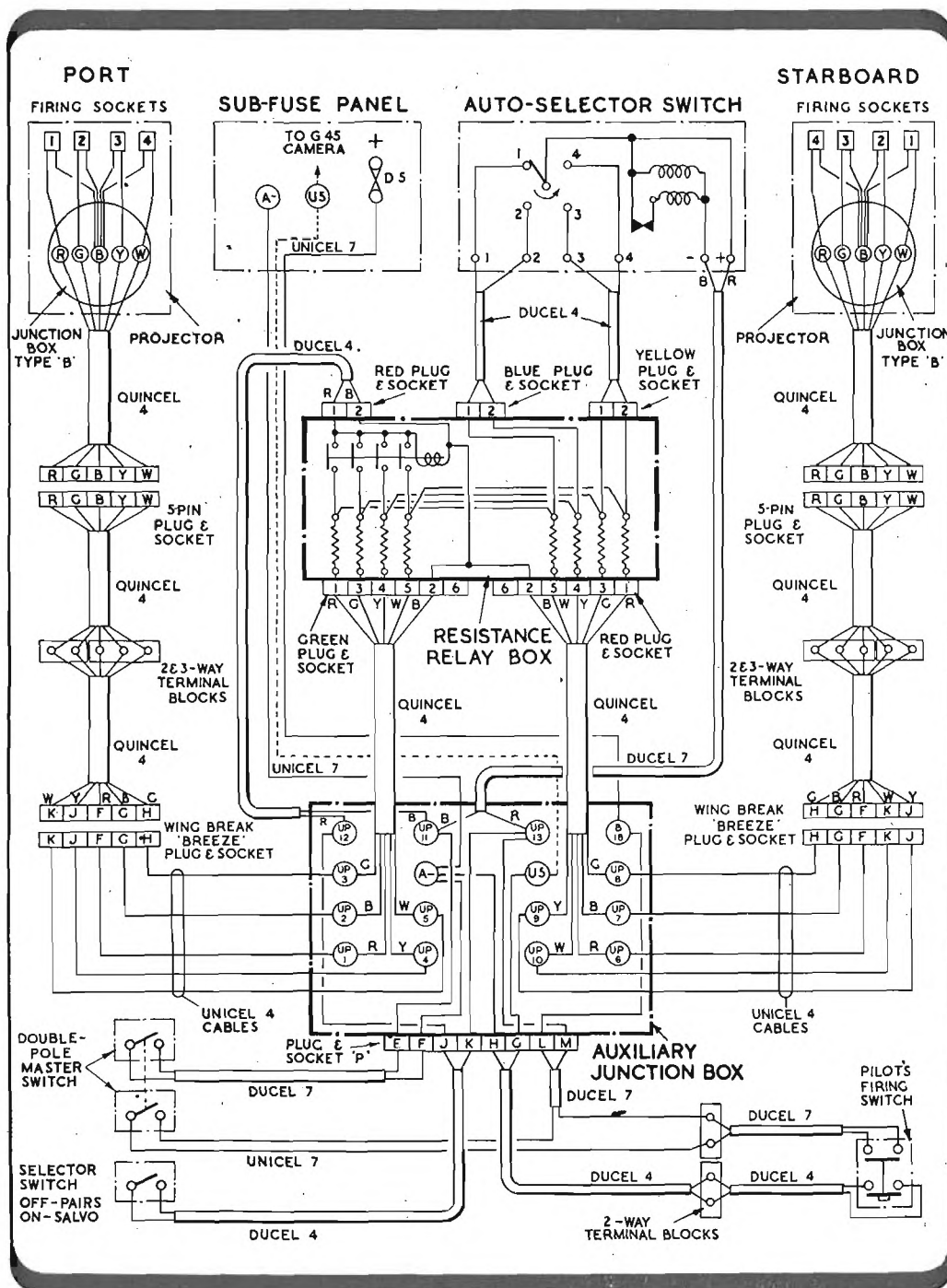


Fig. 4.—Wiring diagram (Beaufighter VIC and XIC aircraft)

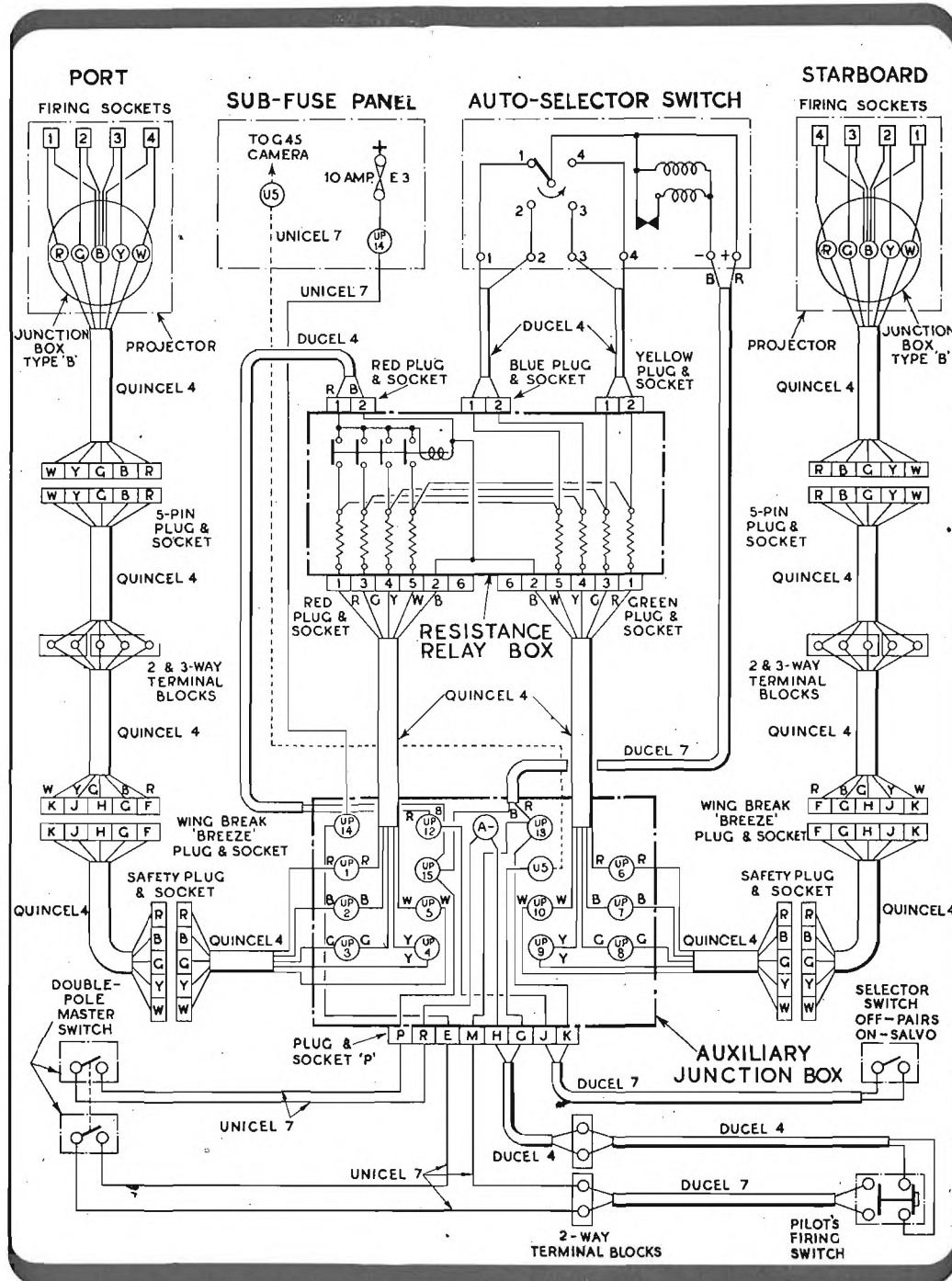


Fig. 5.—Wiring diagram (Beaufighter X aircraft)

Landing lamp windows

13. To prevent damage to the landing lamp windows by blast and debris, blanking-off plates are fitted over them when R.P.'s are carried on the aircraft.

R.P. cockpit controls

14. The R.P. controls and their situation in the cockpit are as follows:—

- (i) The R.P. firing switch is of the electrical push-button type, and is situated on the port side of the control "spectacles".
- (ii) The pairs-salvo selector switch is a general purpose switch, Type B (Stores Ref. 5C/543), and is situated below the windscreen, port centre.
- (iii) The R.P. master switch consists of two general purpose switches, Type B mechanically coupled together, and is situated on the port side of the cockpit above the throttle lever.
- (iv) The 4-way auto-selector switchbox, 24 volt, Type C, No. 2 (Stores Ref. 5D/1297), and the resistance relay box, 24 volt (Stores Ref. 5D/1165), are both situated behind the pilot's seat on the starboard side of the fuselage and are not accessible to the pilot when at the controls.
- (v) The fuse for the R.P. circuit is a 10 amp. fuse and is situated in the auxiliary fuse panel.

Sight

15. The sight used for R.P. is the gunsight projector, Type 1, Mk. I (Stores Ref. 8B/2519) with gunsight reflector, Type 1, Mk. II (Stores Ref. 8B/2517), originally known as the reflector gunsight Mk. IIL (Stores Ref. 8B/2483). This sight is basically the standard reflector gunsight, Mk. II, described in A.P.1730B, Vol. I, Chap. 2, but modified by having an adjustable reflector to permit depression of the line of sight from 0° to 5°.

16. The reflector screen is hinged to a rigid framework mounted on the outside of the standard sight bowl. Rotation of the reflector is effected by two radius arms

mounted rigidly on the framework, these being actuated by pinions held on a transverse shaft at the rear of the sight bowl. This shaft also carries a sector of a gear-wheel which is engaged by a worm gear operated by a self-locking control knob located on the right-hand side of the sight. This operating knob has a circular scale calibrated in degrees and tenths of degrees from 0° to 5°.

17. A full description of the sight will be given, in due course, in Sect. 4, but pending the issue thereof, further information may be obtained from the Armament Officer or Adjutant.

Instructions for use

Fitting the projector to the aircraft

18. Ensure that the $\frac{1}{2}$ in. B.S.F. castellated nuts on the front beam mounting brackets are correctly tightened to the blast plate, and split-pinned.

Note.—Attention is drawn to the assembly instructions given in A.P.2802A, Vol. II, Part 3, Sect. 2, Chap. I, concerning the front mounting brackets, which states that the securing nuts must not be tightened too tightly.

19. Using one of the $\frac{1}{4}$ in. B.S.F. securing bolts, clean out the screw holes in the mainplane by screwing the bolt in and out.

20. Place tab washers and the special chamfered washers on all the securing bolts (eleven).

21. Position the wooden frame, consisting of the three transverse distance pieces, the wooden side fairings and the front fairing, on top of the blast plate, line up the bolt holes, and lift the plate and frame up to the underside of the mainplane. Insert the 5-pin plug into the socket in the wing before the plate is finally positioned.

22. Loosely secure the plate, using a bolt at each corner of the blast plate; screw in the remaining bolts and tighten all bolts evenly.

23. Lock all the bolt heads by turning up the tab washers.

24. Swing up the fairing door at the rear of the blast plate to the wing skin, and secure, using seventeen 2 B.A. rd/hd. screws.

Note.—A two-man team can instal two blast plates in 1 hour, and remove them in $\frac{1}{2}$ hour.

Preparing the Mk. IIIA beam for use

25. If the projector is fitted with Mk. IIIA beams, see para. 4, the stop assembly in each beam, when delivered to the Service, is protected by a coating of lanoline. Before the beams are used, this coating must be removed with metal degreasant (Stores Ref. 33B/510, 511, or 512), and the entire stop assembly mechanism lubricated with corrosion inhibiting instrument oil, D.T.D. 561 (Stores Ref. 34A/131).

26. Full instructions for removing the lanoline and applying the lubricant are given in Sect. 2, Chap. 2, to which reference must be made.

Loading

27. Loading on the Beaufighter is done from the rear. Before commencing to load, ensure that the functioning and electrical tests detailed in Vol. II, Part 3, Sect. 2, Chap. 1, have been completed.

Mk. I beams

28. (i) Ensure that the R.P. master switch in the pilot's cabin is OFF, that the pairs-salvo switch is set to PAIRS, and that the 5-pin safety plug, when fitted, is disconnected from the socket in each wheel well.
- (ii) Remove the rear stop.
- (iii) Ensure that the pigtail lead is coiled in the venturi of the rocket and is held in place by a length of adhesive tape.
- (iv) Lift the rocket up behind the beam to be loaded, holding it at the same angle as the beam. (Two men are required for this).
- Note.*—It is best to commence loading with the inboard beam on each wing.
- (v) Engage the front saddle and slide it up the rails.
- (vi) Engage the rear saddle and slide the rocket forward until there is room to replace the rear stop.

(vii) Replace the rear stop, and push the rocket forward to ensure freedom of movement along the rails.

(viii) Raise the shear lever by depressing its projecting arm and push the rocket back to ensure that the rear saddle abuts the rear stop. Allow the shear lever to fall in front of the rear saddle and insert a length of No. 10 S.W.G. annealed copper wire through the hole in the lever and its supporting bracket and bend the ends over to keep the lever in place. Alternatively, an aluminium snaphead rivet, $\frac{1}{8}$ in. $\times$ $1\frac{1}{4}$ in. (Stores Ref. 28Q/5454), may be used as a shear pin.

Note.—If the rocket is difficult to load due to excessive friction between either the saddles and the rails or between the rocket head and the rails, the rocket should be set aside for re-gauging and fitting of other saddles. Faulty saddles should be marked and set aside for defect procedure.

- (ix) Check that the saddle is between the rear stop and the shear lever by trying to push the rocket forward.
- (x) Repeat the procedure for all the beams.

29. The rockets are now ready for connecting up, which should be done as follows, depending on the mark of aircraft concerned:—

(i) *Beaufighter VIC and XIC* :—

- (a) Check that the master switch is OFF.
- (b) Set the auto-selector switch to 1.
- (c) Just prior to take off, plug the pigtail leads into their respective firing sockets.

Note.—(i) As an additional safety precaution, it is advisable, if possible, to leave the test lamps in the

firing sockets until the moment of plugging-in the pigtail leads, so that there is a visual indication that each socket is "dead" before connecting up the rocket.

- (ii) If Mk. III/TH or IV/TH motors are used, remove the weak link adapter from the Niphan socket, plug the weak link plug into the adapter, and then plug the adapter into the socket; it is easier and more positive to make the connection with the adapter removed from the socket.

(ii) *Beaufighter X* :—

- (a) Check that the master switch is off, and that the 5-pin safety plugs in the wheel wells are disconnected.

- (b) Plug in the pigtail leads into their respective firing sockets.

Note.—See note (ii) to para. 29 (i) (c).

- (c) Set the auto-selector switch to 1.

- (d) Just prior to take-off, plug in the 5-pin safety plugs to the sockets in each wheel well.

WARNING—ENSURE THAT PERSONNEL ARE WARNED TO STAND TO THE SIDE OF THE PROJECTOR AND CLEAR OF THE NOSES OF THE ROCKETS AND REAR OF THE MOTORS WHEN MAKING THE CONNECTIONS GIVEN ABOVE.

Mk. IIIA beams, fig. 6

- 30. (i) Ensure that the R.P. master switch in the pilot's cabin is off, that the pairs-salvo switch is set to PAIRS, and that the 5-pin safety plug, when fitted, is disconnected from the socket in each wheel well.

- (ii) Ensure that the beams are undamaged and free from grit, particularly the grooves in which the shoes of the No. 3 saddles run.

- (iii) Ensure that the pigtail lead is coiled in the venturi of the motor and is held in place by a length of adhesive tape.

- (iv) Lift the rocket up behind the beam to be loaded, holding it at the same angle as the beam. (Two men are required for this).

Note.—It is best to commence loading with the inboard beam on each wing.

- (v) Engage the front saddle in the grooves of the beam, after first lining up the

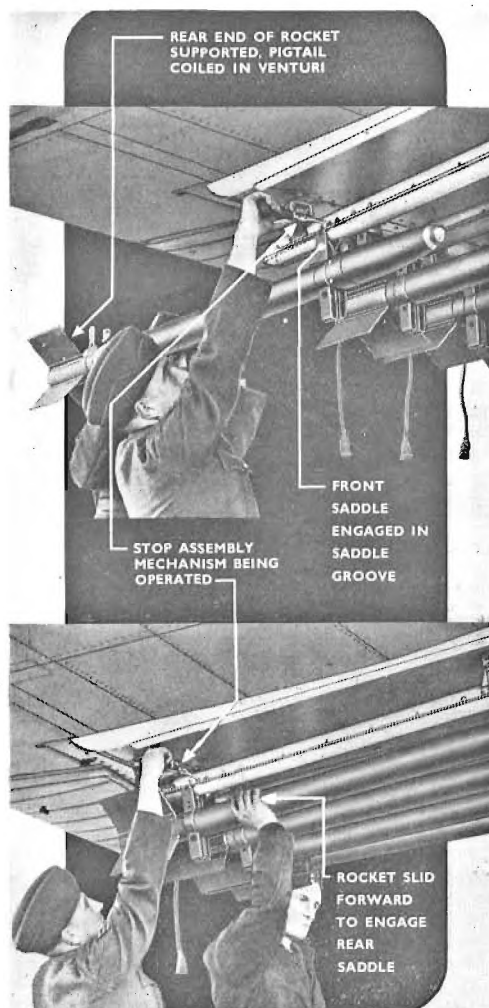


Fig. 6.—Loading the projector (Mk. IIIA beams)

saddle shoes, and slide the rocket forward until the saddle abuts the rear stop plunger.

- (vi) Actuate the stop assembly mechanism to raise the rear and front plungers successively, and allow the front saddle to pass the mechanism.
- (vii) Continue sliding the rocket forward along the beam until the rear saddle can be similarly engaged in the saddle groove, and move the rear saddle up to the rear stop plunger.
- (viii) Actuate the stop assembly mechanism to raise the rear stop plunger, allow the shear lever of the rear saddle to pass into the space between the front and rear plungers, and release the rear plunger.

Note.—(a) If desired, the front and rear saddles may be forced past the rear stop plunger, since this plunger is chamfered on its rear face and has a longitudinal slot for the free passage of the shear lever, the force being taken by the saddle itself. However, care must be taken not to slam the shear lever against the rear face of the front stop plunger.

(b) If the rocket is difficult to load on to the projector due to excessive friction between either the saddles and the beam or between the rocket head and the beam, the rocket should be set aside for regauging and fitting of other saddles. Faulty saddles should be set aside for defect procedure.

- (ix) Check that the shear lever is securely locked between the stop plungers by applying reasonable pressure to the rocket, first in a forward and then in a backward direction.

- (x) Repeat the procedure for all the beams.

31. The rockets are now ready for connecting up, which should be done as stated in para. 29 (i) or (ii), as appropriate.

Unloading

32. **Before commencing any unloading operations, the R.P. master switch must be switched off, and the accumulator disconnected.**

Mk. I beams

- 33. (i) Remove the two 5-pin safety plugs from the sockets in the wheel wells, when fitted, and the eight firing plugs from the beams.
- (ii) Coil the pigtail lead in the venturi, and seal the end of the motor with a suitable adhesive tape to keep the lead in this position.
- (iii) Remove the rear stop.
- (iv) Remove the shear wire from the hole in the shear lever.
- (v) Lift the shear lever by depressing its projecting arm and slide the rocket backwards off the rail. (Two men are required for this).
- (vi) Replace the rear stop.

Mk. IIIA beams

- 34. (i) Proceed as stated in para. 30 (i) and (ii).
- (ii) Operate the stop assembly mechanism to lift the rear plunger, slide the rocket carefully backwards until the front saddle abuts the front plunger.
- (iii) While still supporting the rear end of the rocket, operate the stop assembly mechanism, first in one direction and then in the other to raise the front and rear plungers, sliding the rocket backwards as this is being done to free the front saddle from the stop assembly mechanism, and slide the rocket off the beam. (Two men are required for this).

Harmonisation procedure

35. The harmonisation diagram is given in Sect. 5.

36. The method of adjusting the beams, whether Mk. I or Mk. IIIA, is identical. In order to gain access to the adjusting nuts on the rear U-brackets, the hinged fairing door of the projector must be opened by removing the seventeen 2 B.A. rd./hd. screws securing it to the mainplane.

37. Elevation adjustment is obtained by raising or lowering the beams, using first the coarse adjustment offered by the quick-release pins securing the beams to the U-attachment brackets, and finally by using the fine screw adjustment on the rear bracket.

38. For azimuth adjustment, the nuts on the rear bracket are slackened, and the rear end of the beam moved to one side or the other, the nuts being securely tightened and locked when correct adjustment has been made. There is no need to interfere with the securing nuts of the front U-bracket.

39. If, for any reason, the nut of the front bracket is loose, care must be taken in tightening it; if it is not tightened sufficiently the whole front bracket and beam will loosen, while if it is tightened too much, the front bracket will splay and permit the beam to have side movement on the front quick release pins. In either instance, the accuracy of the weapon will be affected.

40. The hinged fairing door must be

secured again after the necessary adjustment has been made.

Misfire procedure

41. In the event of an aircraft landing with misfired rockets, the following procedure is to be adopted:—

- (i) Switch OFF the R.P. master switch while the electrician disconnects the accumulator.
- (ii) Disconnect the 5-pin safety plug in the wheel well, where fitted.
- (iii) Remove the firing plugs from all the rounds still on the beams, dealing first with any round which has obviously misfired.
- (iv) Unload the rocket as stated in para. 33 or 34, as appropriate.
- (v) Unscrew and remove the projectile from the motor.
- (vi) Set aside the motor for inspection in accordance with A.P. 2608A, App. 12.
- (vii) The electrician will test the complete installation and wiring to ensure that the misfire is not due to an electrical fault in the installation or aircraft circuits.

WARNING—ALL PERSONNEL MUST STAND TO THE SIDE OF THE ROCKETS WHEN MAKING THE OPERATIONS DETAILED IN SUB-PARA. (ii) to (v) ABOVE.

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Section 2

PROJECTORS

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SECTION 2

PROJECTORS

LIST OF CHAPTERS

Note.—A list of contents appears at the beginning of each Chapter.

CHAPTER 1—Aircraft rocket projector, Mk. I *(To be issued later)*.

CHAPTER 2.—R.P. Beams, Mk. III.A and III.B (A.L.11)

CHAPTER 1

AIRCRAFT ROCKET PROJECTOR, Mk. I

LIST OF CONTENTS

	Para.
Leading particulars	1
Introduction	2
General description	5
Blast plate	6
Beam	10
Resistance relay box	13
Electrical installation	14
Functioning	17
Instructions for use—	
Loading	19
Loading from the front (on small aircraft)	20
Loading from the rear (on larger aircraft)	21
Unloading	22
Unloading from the front (on small aircraft)	24
Unloading from the rear (on larger aircraft)	25
Harmonisation procedure	26
Misfire procedure	29

LIST OF ILLUSTRATIONS

Fig.

- 1—Typical view of the rocket projector, Mk. I, loaded (Hurricane aircraft)
- 2—Rocket projector, Mk. I, removed from the aircraft and inverted
- 3—Rear view of the beam ends
- 4—Rear view of the projector rails
- 5—Installation circuit diagram (negative return system)

This is A.L. No. 3 to A.P. 2802A, Vol. I, and concerns Sect. 2
Delete " (To be issued later) " after title of Chap. 1 in the List of Chapters,
write " A.L. 3 " in the outer margin of the list, insert this Chapter, and
make an entry in the Amendment Record Sheet.

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ARMAMENT

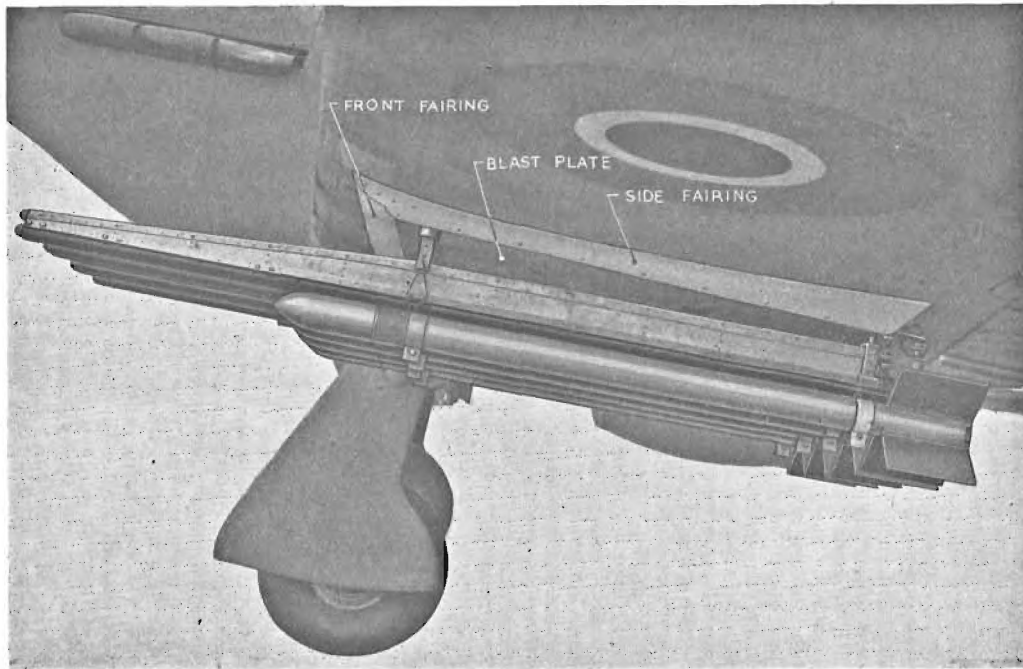


Fig. 1—Typical view of the rocket projector Mk. I, loaded (Hurricane aircraft)

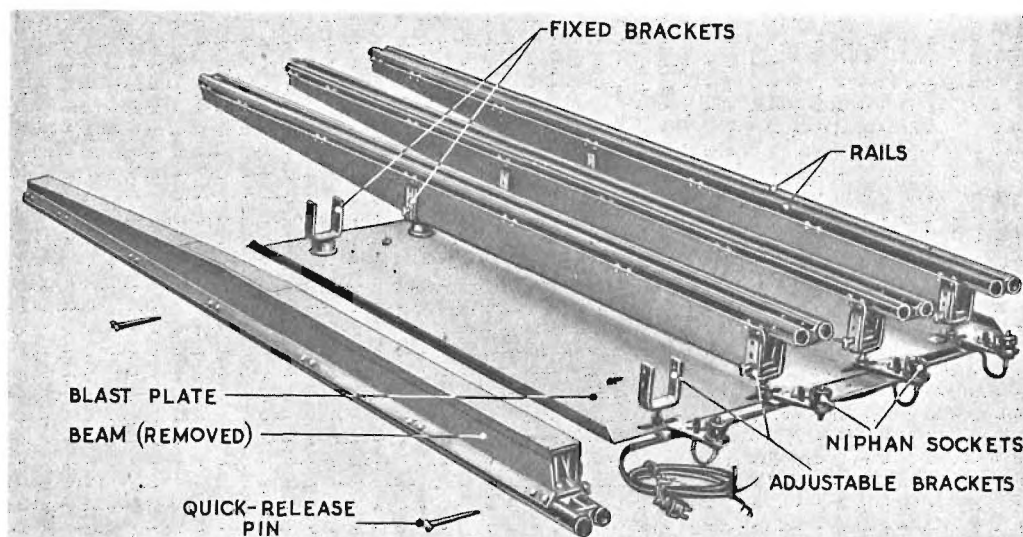


Fig. 2—Rocket projector Mk. I, removed from the aircraft and inverted

CHAPTER 1

AIRCRAFT ROCKET PROJECTOR, Mk. I

Leading particulars

1. Length of rails ... 6 ft. 9 in. approx.
- Weight of projector
(4 beams) unloaded 204 lb. approx.
- Stores Ref. No. ... 11C/2185.

Introduction

2. The Mk. I rocket projectors, together with their associated components, provide for the carriage and release of eight rockets; one projector carrying four rockets, being accommodated on each side of the aircraft. The release of the rockets is electrically controlled, and they can be released either in pairs or in a salvo of eight. Details of the rocket ammunition are given in Sect. 3.

3. The complete installation in the aircraft includes the following components:—

- (i) Two rocket projectors, Mk. I (Stores Ref. 11A/2185), one secured on each side of the aircraft.
- (ii) One resistance relay box, 12 volt (Stores Ref. 5D/1131) or 24 volt (Stores Ref. 5D/1165) mounted in any convenient position in the fuselage.

(iii) One 4-way auto-selector switch, type B, No. 2, 12 volt (Stores Ref. 5D/1296) or type C, No. 2, 24 volt (Stores Ref. 5D/1297) mounted in a conveniently accessible position in the pilot's cabin, so that the pilot can see the numbers in the indication window of the auto-selector switch and is able to reach the actuating press-button.

(iv) One firing switch, electrical push-button type (Stores Ref. 5D/534). This is only required as an addition if there is not one already available in the aircraft. It will be positioned for convenient operation either on the throttle lever or on the control handle or spectacles. (If an electrically-controlled cine camera is included, a firing switch (Stores Ref. 5C/884)—(2-circuit)—will have to be used).

(v) Two general purpose switches, type B (Stores Ref. 5C/543), one acting as a master switch in the circuit and the other for selection of pair or salvo release of the rockets. These switches are marked "R.P." and are situated in convenient, accessible positions in the pilot's cabin.

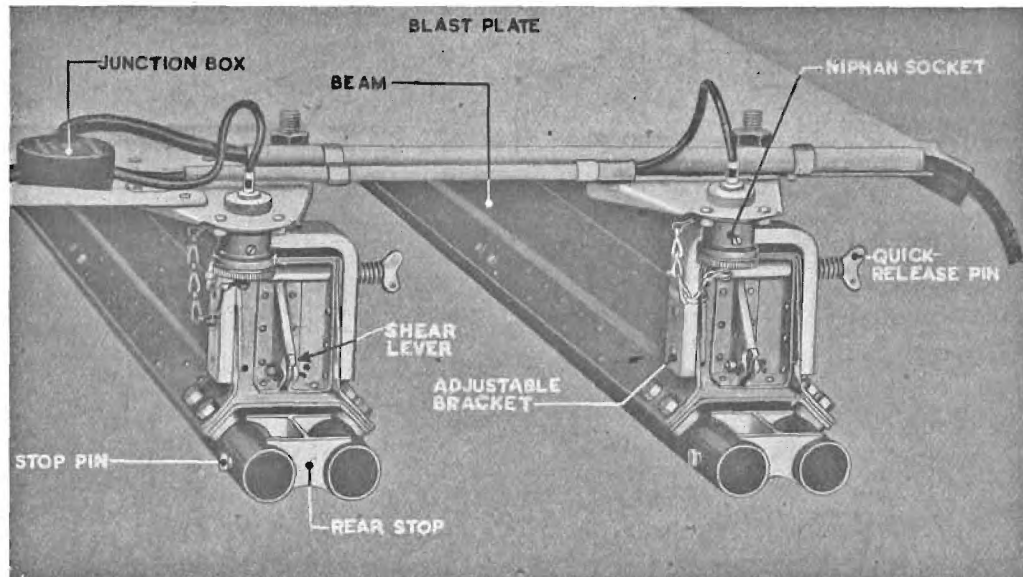


Fig. 3—Rear view of the beam ends

Note—In some installations where bombs are also carried in the aircraft, the bombing and R.P. circuits are combined to a certain extent and a 3-way switch marked "BOMBS-OFF—R.P." is then included.

- (vi) Two sockets, type A (Stores Ref. 5D/529 landplanes, or 5D/525 seaplanes) situated one under each wing or, in some installations, on each side of the fuselage near the projector stub wing.

4. When the rocket projector installation is being fitted, reference must be made to the relevant modification instructions peculiar to any particular aircraft. Brief details of the installation in certain aircraft are given in Sect. 1.

General description

5. The Mk. I projector, see fig. 1 and 2, consists of a rectangular blast plate supporting four beams, each carrying a pair of tubular rails. The weight of each projector unloaded is approximately 204 lb. The projector is standard, but different drilling points in the blast plates are necessary for different aircraft and these must be located to be clear of the beams and rails. In certain instances, apertures are cut in the blast plate to provide ejection openings for guns in the wings, and some aircraft have additional strengthening members riveted to the blast plate. Each projector must be positioned so that the innermost rail is at least 1 ft. clear of the propeller disc.

Blast plate, fig. 1 to 3

6. The blast plate is approximately 45 in. $\times$ 42 in., the two longer sides being cranked at 90 deg. along the edge for strengthening purposes, and two angle brackets being riveted along the shorter edges to provide lateral rigidity. The plate is supported with its fore and aft axis approximately in the line of flight of the aircraft at the probable attacking speed.

7. In general, the blast plate is mounted flush against the wing skin, but other methods may be required to be used in certain instances, such as, for example, suspending the blast plate from the underside of the wing on a cradle structure or mounting the blast plate as a stub wing on the aircraft fuselage.

8. Four D-shaped flat brackets project from the rear of the blast plate, fig. 4, each carrying a 2-way Niphan socket, and a spring clip, or dummy socket, to retain the cap of the socket when removed. The wiring from the four sockets passes through protective metal tubing to a Type B junction box which is secured to the upper side of a rectangular bracket between the two inner socket brackets. The quincel 4 electric cable from the junction box passes through protective metal tubing along the rear edge of the blast plate and terminates in a 5-pin plug for connection to the aircraft socket.

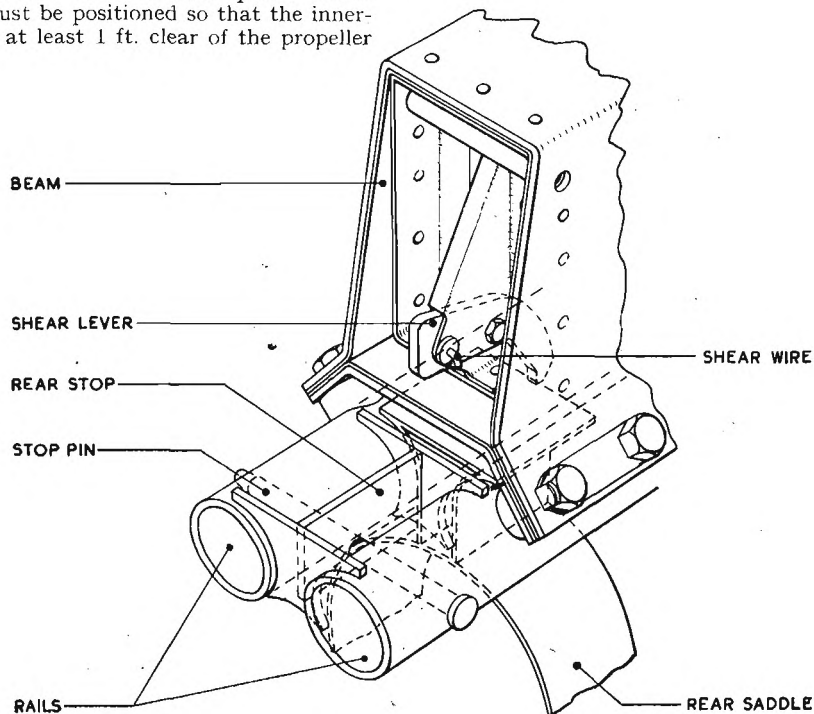


Fig. 4—Rear view of the projector rails

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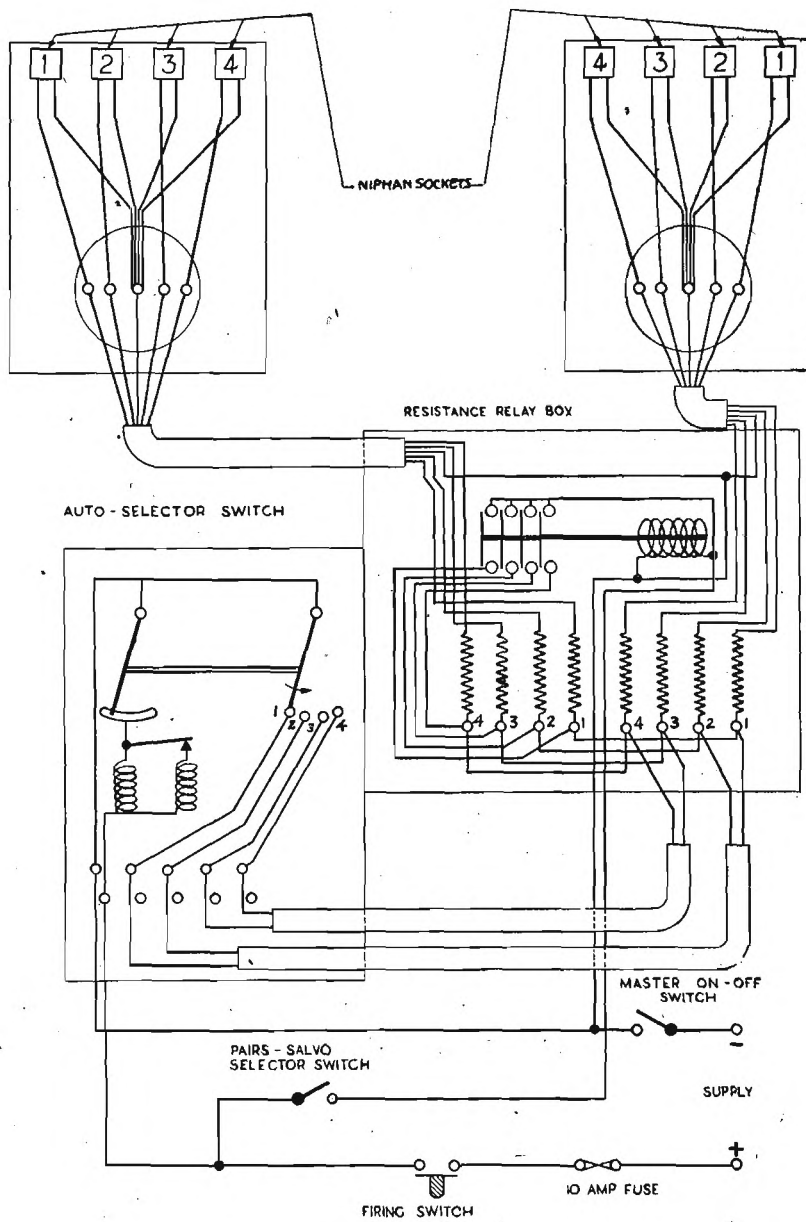


Fig. 5—Installation circuit diagram
(negative return system)

9. Eight U-shaped brackets, see fig. 2, secured to the underside of the plate provide suspension points for the four beams. The four forward brackets are fixed but the four rear bracket securing bolts pass through slots in the plate which allow for individual lateral adjustment of the beams for harmonisation.

Beam, fig. 1, 3 and 4

10. Each beam is secured to its suspension bracket by two quick-release pins, three alternative holes being provided in each bracket to provide approximate elevation adjustment. Final elevation adjustment is obtained by rotating the adjusting nuts on the rear bracket securing bolts, one nut and a lock-nut being provided on each side of the blast plate. Each beam is 6 ft. 7 in. long, of rectangular box section, built up of top, bottom and two side plates, with 12 internal diaphragm stiffeners. The box section is parallel between the two suspension points but is tapered towards the front end.

11. The tubular rails are $1\frac{1}{4}$ in. diameter and approximately 6 ft. 9 in. long. Each rail is secured to the outwardly turned flanges of the beam side plates by seven pairs of $\frac{1}{4}$ in. hex./hd. bolts passing into nut attachments inside the tube. The forward ends of the beams and rails are closed by shaped fairings of light alloy.

12. At the rear end of each pair of rails is an H-shaped stop, see fig. 4, which is detachably secured by a headed pin passing through the two rails and the stop and held by a spring wire engaging the groove in the rod. In front of this stop is an L-shaped shear lever which pivots on a $\frac{1}{4}$ in. bolt passing laterally through the supporting web at the rear end of the beam. One arm of the lever projects downwards between the rails, and the other arm projects rearwards and is held by a No. 10 S.W.G. annealed copper shear wire, or an aluminium snaphead rivet, $\frac{1}{4}$ in. $\times$ $1\frac{1}{2}$ in. (Stores Ref. 28Q/5454), which passes through holes in the adjacent sides of the supporting web and in the lever.

Resistance relay box

13. The resistance relay box consists of a rectangular metal case accommodating eight resistances and an electro-magnetic relay operating four pairs of contacts. The electrical connections of the box are made through five 2-pin plugs and sockets located, three on one end of the box and two on the opposite end. The cover is secured by two captive screws and the relay box is fixed in the aircraft by four screws passing through holes in lugs on the side of the box. The function of the relay is explained in para. 18.

Electrical installation, fig. 5

14. A list of the electrical components and their appropriate location on the aircraft is given in para. 3.

15. (i) In aircraft having an electric system with a negative return, the supply positive is connected via a 10 amp. fuse, to the firing switch. The other terminal of the firing switch is connected to the positive IN terminal of the auto-selector switchbox and also to the PAIRS-SALVO switch. The supply negative is connected to the master switch. Between the firing switch and the master switch there are three circuits; one to the IN terminals of the auto-selector switchbox; another through the auto-selector switchbox, the resistance in the relay box, to the plugs for rocket projector connection, and, via a common negative return, to the master switch; the third, via the PAIRS-SALVO switch to the relay magnet coil in the relay box.

(ii) In aircraft having an electric system with an earth return, the firing switch, PAIRS-SALVO switch and master switch are all in the positive side of the circuit.

(iii) In Fleet Air Arm aircraft the master switch is of a double-pole type to ensure both positive and negative leads are broken when the switch is OFF.

16. Each of the four output positive terminals of the auto-selector switch are connected to the relay box and, via two resistances in parallel, to the two corresponding plugs for rocket projector connection, terminal No. 1 being connected to the outboard rocket projector plug on each projector, terminal No. 2 to the next inner pair, and so on. Connections are also made between the resistance and the four contacts operated by the electro-magnet.

Functioning

17. With the selector switch set at PAIRS, auto-selector switch at 1, and the master switch ON; if the firing switch is pressed, a circuit is completed through the auto-selector switchbox to the two outer rockets which are projected. When the firing switch is released the auto-selector switch transfers the circuit to the next inner pair, so that when the firing switch is again pressed, the second pair is released. This operation is repeated each time the firing switch is pressed until all eight rockets have been projected.

18. With the selector switch set at SALVO and the master switch ON; if the firing switch is pressed, a circuit is completed via the PAIRS-SALVO switch to the electro-magnet in the relay box which is energised and closes the four pairs of contacts. This completes all eight circuits through the resistances, direct to the positive of the supply. All rockets are projected together, irrespective of the position of the auto-selector switch which is short-circuited.

Instructions for use

Loading

19. Before commencing to load, ensure that the functioning tests detailed in the daily servicing inspection in Vol. II, Part 3, Sect. 2, Chap. 1 have been completed.

WARNING—DURING ALL LOADING OPERATIONS ENSURE THAT PERSONNEL DO NOT STAND DIRECTLY IN FRONT OR TO THE REAR OF THE ROCKETS.

Loading from the front (on small aircraft)

20. (i) Ensure that the master switch in the pilot's cabin is OFF.
- (ii) Lift the front of the rocket in front of the rail to be loaded, holding it at the same angle as the rail. (2 men are required for this).
- (iii) Engage the rear saddle on to the rails and slide it down the rails, taking care to guide the pigtail carefully between the rails, or ensure that it is curled in the venturi.
- (iv) While still supporting the forward end of the rocket, engage the front saddle.
- (v) The armourer who has been supporting the front of the rocket must now go to the rear of the projector and lift the shear lever tongue by depressing its projecting arm.
- (vi) The rocket is now slid carefully backwards until the rear saddle meets the rear stop. The tongue is then permitted to fall in front of the rear saddle, and the shear wire, consisting of a short length of No. 10 S.W.G. annealed copper wire, or an aluminium snaphead rivet, $\frac{1}{8}$ in. $\times$ $1\frac{1}{2}$ in., is inserted through the hole and bent over to keep the lever in place, see fig. 3.

Note—If the round is difficult to load on to the projector due to excessive friction between either the saddles and the rails, or between the shot or shell and the rails, the round should be set aside for re-gauging and fitting of other saddles. The faulty saddles should be marked and set aside for defect procedure.

- (vii) Ensure that the saddle is between the rear stop and the tongue, by trying to push the rocket forward.
- (viii) Set the auto-selector switch to 1.
- (ix) Just prior to the aircraft taking off, the plugs on the pigtail leads are to be plugged into the sockets on the projector.

WARNING—ENSURE THAT PERSONNEL ARE WARNED TO STAND TO THE SIDE OF THE PROJECTOR, AND CLEAR OF THE NOSE OF THE PROJECTILE AND THE BACK OF THE MOTOR WHEN MAKING THESE CONNECTIONS.

Loading from the rear (on larger aircraft)

21. (i) Ensure that the master switch in the pilot's cabin is OFF.
- (ii) Remove the rear stop.
- (iii) Lift the rocket up behind the rail, holding it at the same angle as the rail. (2 men are required for this).
- (iv) Engage the front saddle and slide it up the rails.
- (v) Engage the rear saddle and slide the rocket forward until there is room to replace the rear stop.
- (vi) Replace the rear stop. Push the rocket forward along the projector rails to ensure freedom of movement.
- (vii) Raise the shear lever and push the rocket back to ensure that the rear saddle is against the stop. The lever is then permitted to fall in front of the rear saddle and a length of No. 10 S.W.G. annealed copper wire is inserted through the hole and bent over to keep the lever in place, see fig. 3. Alternatively, an aluminium snaphead rivet, $\frac{1}{8}$ in. $\times$ $1\frac{1}{2}$ in. (Stores Ref. 28Q/5454), may be used as a shear pin.
- (viii) Ensure that the saddle is between the rear stop and the tongue, by trying to push the rocket forward.
- (ix) Set the auto-selector switch to 1.
- (x) Just prior to the aircraft taking off, the plugs on the pigtail leads are to be plugged into the sockets on the projector.

WARNING—ENSURE THAT PERSONNEL ARE WARNED TO STAND TO THE SIDE OF THE PROJECTOR AND CLEAR OF THE NOSE OF THE PROJECTILE AND THE BACK OF THE MOTOR WHEN MAKING THESE CONNECTIONS.

Unloading

22. BEFORE COMMENCING ANY UNLOADING OPERATIONS, THE R.P. MASTER SWITCH MUST BE SWITCHED OFF, AND THE ACCUMULATOR DISCONNECTED OR THE ACCUMULATOR MASTER SWITCH, IF FITTED, SWITCHED OFF.

23. Remove the two 5-pin plugs, and the eight Niphan plugs.

Unloading from the front (on small aircraft)

24. (i) Remove the shear wire from the hole in the shear lever.
- (ii) Lift the shear lever by depressing the projecting arm, and slide the rocket forward off the rails. (2 men are required for this).

Unloading from the rear (on larger aircraft)

25. (i) Remove the rear stop.
- (ii) Remove the shear wire from the hole in the shear lever.
- (iii) Lift the shear lever by depressing the projecting arm and slide the rocket backwards off the rails. (2 men are required for this).
- (iv) Replace the rear stop.

Harmonisation procedure

26. The aircraft must be rigged laterally level and set at the correct fore and aft attitude for the type and speed of the attack to be made, and the R.P. harmonised according to the diagram prepared for the particular aircraft. Vertical harmonisation with Harmonisation Sighting Tube (Stores Ref. 1E/5223) correctly positioned, is achieved, firstly by lowering or raising the rails, using the coarse adjustment offered by the quick release pins and finally by using the fine screw adjustment on the rear adjusting bracket. For azimuth adjustment, nuts on the rear adjusting bracket are slackened and the rear of the rail is moved to one side or the other, the nuts being securely tightened when the correct adjustment has been obtained. There is no need to interfere with the securing nuts of the front brackets.

27. If, for any reason, the nut of the front bracket is loose, care must be exercised in tightening it; if it is not tightened sufficiently the whole front bracket and rail will loosen, while if it is tightened too much, the front bracket will splay and permit the rail to have side movement on the front quick-release pin. In either case, the accuracy of the weapon may be affected.

28. Full information on harmonisation of the projector will be given in Sect. 5, but pending the issue thereof, information can be obtained from the Armament Officer or Adjutant.

Misfire procedure

29. In the event of an aircraft landing with misfired rockets, the following procedure is to be adopted:—

- (i) Switch OFF the R.P. master switch, and disconnect the accumulator, or switch OFF the accumulator master switch, if one is fitted.
- (ii) Remove the 5-pin plug.
- (iii) Remove the Niphan plug of the misfired round from the projector.
- (iv) Upload the rocket as stated in para. 24 or 25, as appropriate.
- (v) Unscrew and remove the projectile from the rocket motor.
- (vi) Set aside the motor for A.I.D. inspection.
- (vii) The electrician shall test the complete installation and wiring to ensure that the misfire is not due to an electrical fault in the installation or aircraft circuits.

WARNING—ALL PERSONNEL MUST STAND TO THE SIDE OF THE ROCKET WHEN MAKING THE OPERATIONS DETAILED IN SUB-PARA. (ii) TO (v) ABOVE.

CHAPTER 2

R.P. BEAMS, Mk. IIIA and IIIB

LIST OF CONTENTS

	<i>Para.</i>
Leading particulars	1
Introduction	2
General description	
Beam	8
Attachment lugs	11
Fairings	13
Stop assembly	15
Electrical equipment	19
Functioning	21
Instructions for use	
Preparing the beam for use	22
Loading	23
Loading from the front (on small aircraft)	24
Loading from the rear (on larger aircraft)	26
Unloading	28
Unloading from the front (on small aircraft)	31
Unloading from the rear (on larger aircraft)	32
Harmonisation procedure	33
Misfire procedure	35

LIST OF ILLUSTRATIONS

Fig.

1. Typical view of the Mk. IIIA beams installed and loaded (Typhoon aircraft)
2. Mk. IIIA and IIIB beams
3. Components of the Mk. IIIA beam
4. Two halves of the beam showing the stop assembly, early manufacture
5. Two halves of the beam showing the stop assembly, present manufacture
6. Rear fairing components
7. Sectional view of the rear end of the beam
8. View of the rear end of the beam showing attachment to Mk. I blast plate
9. Sectional view of the plunger mechanism and No. 3 saddle

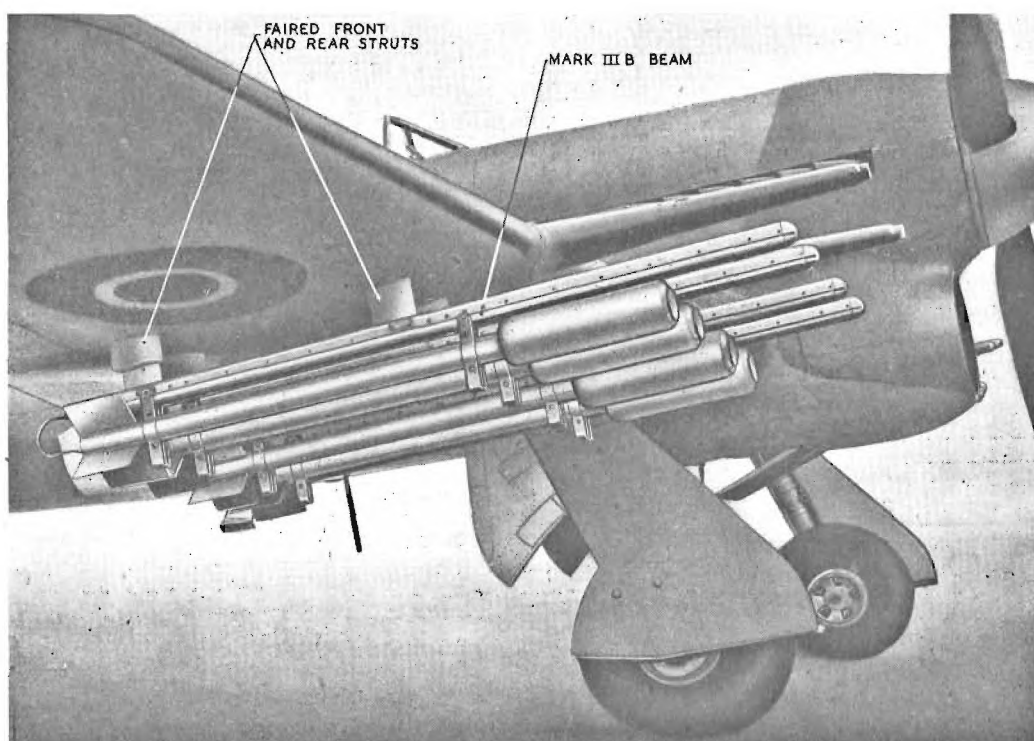


Fig. 1.—Typical view of the Mk. IIIA beams installed and loaded (Typhoon aircraft)

CHAPTER 2

R.P. BEAMS, Mk. IIIA and IIIB

Leading particulars

1. Length of beam ... 7 ft. 8½ in.
Weight of one beam without struts ... 20½ lb.
Stores Ref. numbers:—
Beam, Mk. IIIA ... 11C/2648
Beam, Mk. IIIB ... 11C/2720
Removable fittings Mk. IIIB (Typhoon a/c) 11C/2698
Removable fittings Mk. IIIA (Tempest a/c) ... 11C/2723

(For fittings for other aircraft refer to A.P.1086).

Introduction

2. The Mk. IIIA or IIIB beam is a separate item of equipment, and eight beams, together with removable fittings, are fitted on certain aircraft instead of the two Mk. I projectors described in Sect. 2, Chap. 1. There is a considerable saving in weight over the Mk. I projector; a set of eight Mk. III beams, together with struts and fairings, weighs approx. 240 lb., compared with 408 lb. for the two Mk. I projectors. In addition there is a considerable reduction in drag, due to better stream-lining.

3. Each Mk. III beam carries one rocket and is individually secured under the aircraft wing by two struts; the innermost projector on each wing must be at least 1 ft. clear of the propeller disc. The beams are electrically connected to the other components in the aircraft installation in a similar manner to the Mk. I projector, see Chap. 1.

4. The beam is fitted with two lugs for attachment to the struts, the Mk. IIIA being the standard beam for most aircraft. The Mk. IIIB beam is fitted with two special attachment lugs and is for Typhoon aircraft only.

5. The beams and removable fittings are supplied separately and the items for any aircraft are ordered as follows:—Beam, R.P., Mk. IIIA (Stores Ref. 11C/2648), and removable fittings Mk. IIIA for—(name of aircraft). Different Stores Ref. numbers are allotted to the removable fittings for each different aircraft.

6. To make it possible for the Mk. III beam to be substituted for the Mk. I beam in aircraft already fitted with the Mk. I blast plate, two adapters, Mk. IIIA (Stores Ref. 11C/2719), are fitted to the beam instead of the two attachment lugs.

7. Before being carried on Mk. III beams, rockets must be fitted with No. 3 saddles, see Sect. 3, Chap. 2, fig. 6.

General Description

Beam

8. The beam consists of two light-alloy half-beams of approximate U-section which are fitted together, one partly within the other, to form a beam of approximate O-section, having a rectangular groove along each side in which the shoes of the No. 3 saddle run.

9. The two halves of the beam are secured together by forty-eight 2 B.A. mushroom headed screws which screw into anchored Simmonds nuts inside the beam. Some beams are in service, which have the two halves secured together by twenty-four 2 B.A. csk/hd. screws and twenty-four 2 B.A. mushroom headed screws, and care should be taken to see that csk/hd. screws are used in the countersunk holes when renewing.

10. The grooves along each side, formed by flanges on the two halves of the beam, are set during assembly to be between 0.34 and 0.36 in. wide along the whole length except for a short distance near the forward attachment lug. Here the two halves of the beam are drawn closer together, by a special ¼ in. csk/hd. screw passing vertically through the two beam halves, until the width of the groove is between 0.314 and 0.319 in. This causes the shoes of the front saddle on the rocket to be a good fit in the groove, thus steadying the rocket and in addition providing a certain amount of constraint as the rocket starts to leave the beam.

Attachment lugs

11. Front and rear lugs provide the attachment points for the beam to the aircraft. The two lugs on the Mk. IIIA are identical except that the rear lug has an elongated bolt hole approximately 1 in. long to provide a certain amount of fore and aft clearance. The lugs are approx. inverted "Y" in shape, one being secured near the rear end of the beam, the other near the middle, by four mushroom head screws. Five alternative positions spaced at 2½ in. centres are provided for each lug to allow for adjustment to the most convenient positions on the aircraft wing.

12. The two lugs on the Mk. IIIB beam are special for the Typhoon aircraft, and their upper ends are formed into box-section. The differences between the front and the rear lugs can be seen in fig. 2.

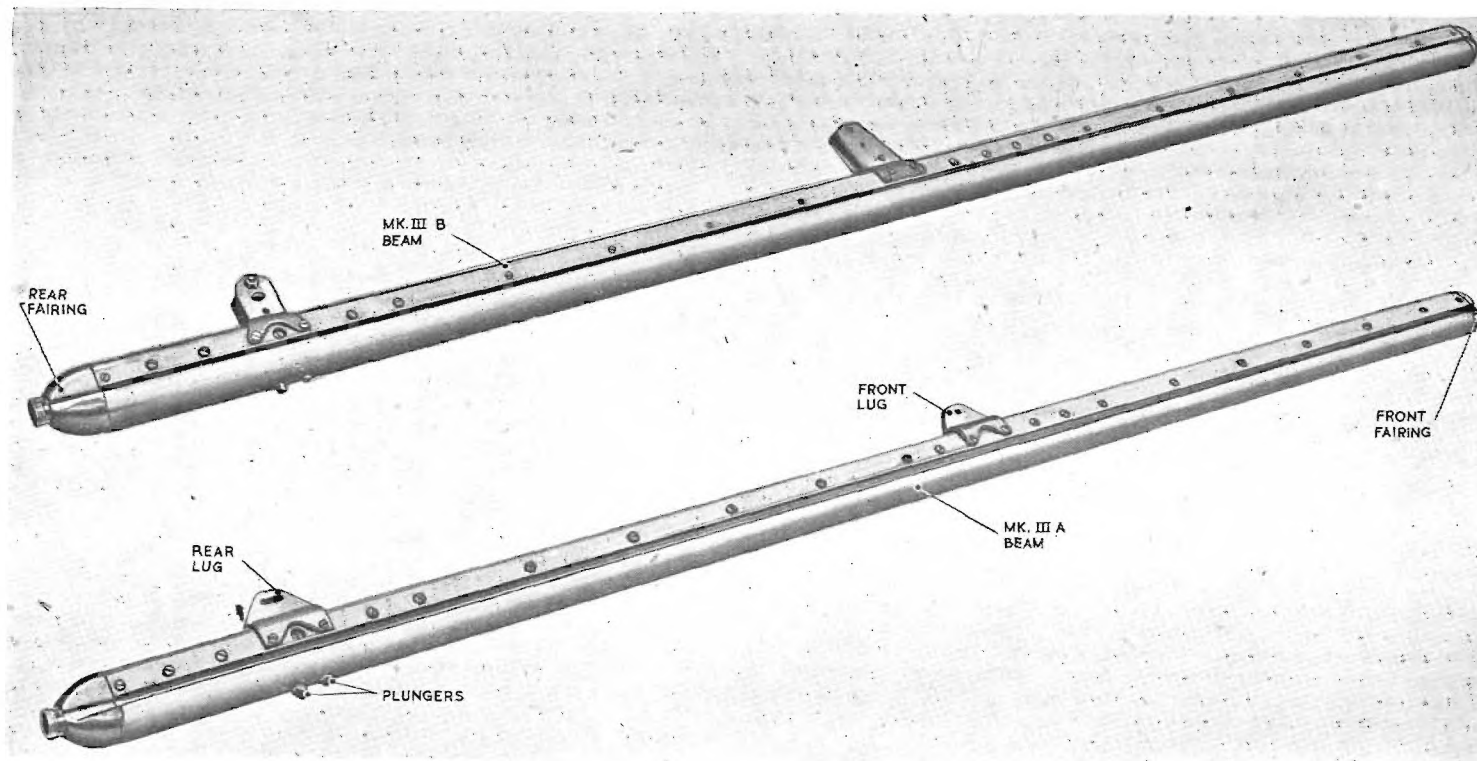
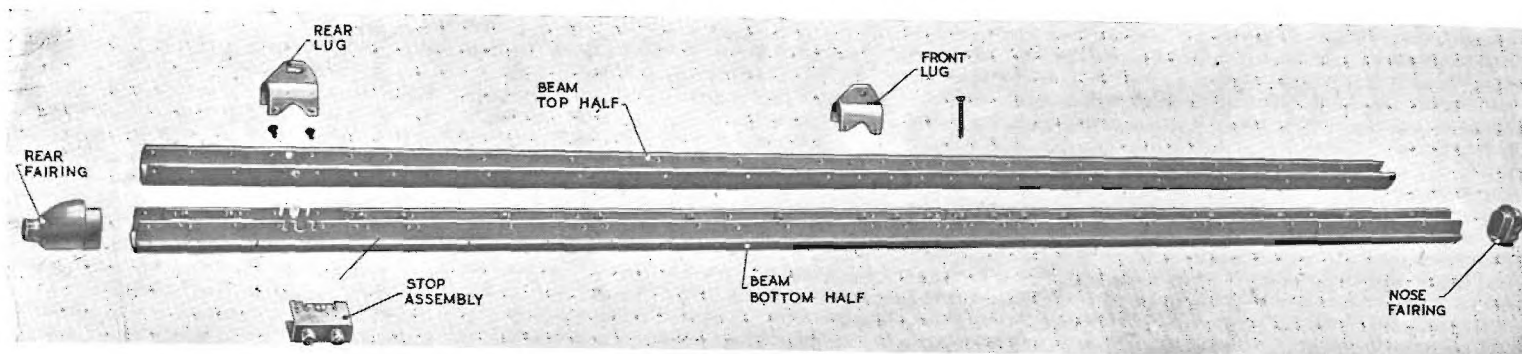


Fig. 2.—Mk. IIIA and IIIB beams



Fairings

13. At the forward and rear ends are shaped fairings which fit partly inside the ends of the beam and are secured to the beam by two of the mushroom head screws.

14. The nose fairing forms a rounded end for the beam but the rear fairing is shaped to accommodate a 2-pin socket which accepts the adapter for the weak-link connection to the rocket on Mk. III/TH and later marks of motor, or the Niphan plug on Mk. I and II motors.

Stop assembly

15. The stop assembly is housed inside the beam near the rear lug. The components of the assembly are supported by a U-shaped channel which is secured in position in the beam by four mushroom head screws. The assembly consists of the channel, front and rear stops, latch plates and bar, and four 2 B.A. anchor nuts. Two designs of stop assembly may be found in Service, see fig. 4 and 5, the main difference being that in one instance the upper ends of the plungers are supported by plunger guides in the upper half-beam, and in the other instance the guides are fixed in the stop assembly spring housings.

16. The stops are spring-loaded downwards by springs supported in barrels in the channel. Transverse pins projecting at each side of the stops, engage vertical slots in the sides of channel and thus prevent the stops rotating. The ends of pins rest in hooked ends of two latch plates which are fixed at each end of a latch pin pivoted through the channel. The latch pin can be partially turned by an actuating lever which is fixed to the end of the pin and lies alongside the beam. Rotation of the latch pin causes the hooked ends of the latch plates to lift one of the stops clear of the rocket saddle, depending upon which way the pin is turned, and so enable a rocket to be loaded or removed from the beam, either forwards or rearwards.

17. When the stop assembly is correctly positioned in the beam the front stop projects 0.3 in. and the rear stop projects 0.5 in. below the lower edge of the beam. The distance between flat surfaces formed on the facing sides of the stops is 1 in., and when a rocket is positioned on the beam the rear saddle is positioned between the two stops in such a manner that the rear surface of the saddle bears against the rear stop, and the front of the shear lever in the saddle bears against the front stop, see fig. 9.

18. The front face of the front stop is chamfered to enable it to ride up and over the shear lever as the rocket is moved into position: this should only be done when copper shear wires

are fitted. The rear face of the rear stop is similarly chamfered, to ride over the saddle when the rocket is loaded from the rear; a slot in the rear stop provides clearance for the shear lever in this instance.

Electrical equipment

19. A 2-pin Niphan socket is incorporated in the fairing at the rear end of the beam, and a length of Dumet 4 cable from the socket passes through a hole in the upper surface of the beam near the attachment lug. The end of the cable is connected to a 5-way junction box secured inside the wing, or, if the beam is attached to a Mk. I blast plate, to the junction box on the blast plate.

20. The remainder of the electrical components in the installation are connected in the same manner as the Mk. I installation described in Chapter 1.

Functioning

21. The functioning of the installation is the same as that of the Mk. I.

Instructions for use

Preparing the beam for use

22. When delivered to the Service, each beam is protected by a coating of lanoline which must be removed before the beam is used. This should be done as follows:—

- (i) If the beams are on the aircraft, disconnect the leads at the junction box, and remove the beam from the aircraft.
- (ii) Unscrew the two 2 B.A. mushroom head screws securing the rear fairing to the beam, and remove the rear fairing, 2-pin socket, and Dumet 4 cable attached.
- (iii) *Note*:—It is important to remove the cable from the beam completely to obviate the risk of the de-greasant affecting the insulation.
- (iv) Pour the metal de-greasant (Stores Ref. 33B/510, 511, or 512) through the holes in the beam immediately above the stop assembly, or through the rear of the beam, and let it wash around the stop assembly. Actuate both spring-loaded stops several times while doing this.
- (v) When the lanoline has been completely removed, drain off the de-greasant and dry the stop assembly as far as possible with a clean rag pushed in through the rear of the beam.

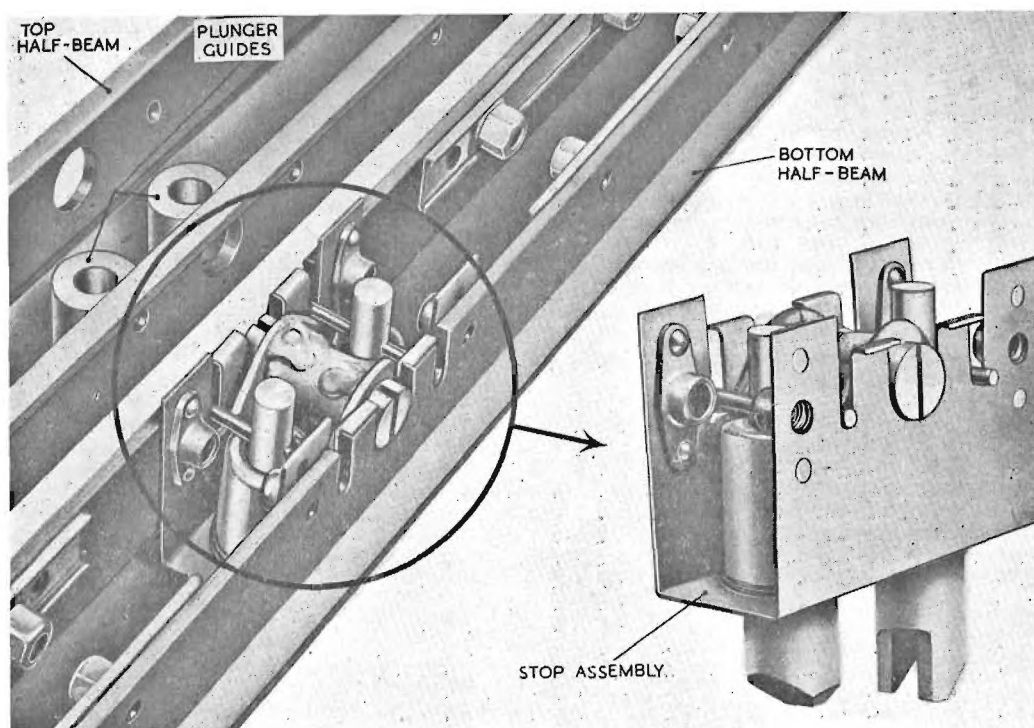


Fig. 4.—Two halves of the beam showing the stop assembly, early manufacture

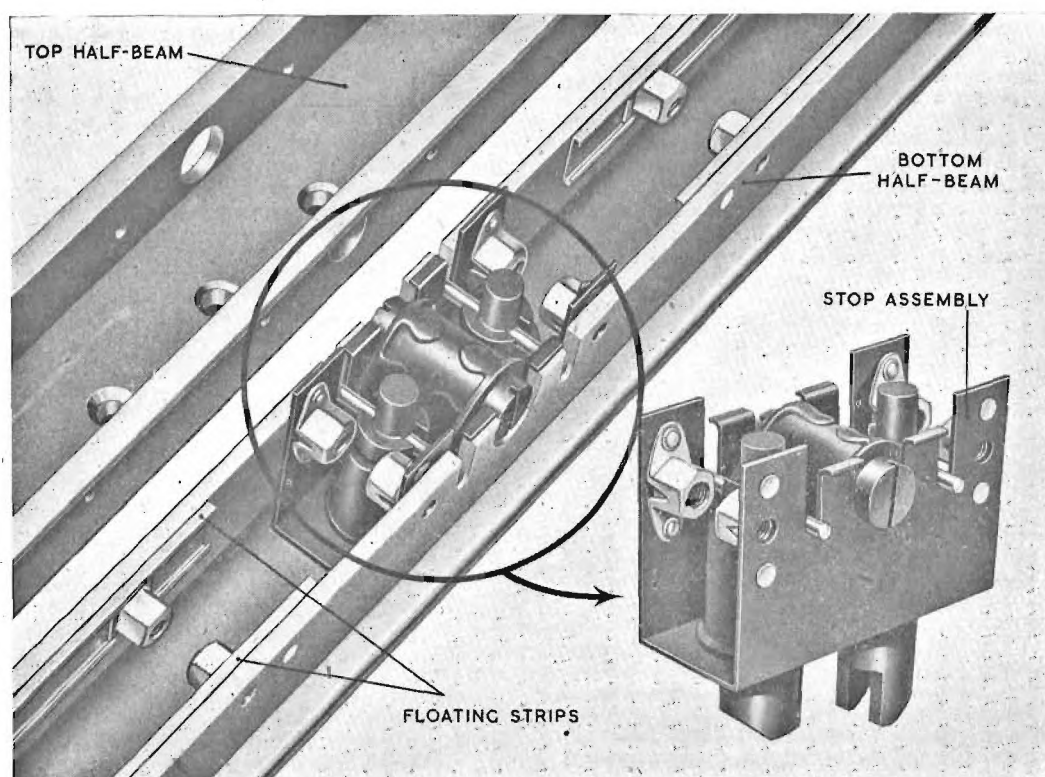


Fig. 5.—Two halves of the beam showing the stop assembly, present manufacture

- (vi) Thoroughly lubricate the stop assembly with corrosion inhibiting instrument oil, D.T.D.561 (Stores Ref. 34A/131).
- (vii) Pass the Dumet 4 cable back through the rear end of the beam and out through the foremost of the three holes in the top of the beam. The cable can be easily pulled out through this hole by using a length of twine or thin wire threaded through the hole into the beam.
- (viii) Replace the rear fairing on the beam and secure it with the two special 2 B.A. mushroom head screws.

WARNING :—During all loading operations ensure that personnel do not stand directly in front or to the rear of the rockets.

Loading

23. Before commencing to load, ensure that the electrical and functioning tests detailed in Vol. II, Part 3, Sect. 1 have been completed.

Loading from the front (on small aircraft)

- 24. (i) Ensure that the R.P. master switch in the pilot's cockpit is OFF, that the 5-pin plug is disconnected from the socket in each mainplane, and that the pairs-salvo switch is set to "PAIRS."
- (ii) Ensure that the beams are undamaged and free from grit, particularly along the saddle grooves.

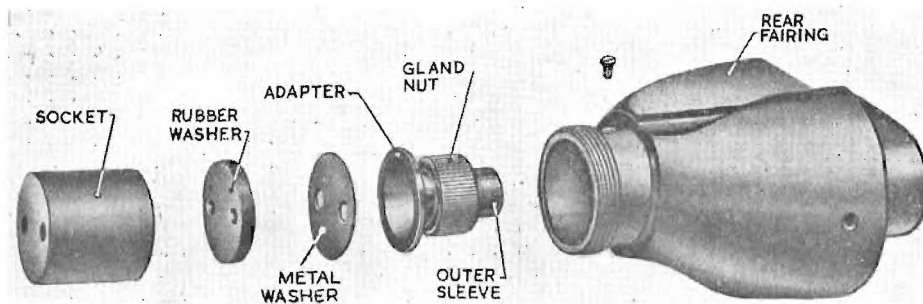


Fig. 6.—Rear fairing components.

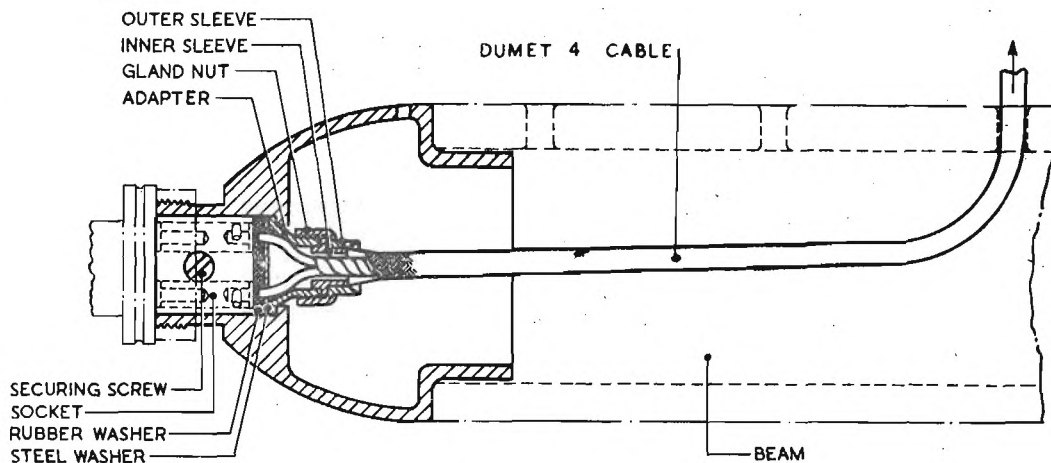


Fig. 7.—Sectional view of the rear end of the beam

- (iii) Lift the rocket in front of the beam to be loaded, holding it at the same angle as the beam (two men are required for this), and ensure that the pigtail lead is coiled in the venturi.

Note :—It is best to commence loading with the inboard beam on each wing.

- (iv) Engage the rear saddle on to the beam after first lining up the saddle shoes, and slide the rocket down the rails until the front saddle can be similarly engaged. Continue to slide the rocket along the beam until the rear saddle abuts the forward face of the front stop plunger.

Note :—The rear saddle must not be slammed against the front stop plunger, nor must any attempt be made to force the saddle past the plunger, as this may break or damage shear wire.

- (v) Operate the stop assembly mechanism, either by using the actuating lever or by using a screw driver in the slot of the plunger operating screw, to raise the front stop plunger, thus allowing the rear saddle to pass into the space between the two plungers. Release the front plunger.

Note :—If a round is difficult to load on to the projector due to excessive friction between either the saddle and the beam or between the rocket

head and the beam, the rocket should be set aside for re-gauging and fitting of other saddles. Faulty saddles should be set aside for defect procedure.

- (vi) Check that the saddle is securely locked between the stops by trying to push the rocket first in one direction and then in the other.
- (vii) Repeat the procedure for all the beams.
- (viii) Uncoil the pigtail lead from the rear of the rocket and allow it to hang down. If a Mk. III/TH or IV/TH motor is used, fit an adapter plug (Stores Ref. 5D/1335) to the weak link plug on the pigtail; it is easier to do this than make the connection with the adapter in position in the Niphan socket.

25. The projector is now ready for connecting up to the electrical installation, and should be done in the following manner :—

- (i) Check that the master switch is set at SAFE and the PAIRS-SALVO switch is set to PAIRS.
- (ii) Connect up the Niphan plugs or adapter on the pigtail of each rocket to the appropriate Niphan socket on the beam.
- (iii) Just prior to take-off, plug in the 5-pin plugs to the sockets in the main-plane or wheel well.

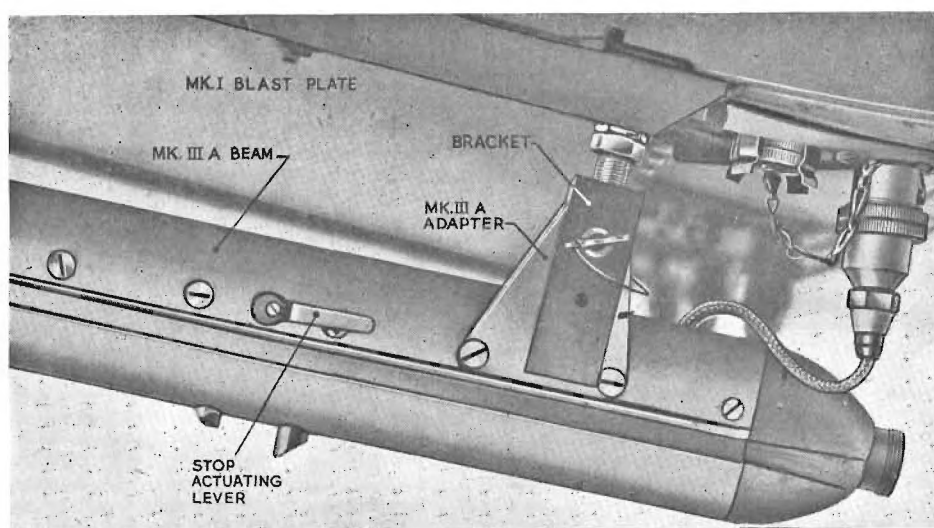


Fig. 8.—View of the rear end of the beam showing attachment to Mk. I blast plate

Loading from the rear (on larger aircraft)

26. (i) Ensure that the R.P. master switch in the pilot's cockpit is OFF, that the 5-pin plug is disconnected from the socket in each mainplane and that the PAIRS-SALVO switch is set to pairs.
 - (ii) Ensure that the beams are undamaged and free from grit, particularly along the grooves.
 - (iii) Lift the rocket up behind the beam to be loaded, holding it at the same angle as the beam (two men are required for this), and ensure that the pigtail lead is coiled in the venturi.
- Note* :—It is best to commence loading with the inboard beam of each wing.
- (iv) Engage the front saddle in the grooves of the beam after first lining up the saddle shoes, and slide the rocket forward until the saddle abuts the rear stop plunger.
 - (v) Actuate the stop assembly mechanism to raise the rear and front

plungers successively and allow the front saddle to pass the mechanism.

- (vi) Continue sliding the rocket forward along the beam until the rear saddle can be similarly engaged in the saddle groove, and move the rear saddle up to the rear stop plunger.
- (vii) Actuate the stop assembly mechanism to raise the rear stop plunger. Allow the shear lever of the rear saddle to pass into the space between the front and rear plungers, and release the rear plunger.

Note :—(a) If desired, the front and rear saddles may be forced past the rear stop plunger, since this plunger is chamfered on its rear face and has a longitudinal slot for the free passage of the shear lever, the force being taken by the saddle itself. However, great care must be taken not to slam the shear lever against the rear face of the front stop plunger.

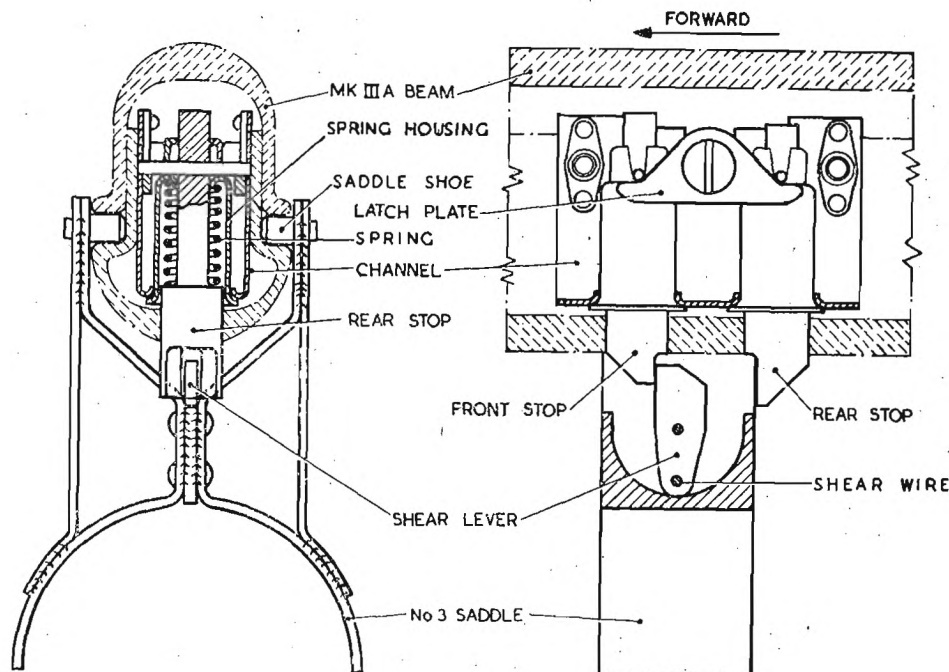


Fig. 9.—Sectional view of the plunger mechanism and No. 3 saddle

- (b) If the rocket is difficult to load on to the projector due to excessive friction between either the saddles or the beam or between the rocket head or the beam, the rocket should be set aside for re-gauging and fitting of other saddles. Faulty saddles should be set aside for defect procedure.
- (viii) Check that the shear lever is securely locked between the stop plunger by applying reasonable pressure to the rocket, first in a forward and then in a backward direction.
- (ix) Repeat the procedure for all the beams.
- (x) Uncoil the pigtail lead from the rear of the rocket and allow it to hang down. If a Mk. III/TH or IV/TH motor is used, fit an adapter plug (Stores Ref. 5D/1335) to the weak link plug on the pigtail; it is easier to do this than make the connection with the adapter in position in the Niphan socket.

27. The projector is now ready for connecting up to the electrical installation which should be done in the same manner as that described in para. 25.

Unloading

28.—*Before commencing unloading operations the R.P. Master Switch must be switched off and the Accumulator disconnected.*

29. Remove the two 5-pin plugs and the eight Niphan plugs.

30. Coil the pigtail lead in the venturi and seal the end of the motor with a suitable adhesive tape or replace the protecting cover, to keep the lead in this position.

Unloading from the front (on small aircraft)

31. Operate the stop assembly mechanism to raise the front stop plunger and slide the rocket forward off the rails. (Two men are required for this).

Unloading from the rear (on larger aircraft)

- 32 (i) Operate the stop assembly mechanism to lift the rear plunger and slide the rocket carefully backward until the front saddle abuts the front plunger.
- (ii) While still supporting the rear end of the rocket, operate the stop assembly mechanism, first in one direction and then in the other, to raise the front and rear plungers successively, sliding the rocket backwards as this is being done to free the front saddle from the stop assembly mechanism and slide the rocket off the beam. (Two men are required for this).

Harmonisation procedure

33. Harmonisation diagrams for different aircraft are given in Sect. 5.

34. The method of adjusting the beams for harmonisation varies with different aircraft and reference should be made to the relevant chapter in Sect. 1.

Misfire procedure

- 35. In the event of an aircraft landing with misfired rockets, the following procedure is to be adopted :—
 - (i) Switch OFF the R.P. master switch while the electrician disconnects the accumulator.
 - (ii) Remove the 5-pin plugs from the sockets on the aircraft. (The position of these will vary with different aircraft).
 - (iii) Remove the firing plugs from all rounds still on the beams, dealing first with any round which has obviously misfired.
 - (iv) Unload the rockets as stated in para. 28 onwards.
 - (v) Unscrew and remove the projectile from the rocket motor, and set the motor aside for A.I.D. inspection.
 - (vi) The electrician will now test the complete installation and wiring to ensure that the misfire was not due to an electrical fault in the aircraft.

*This leaf issued with A.L. No. 1
July, 1944*

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Section 3

AMMUNITION

SECTION 3

AMMUNITION

LIST OF CHAPTERS

Note.—A list of contents appears at the beginning of each chapter

- CHAPTER 1—General notes on aircraft rocket ammunition
- CHAPTER 2—Aircraft rocket motor, 3 in., No. 1, Mk. 1 to 4
- CHAPTER 3—25 lb. shot—A.P., S.A.P., and practice
- CHAPTER 4—60 lb. shell—S.A.P./H.E., and practice
- CHAPTER 5—Smoke container, No. 1, Mk. 1
- CHAPTER 6—H.E. shell, 60 lb. "F", and fuze, D.A., No. 899, Mk. 1
- CHAPTER 7—Saddles No. 1, 2, 3 and 5
- CHAPTER 8—Saddles No. 4 and 8
- CHAPTER 9—Saddle positioning jig, No. 1, Mk. 2 (*To be issued later*)
- CHAPTER 10—Saddle positioning jig, No. 2, Mk. 2 (*To be issued later*)
- CHAPTER 11—Triplex ammunition and No. 7 and 9 saddles (*To be issued later*)

CHAPTER I

GENERAL NOTES ON AIRCRAFT ROCKET AMMUNITION

LIST OF CONTENTS

	<i>Para.</i>
Introduction	1
Ancillary equipment	6
Saddle positioning jig	7
Transporting cradle	10
Assembling	12
Assembling the fins	13
Assembling the saddles	14
Testing the rocket motor	15
Assembling the round	19
Loading	21

LIST OF ILLUSTRATIONS

Fig.

- 1.—3 in. aircraft rocket ammunition
- 2.—Transporting cradle
- 3.—Loaded cradles mounted on Type C, Mk. III bomb trolley
- 4.—Detail of trolley showing method of mounting one cradle upon another

CHAPTER I

GENERAL NOTES ON AIRCRAFT ROCKET AMMUNITION

Introduction

1. The 3 in. aircraft rocket ammunition, see fig. 1, consists of the following main components:—

- (i) The rocket motor, containing the propellant charge, which is fitted with:—
 - (a) four fins and
 - (b) two saddles
- (ii) The projectile, of which there are various types, such as, for example, 25 lb. A.P., S.A.P., and practice shot, and 60 lb. H.E./S.A.P. shell.

2. The components are issued to the Service separately, and must be assembled on the site before the rocket is loaded on to the aircraft. Detailed descriptions of the components are given in subsequent chapters to this Section. Full instructions for assembling the rockets are given in para. 12 to 20.

3. The rocket is suspended on and fired (electrically) from a projector which is attached to the underside of the wing structure of the aircraft. A detailed description of the projector and instructions for its use, including instructions for loading and release of the rockets, is given in Sect. 2.

4. The advantage of this weapon is that a heavy projectile can be fired from an aircraft

without producing large recoil stresses on the aircraft; the limiting conditions as to the weight of the rocket are only governed by the wing loading imposed, and the accuracy obtainable.

5. The aircraft rocket ammunition is used for attacking a variety of targets, among which are A.F.V.s and other armoured targets, submarines, merchant shipping, locomotives, gun emplacements, tank-landing craft, and also as an anti-personnel weapon.

Ancillary equipment

6. As stated in para. 2 the components of the rocket ammunition are supplied separately and have to be assembled before loading the rockets on to the aircraft. To facilitate this, certain ancillary equipment is supplied, namely:—

- (i) Saddle positioning jig
- (ii) Transporting cradle (Stores Ref. 4G/2579).

Saddle positioning jig

7. The following saddle positioning jigs are at present in use in the Service:—

Jig, saddle positioning, rocket, aircraft, 3 in., No. 1, Mk. 2 (Stores Ref. 12N/20)

Jig, saddle positioning, rocket, aircraft, 3 in., No. 2, Mk. 2 (Stores Ref. 12N/50).

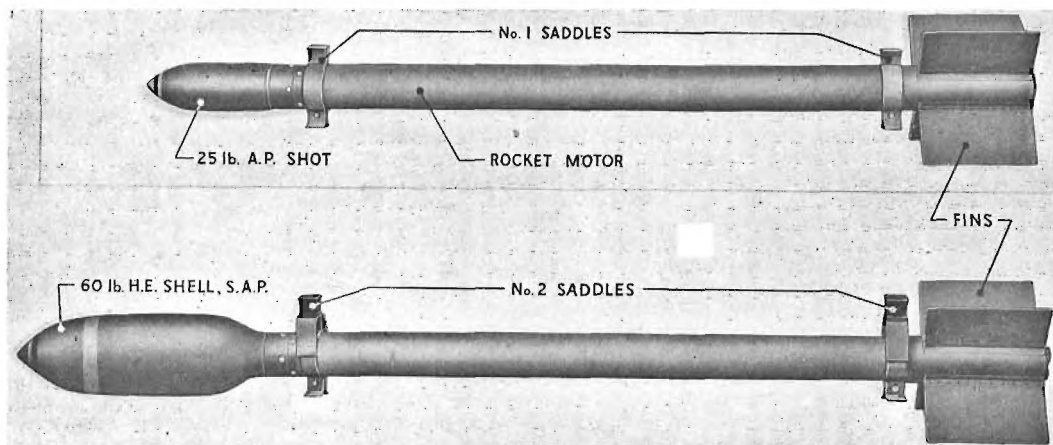


Fig. 1.—3 in. aircraft rocket ammunition

8. The No. 1, Mk. 2 jig can be used for jiggling saddles No. 1, 2 and 3. The No. 2, Mk. 2 jig can be used for jiggling saddles No. 3, 4, 5 and 8.

9. Full details of these jigs and instructions for their use are given in later chapters to this section.

Transporting cradle, fig. 2 to 4

10. A cradle is provided for transporting the assembled rounds of ammunition, which supports the motor and raises the fins and saddles from the floor of the transport vehicle. It consists of a metal frame having four V-shaped slots along each end plate, in which the rocket motor seats. To minimise damage to the motor, these slots are faced with Ferodo pads. Two quick-release straps are provided between a central bracing tube and side bracing tubes, each strap passing over and securing two rockets. At two diagonally opposite corners of the frame there is a spring-loaded screw clamp by which the cradle is secured to the main frame of a bomb trolley. In order that one cradle may be mounted upon another, recesses are formed on the upper corners of the frame into which the clamps of another cradle can be engaged, see fig. 4.

11. The method of loading and mounting the cradles on a bomb trolley are shown in fig. 3 and 4. If, however, the cradle is to be mounted on a hand-cart, lorry, or other vehicle where the securing clamps cannot be used, it is preferable to pack the rockets, heads and tails so that the weight may be more evenly distributed.

Assembling

12. Assembling must be done in the sequence of operations detailed in the following paragraphs.

WARNING:—Personnel must stand to the side of the rocket motor during assembling operations.

Assembling the fins

13. The four fins must be assembled to the motor as follows:—

- (i) Remove the protecting cover over the fin slots, leaving the cover at the opposite end of the motor in position.
- (ii) Stand the motor vertically with the front cover resting on the ground.
- (iii) Engage the tongues of the fins with the slots in the motor. Push the tongues inwards and slide the fin upwards. Tap the fin upwards with a hide-faced hammer, taking care not to bend or otherwise deform the fin. The end of

the fin should be flush with the end of the motor. Reject any fins which are not a tight fit on the motor.

- (iv) Insert a spike (the tang of a small file is quite suitable) into the upper hole in the catch which is situated midway along the fins, and press down the catch to engage the slot in the motor.

Assembling the saddles

14. Depending upon the particular saddle positioning jig in use and the particular saddle to be jiggled, instructions for assembling the saddles differ. Reference should therefore be made to the relevant chapter for the particular jig in question for detailed instructions for assembling the saddles.

Testing the rocket motor

15. After assembling the fins and saddles but before assembling the complete round of ammunition, the rocket motor must be tested for continuity of circuit. The following equipment is required for this purpose:—

Item	Stores Ref. No.	Quantity
Tester, fuze	5G/1142	1
Niphan socket (Bakelite portion only)	5A/3410	1
Adapter, single weak link	5D/1335	1
Channel end, 2 B.A., brass, tinned	5K/1494	2
Cable, electric, ducel 4	5E/1362	3 feet

16. Assemble the equipment as follows:—

- (i) Attach two channel ends to one end of the ducel cable.
- (ii) Attach the Niphan socket to the other end of the cable.
- (iii) Connect the channel ends to the two terminals of the fuze tester.
- (iv) If Mk. 3 or 4 rocket motors are being tested, plug the weak link adapter into the Niphan socket.

17. The following test must be done in the open, well clear of other operations, and away from inflammable material, with sandbags or suitable traverse at the forward end of the motor, so that no damage to personnel or material can occur if the motor accidentally ignites.

Warning.—Under no circumstances must a projectile be fitted to the rocket motor during these tests.

18. Remove the protecting covers on the ends of the motor (unless already done), uncoil the pigtail lead, and examine the pins of

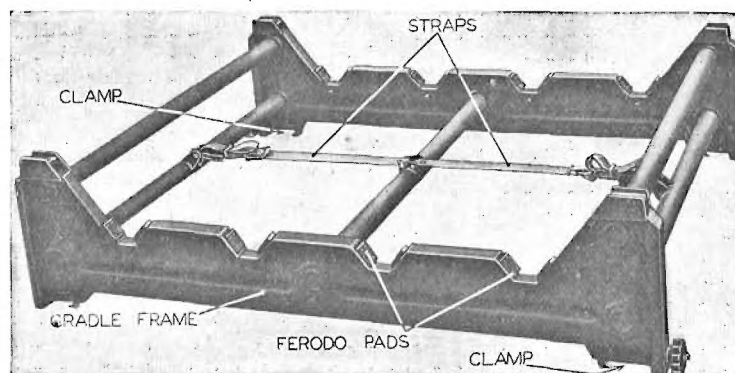


Fig. 2.—Transporting cradle

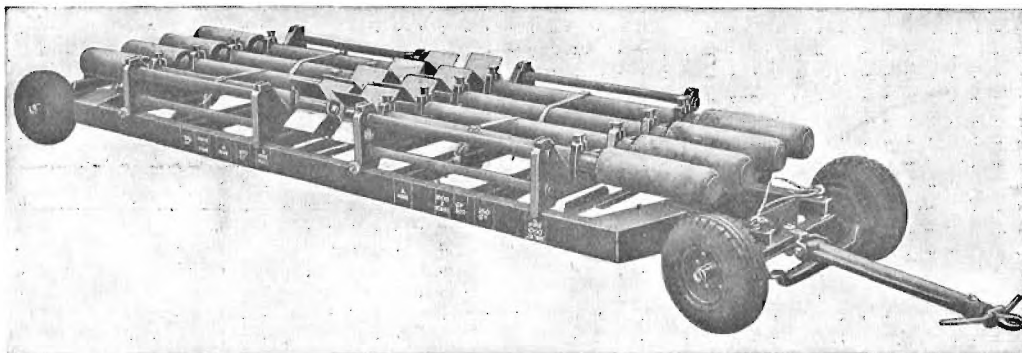


Fig. 3.—Loaded cradles mounted on Type C, Mk. III bomb trolley

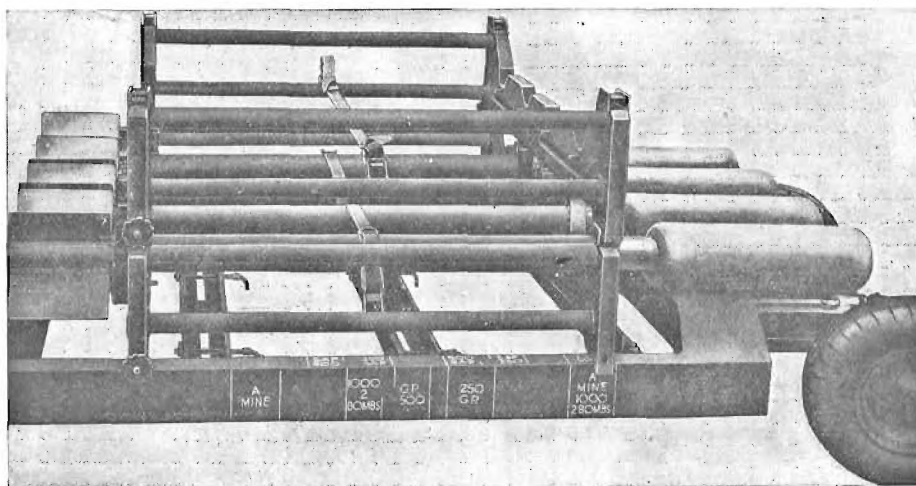


Fig. 4.—Detail of trolley showing method of mounting one cradle upon another

the Niphan plug (Mk. 2 motors), or the contacts of the weak link plug (Mk. 3 and 4 motors), to ensure that they are free from corrosion, grease, and dirt. Then test as follows:—

- (i) Connect the pigtail lead of the motor to the Niphan socket (or adapter) of the test assembly.

Important note.—The combined length of the pigtail lead and the test assembly lead enables the test to be done well clear of either end of the motor. It will be found that the fuze tester can be placed at least 3 ft. to the side of the motor at a point midway along its length.

- (ii) Depress the operating lever of the fuze tester and release it, and observe the Neon tube for illumination.

Note.—*This lever must be operated ONCE only.*

- (iii) If the Neon tube glows the motor circuit can be considered satisfactory. If the tube fails to glow, the motor is to be considered unserviceable and set aside for defect action.

Note.—When this test is done in snow-covered areas, the glare makes it practically impossible to detect the glow of the Neon tube. To obviate this, either of the following methods is suggested:—

- (a) The test should be done in an area cleared of snow, and a screen erected immediately behind the fuze tester to protect it from glare, or
- (b) A piece of 20 S.W.G. metal sheet should be shaped so as completely to close the open side of the hood of the tester, and a hole $\frac{1}{8}$ in. dia. drilled in its centre through which the tube can be viewed.
- (iv) Disconnect the pigtail lead from the Niphan socket (or adapter), and replace the pigtail in the venturi, sealing it in position suitably. The motor, if serviceable, is now ready for the final assembly operations.

Assembling the round

19. Assemble the round as follows:—

- (i) Remove the protecting cover from the adapter and wipe all surfaces very clean with a rag, remove all traces of lanoline and dirt, paying

particular attention to the screw threads.

- (ii) With a rag wipe the internal surfaces of the shell ring on the motor, in particular the screw threads and the obturator, to remove all traces of grease and dirt.
- (iii) Engage the thread on the adapter with the thread on the shell ring.
- (iv) Screw the shot or shell home using two U-wrenches (Stores Ref. 12N/21). One wrench should be positioned midway between the saddles, gripping the rocket motor firmly, and the other positioned around the largest diameter of the shot or shell, and used for screwing it home. The wrenches must be assembled with the toe pointing in the direction of rotation, and the strap threaded through from the toe and drawn tight.

Note.—(a) It is essential that the shot or shell screws hard home to prevent the escape of the propellant gases, and to prevent the shot or shell working loose when it is being carried on an aircraft in flight. If the shot or shell does not screw completely down, it must be replaced and set aside for examination.

(b) When fitting the 60 lb. H.E./S.A.P. shell, it is essential to wipe the thermal initiator free from lanoline, and to ensure that no dirt or grit gets on to it after cleaning. Ensure that the letters "TH" appear in the temperature circle on the rocket motor as only motors so marked are suitable for use with the 60 lb. shell.

- (v) Check that the shell ring is securely held in the motor tube by the studs.

20. The ammunition is now ready for loading on the aircraft and should be lifted off the jig and placed in the cradle for transporting to the loading point. Great care should be taken to ensure that the fins and saddles are not damaged while the ammunition is being moved from the assembly point to the aircraft. **On no account must the assembled rocket be rested on the ground or bench with the fins and saddles acting as supports.**

Loading

21. Full instructions for loading are given in Section 2.

CHAPTER 2

AIRCRAFT ROCKET MOTOR, 3 in., No. 1, Mk. 1 to 4

LIST OF CONTENTS

	<i>Para.</i>
Introduction	1
General description	3
Motor tube—	
No. 1, Mk. 1, 1/TH, 2 and 2/TH motors	5
No. 1, Mk. 3/TH motor	8
No. 1, Mk. 4/TH motor	13
Fins	14
Saddles	16
Propellent charge—	
No. 1, Mk. 1 and 1/TH motors	19
No. 1, Mk. 2, 2/TH, 3/TH and 4/TH motors	20
Temperature limitations	21
Identification markings	23
Supply	24
Storage	27
Assembly	30
Functioning	31

LIST OF ILLUSTRATIONS

Fig.

- 1.—Aircraft rocket motor, 3 in. No. 1, Mk. 2/TH
- 2.—Rear end of the No. 1, Mk. 3/TH motor
- 3.—Weak link lead and adapter for No. 1, Mk. 3/TH motor
- 4.—2-way weak link adapter
- 5.—Mk. 1 and 2 fins
- 6.—Section of fin showing attachment to motor tube
- 7.—Rocket motors in box M.96

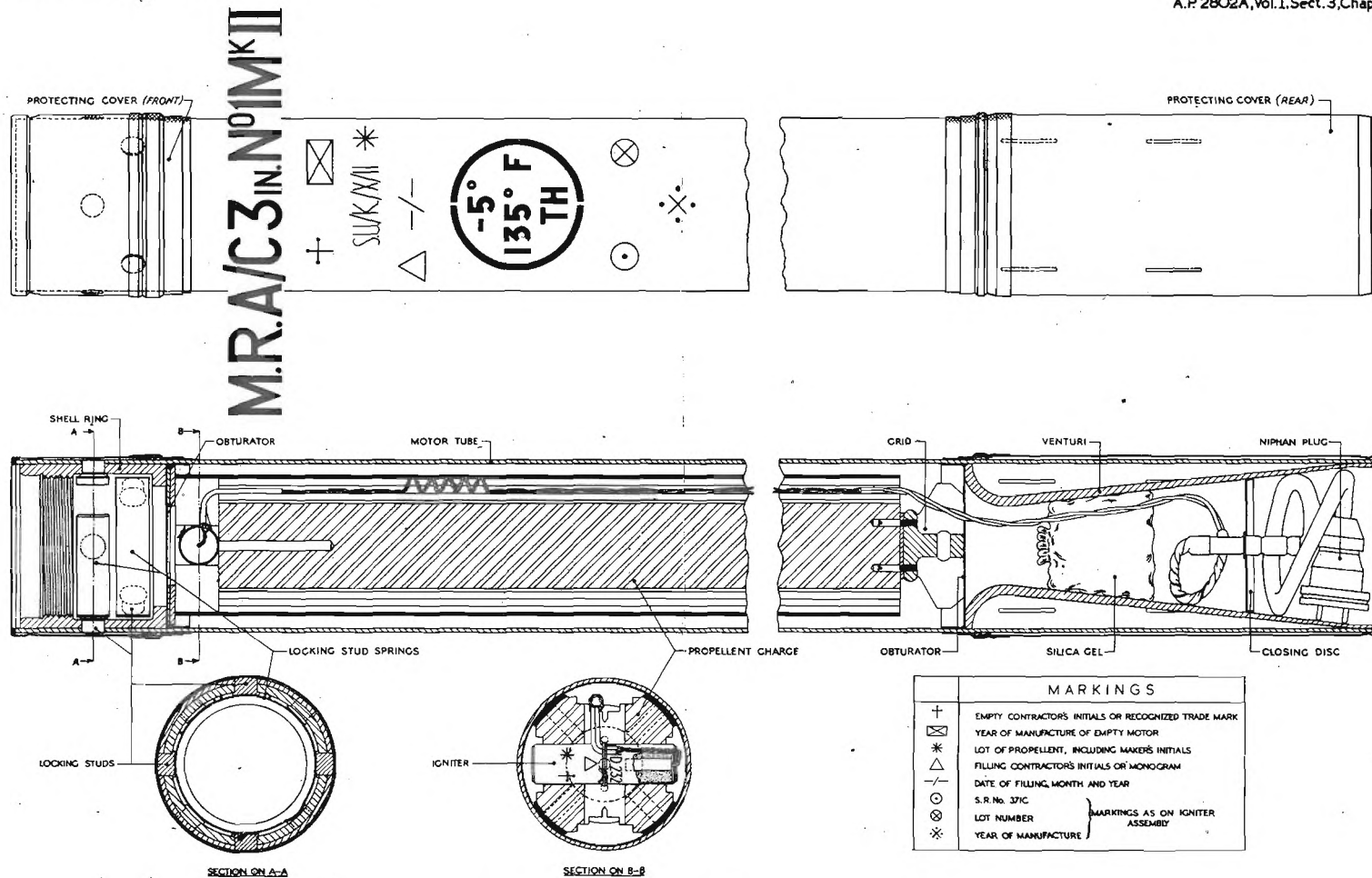


Fig.1.—Aircraft rocket motor, 3 in., No. 1, Mk. 2/TH

CHAPTER 2

AIRCRAFT ROCKET MOTOR, 3 in., No. 1, Mk. 1 to 4

Introduction

1. The rocket motor, as its name suggests, supplies the motive power necessary to propel the projectile to the target. Briefly, it consists of an electrically fired propellant charge (cordite) contained in a large metal tube with a venturi (nozzle) at the rear end through which the gases of combustion expand and so propel the rocket in flight. The projectile (shot or shell) is secured in the forward end of the motor.

2. The Stores Ref. numbers and nomenclatures of the various motors are as follows:—

Stores Ref.	Nomenclature
I2N/1	Motor, rocket, aircraft, 3 in., No. 1, Mk. 1
I2N/2	Motor, rocket, aircraft, 3 in., No. 1, Mk. 1/TH
I2N/3	Motor, rocket, aircraft, 3 in., No. 1, Mk. 2
I2N/4	Motor, rocket, aircraft, 3 in., No. 1, Mk. 2/TH
I2N/5	Motor, rocket, aircraft, 3 in., No. 1, Mk. 3/TH
I2N/28	Motor, rocket, aircraft, 3 in. No. 1, Mk. 4/TH

General description

3. There is very little difference between the various marks of motor, so that the following description can be taken to apply to all marks unless otherwise stated. The only difference between the Mk. 1, 1/TH, 2, and 2/TH motors is in the propellant charge used, whilst the Mk. 2/TH, 3/TH and 4/TH motors are identical except for the pigtail lead and plug. The symbol "TH" appearing after the mark number merely indicates that the propellant is modified to allow the motor to be used for both shot and shell, whereas the other motors can be used with shot only.

4. The rocket motor consists of the following main components:—

- (i) Motor tube
- (ii) Fins
- (iii) Saddles
- (iv) Propellant charge.

Motor tube

No. 1, Mk. 1, 1/TH, 2 and 2/TH motors, fig. 1

5. The motor tube is of steel and is 55.19 in. long and 3.25 in. dia. A shell ring, internally threaded to receive the shot or shell, and having eight spring-loaded studs, is secured in the forward end of the motor tube by the spring-loaded studs engaging corresponding holes formed in the tube. Near the rear end of the tube are eight slots for the attachment of four fins to stabilize the rocket in flight. In the interior of the tube, at the rear end, a venturi (nozzle) is fixed, through which the gases of combustion of the propellant charge expand and so propel the rocket in flight.

6. A grid to retain the propellant charge is arranged in front of the venturi. Two obturators are fitted in the motor, one between the grid and the face of the venturi and the other between the shell ring and the forward face of the propellant. The latter obturator serves as a closure for the forward end of the motor.

7. To keep the interior of the motor dry, a bag of silica gel is inserted into the rear end of the venturi and retained by a closing disc. Electric leads from an igniter embedded in the forward face of the propellant, pass along the propellant, and are secured to a pigtail lead near the rear closing disc. During transit and

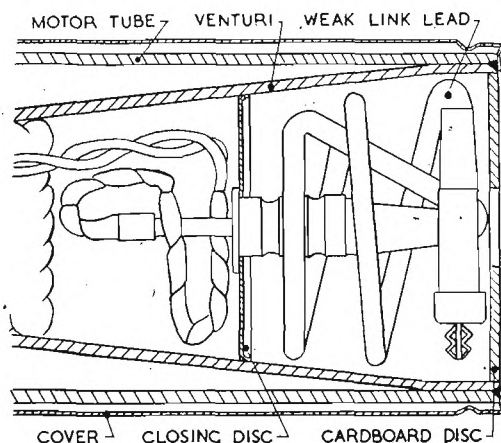
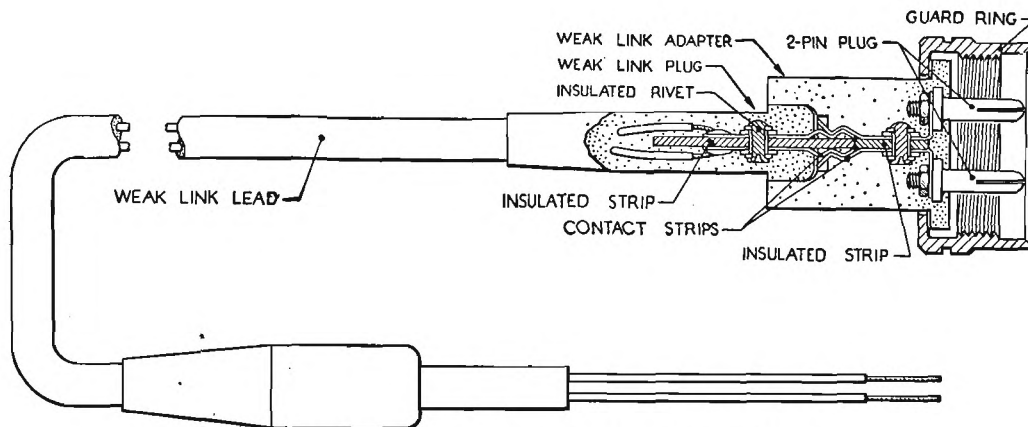


Fig. 2.—Rear end of the No. 1, Mk. 3/TH motor



storage, the pigtail lead with Niphan plug is stored in the venturi and retained in position by a protecting cover. Protecting covers are positioned over each end of the motor when issued, to prevent dirt and dust entering during transit and storage.

No. 1, Mk. 3/TH motor, fig. 2 to 4

8. The No. 1, Mk. 3/TH motor differs from the No. 1, Mk. 2/TH motor in the pigtail lead. To obviate the danger of damage to the control surfaces of the aircraft wing by the remnant of the pigtail lead and the closing disc after firing rockets fitted with either Mk. 1 or 2 motors, a weak link lead, plug and adapter have been introduced for use with the Mk. 3/TH motor. In addition, the Mk. 3/TH motor has a cardboard closing disc in the rear end of the motor tube to retain the pigtail lead in the venturi after the rear protecting cover has been removed.

9. The weak link lead and plug is 21.5 in. long and consists of a pair of conductors in a moulded rubber covering and connected at one end to contact strips arranged one either side

of an insulated strip, the whole assembly being fastened together by an insulated rivet and embedded in a moulded rubber body. The ends of the contact strips are corrugated and protrude from the body to form a male jack connection.

10. The weak link adapter (Stores Ref. 5D/1335) is not part of the rocket motor but an accessory to the projector. It consists of a female jack connection having two contact strips connected to a 2-pin plug, the whole assembly being encased in a moulded rubber body. The body is recessed at the front to receive the body of the weak link plug, and has a flange at its other end over which a guard ring fits. The adapter plugs into the Niphan socket on the projector and is locked thereto by the guard ring.

11. The corrugations on the contact strips of the plug and the adapter and the close fit between the body of the plug and the recess in the adapter give sufficient friction to prevent the plug being pulled out by the slip stream acting on the lead during flight.

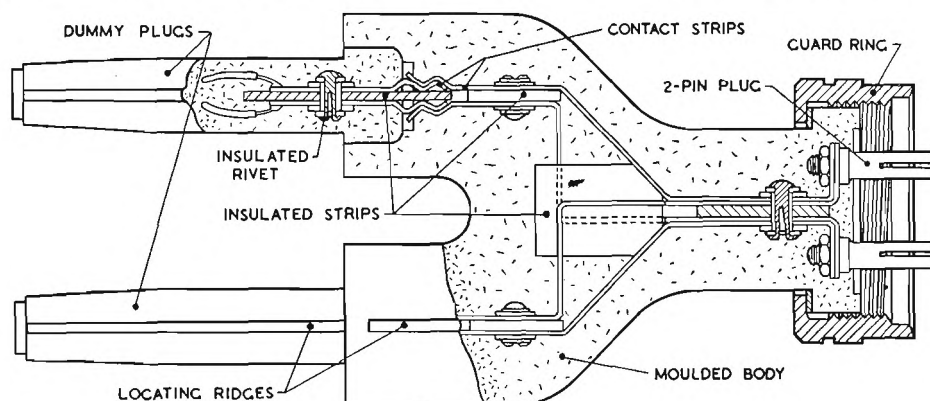


Fig. 4.—2-way weak link adapter

12. There is also a 2-way weak link adapter (Stores Ref. 5D/1409), see fig. 4. This adapter is used only for tier-carriage loading when it is desired to connect two rockets to one projector socket. The two sockets on the adapter are connected in parallel, and have dummy plugs inserted to prevent ingress of dirt and moisture when not in use.

No. 1, Mk. 4/TH motor

13. The No. 1, Mk. 4/TH motor is identical with the No. 1, Mk. 3/TH motor, see para. 8 to 12, with the exception that the length of the weak link lead is increased from 21.5 in. to 34.5 in., to fit certain projector installations. A clip is provided so that the length of the lead can be adjusted.

Fins, fig. 5 and 6

14. There are two fins at present to the Service, Mk. 1 (Stores Ref. 12N/15) and Mk. 2 (Stores Ref. 12N/43). The fins, of which there are four per motor, consist of rectangular sheets of metal 8 in. x 5 in., and are each fitted with two tongues for engaging the slots in the motor tube, and a securing catch, which when pressed down locks the fin in position, see fig. 6.

15. The only difference between the Mk. 1 and 2 fins, see fig. 5 is that the Mk. 2 fin has a

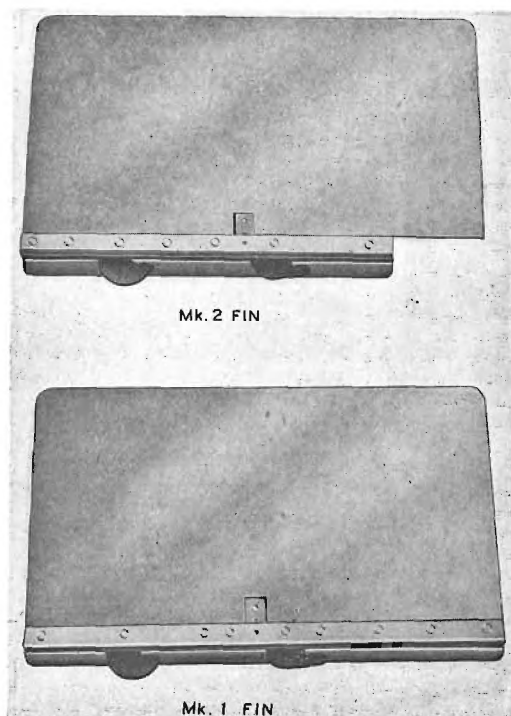


Fig. 5.—Mk. 1 and 2 fins

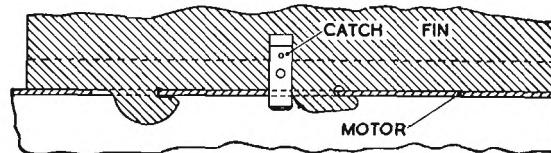


Fig. 6.—Section of fin showing attachment to motor tube

portion of its rear inner surface cut away to allow the rear saddle to be fixed to the extreme end of the rocket motor for the bottom round of certain tier-carriage loads. The Mk. 1 fin is now obsolescent.

Saddles

16. The saddles, two of which are provided for each round, serve to suspend the rocket on the projector rails. Normally, one saddle is positioned approximately at the centre of gravity of the rocket and the other just in front of the fins.

17. To enable the saddles to be correctly located on the rocket motor a series of saddle positioning jigs are provided and these are described in detail in later chapters of this section, to which reference should be made for assembling instructions for any particular saddle.

18. There are a number of different types of saddle in the Service and these are described in detail in subsequent chapters of this section. The following Table gives the stores reference numbers of the saddles at present in the Service, the R.P. head and the projector with which each is used:—

Stores Ref. No.	Saddle	R.P. Heads	Projector
12N/16	No. 1	25 lb. A.P. and S.A.P.	Mk. I, IA, and IB
12N/17	No. 2	60 lb. SAP/HE, "F" and practice (concrete)	Mk. I, IA and IB
12N/18	No. 3	25 lb. practice (concrete)	
12N/39	No. 4	All 25 and 60 lb. heads	Mk. IIIA, IIIB, V and VI
12N/40	No. 5	All 25 and 60 lb. heads	Mk. IIIA and IIIB
12N/62	No. 7	All 25 and 60 lb. heads	Mk. VIII and IX
12N/41	No. 8	180 lb. H.E. and practice	Mk. IIIA, IIIB, V and VI
12N/63	No. 9	All 25 and 60 lb. heads	Mk. VIII and XI
		180 lb. H.E. and practice	Mk. VIII and XI

Propellant charge

No. 1, Mk. 1 and Mk. 1/TH motors

19. The propellant used in the No. 1, Mk. 1 and 1/TH motors is a single tube of cordite weighing 12.5 lb. The temperature limits of this tubular cordite are 0 to 80 deg. F. and consequently the No. 1, Mk. 1 and 1/TH rocket motors cannot be used in tropical climates. The two types of tubular cordite which will be found in the Service are:—

- (i) *Only suitable for use with shot.*—No. 1, Mk. 1 motor. The letters "SU/D" are marked on the motor tube.
- (ii) *Suitable for use with both shot and shell.*—No. 1, Mk. 1/TH motor. The letters "TH" are marked on the motor tube in red inside the temperature circle and the letters "SU" are stencilled on the tube to indicate the type of propellant.

No. 1, Mk. 2, Mk. 2/TH, 3/TH and 4/TH motors

20. The propellant used in the No. 1, Mk. 2 and Mk. 2/TH motors is a single stick of cruciform cordite weighing 11 lb. Although the same cordite (SU/K/X/11) is used in both these motors, the charge in the Mk. 2/TH motor differs slightly from that in the Mk. 2 motor to make it suitable for use with the 60 lb. shell. The Mk. 3/TH and 4/TH motors have the same propellant charge as the Mk. 2/TH. The temperature range for all these motors is 5 to 135 deg. F., so that they are suitable for use in all climates. The two types of cruciform cordite which will be found in the Service are:—

- (i) *Suitable for use only with shot.*—No. 1, Mk. 2 motor. The letters "SU/K/X/11" are stencilled on the motor tube.
- (ii) *Suitable for use with shot and shell.*—No. 1, Mk. 2/TH, 3/TH and 4/TH motors. In addition to the letters "SU/K/X/11" marked on the motor tube, the letters "TH" are stencilled in red in the temperature circle.

Temperature limitations

21. The upper and lower temperature given for the Mk. 1 to 4 motors are the upper and lower limits at which the motors can be used with certainty and safety. Below the lower temperature, ignition of the cordite charge becomes difficult, whilst above the upper temperature, a high rate of burning of the propellant occurs, which may result in excessive pressures being generated and the bursting of the motor tube.

22. The following table gives the identification markings, use, and temperature range of the various motors:—

Motor, rocket, aircraft, 3 in.	Markings	For use with	Temp. range
No. 1, Mk. 1	SU/D	Shot or practice shot	0 to 80°F. Not suitable for tropical climates
No. 1, Mk. 1/TH	SU TH	Shot or shell	
No. 1, Mk. 2	SU/K/X/11	Shot or practice shot	5 to 135°F. Suitable for use in all climates
No. 1, Mk. 2/TH to 4/TH	SU/K/X/11 TH	Shot or shell	

Identification markings, fig. 1

23. The various markings on the motor tube are shown in fig. 1. Motor tubes supplied to the Service may be painted either white or green, but this difference in colour has no significance as far as the Service is concerned. All stencilling is in black on the white motors, and in yellow on the green motors. The exception to this is the temperature circle and the markings within the circle, which are stencilled in red on both the white and green motors.

Note.—Some motors may be found in the service which have the word "PRACTICE" stencilled in black on the side. This marking has no significance whatsoever and should be disregarded.

Supply

24. Two rocket motors with their protecting covers are packed in a steel box M.96, see fig. 7, the stowage dimensions of which are 56.75 in. long, 10.85 in. wide, and 5.0 in. deep. The filled box weighs 100 lb.

25. Alternatively, two motors are packed in a wooden box M.97, the stowage dimensions of which are 58.6 in. long, 11.35 in. wide and 6.75 in. deep. The filled wooden box weighs 90 lb.

26. The Mk. 1 and 2 fins are packed 48 in a wooden box, M.204, the dimensions of which are 21 in. by 15 in. by 10.25 in. The filled box weighs 64 lb. approx.

Storage

27. The rocket motors are classified, for storage purposes, in Group 6, Category Y, see A.P.2608A, Chap. 7.

Note.—Attention is drawn to A.P.2608A, App. I, para. 7, which prohibits the storage of electrically ignited stores within 50 yds. of high voltage electric cables or wireless transmitters.

28. Cordite deteriorates rapidly at high temperatures, for this reason the estimated life

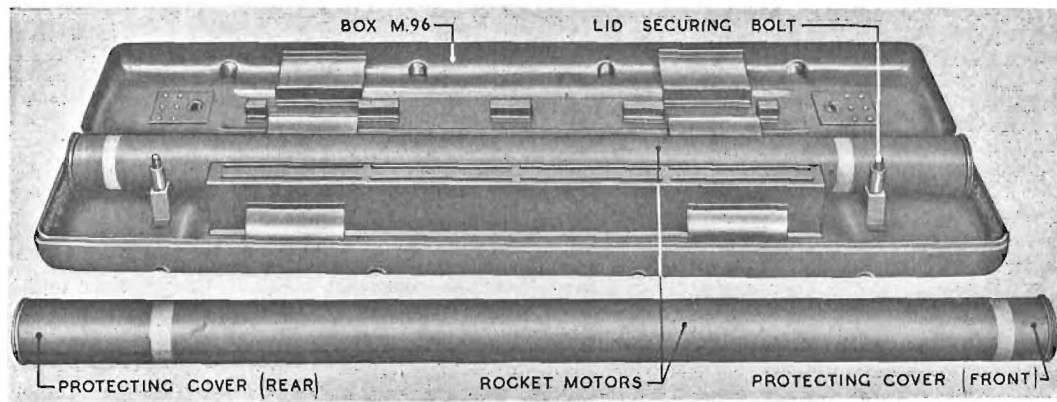


Fig. 7.—Rocket motors in box M.96

of the cordite used in the motors, at various temperatures, is:—

- 140 deg. F.—3 months
- 130 deg. F.—6 months
- 120 deg. F.—1 year
- 110 deg. F.—2 years
- 100 deg. F.—3½ years
- 90 deg. F.—7½ years

From the above it will be seen that the most desirable temperature for storage is below 90 deg. F.

29. Fins should be stored in a dry place to obviate the risk of rusting.

Assembly

30. Full instructions for assembling the rocket ammunition are given in Chap. 1.

Functioning

31. On closing the firing switch in the pilot's cabin, when the master switch is "ON", an electric current is passed through the electrical leads to the wire bridge embedded in the igniter, see fig. 1. The wire bridge incandesces and fires the igniter which in turn ignites the propellant charge. The gases of combustion produced acting through the venturi, propel the rocket forward, and the velocity increases with the progressive burning of the propellant, reaching a maximum at a range of 600 yds. (approx.).

CHAPTER 3

25 lb. SHOT—A.P., S.A.P., and PRACTICE

LIST OF CONTENTS

Introduction	...	...	...	...	...	...	...	...	...	Para.
										1
General description :—										
Shot, A.P., 25 lb.		...	...	...	...	...	...	...	...	4
Shot, S.A.P., 25 lb.		...	...	...	...	...	...	...	...	5
Shot, practice (concrete), 25 lb.	...	...	...	...	...	...	...	...	...	6
Identification markings	...	...	...	...	...	...	...	...	...	7
Supply	...	...	...	...	...	...	...	...	...	8
Storage	...	...	...	...	...	...	...	...	...	9

LIST OF ILLUSTRATIONS

<i>Fig.</i>		
1.	...	Shot, A.P., 25 lb., No. 1, Mk. I
2.	...	Shot, A.P., 25 lb., No. 2, Mk. I
3.	...	25 lb. shot, practice (concrete)
4.	...	Identification markings on 25 lb. shot

CHAPTER 3

25 lb. SHOT—A.P., S.A.P., and PRACTICE

Introduction

1. The Stores Ref. numbers and nomenclatures of the various types of 25 lb. shot are as follows:—

Stores Ref.	Nomenclature	Detail
	Shot :— 25 lb. :— A.P. :— No. 1 :— Mk. I :—	
12N/7		Steel, with adapter, and cover protecting adapter (Ref. 125/682).
	No. 2 :— Mk. I :—	
12N/26		Steel, with adapter, and cover protecting adapter (Ref. 125/682).
	S.A.P. :— Mk. I :—	
12N/8		Mild steel, with adapter, and cover protecting adapter (Ref. 125/682).
	Practice, concrete :— Mk. I :—	
12N/9		With adapter, and cover protecting adapter (Ref. 125/682).

2. The shot screws into the forward end of the rocket motor. Instructions for assembling the complete rounds of ammunition are given in Chap. 1 of this Section.

3. The 25 lb. A.P. shot is used for attacking submarines or merchant ships; the No. 1, Mk. I shot when the angle of dive of the attack is 15 deg. or greater, and the No. 2, Mk. I shot when the angle of dive is less than 15 deg. This ensures that the best results are obtained with the two types of A.P. shot available. The 25 lb. S.A.P. shot and the 25 lb. concrete practice shot are used for training and practice purposes only. In connection with the use of the practice shot, it is important to note that this is only used for training purposes for the 25 lb. projectile. A 60 lb. practice shell is provided for training purposes on the 60 lb. projectile, see Chap. 4 of this Section.

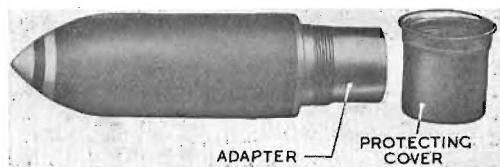


Fig. 1—Shot, A.P., 25 lb., No. 1, Mk. I.

General description

Shot, A.P., 25 lb., fig. 1 and 2

4. The A.P. shot consists of a solid steel head with an adapter at the rear which is threaded for engaging with the shell ring on the motor. The No. 1, Mk. I shot (with adapter) is 12.4 in. long, 3.44 in. diameter, and weighs 24 lb. 12 oz. The No. 2, Mk. I shot (with adapter) is 14.7 in. long, 3.44 in. diameter, and weighs 24 lb. 12 oz. A protecting cover is provided for protecting the screw thread on the adapter, and the shot is issued to the Service with the adapter in position.



Fig. 2—Shot, A.P., 25 lb., No. 2, Mk. I.

Shot, S.A.P., 25 lb.

5. The S.A.P. shot is similar in contour to the A.P. shot No. 1, Mk. I, described in para. 4, and is of the same dimensions and weight. It differs only in that it is made of mild steel. The shot is supplied to the Service with a protecting cover over the screw thread on the adapter. It is obsolete for operational use, but can be used with advantage for training.



Fig. 3—25lb. shot, practice (concrete)

Shot, practice (concrete), 25 lb., fig. 3

6. The shot is cylindrical with a steel adapter at the base end which engages with the shell ring on the motor. The concrete is cast in a steel mould around a spider formed by eight reinforcing bars attached to the head of the adapter. The concrete body of the shot is 11.5 in. long and 5 in. diameter. The exposed length of the adapter is 3.08 in., so that the overall length of the shot is 14.58 in. A protecting cover is supplied with this shot to prevent damage to the screw thread on the adapter. As the concrete will tend to chip and

break if subjected to rough handling, it is essential that the shot should not be thrown or dropped when loading and unloading into lorries or from trucks.

Identification markings, fig. 4

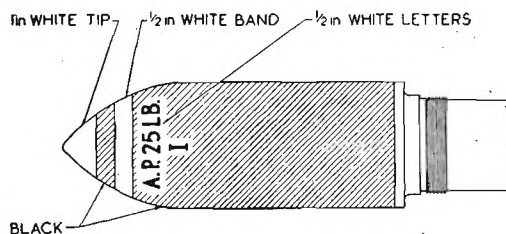
7. The various markings on the 25 lb. A.P. and S.A.P. shot are shown in fig. 4. The concrete practice shot is not painted or marked as its appearance is considered sufficiently distinctive.

Supply

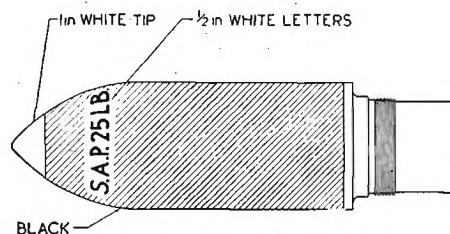
8. The shot are not supplied in boxes but merely have the covers over the screw threads on the adapters to protect them from being damaged during handling and storage.

Storage

9. The shot are not classified as explosives, but should be stored in a dry place to obviate the risk of rusting.



SHOT. A.P. 25 lb.



SHOT. S.A.P. 25 lb.

Fig. 4—Identification markings on 25 lb. shot

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 Delete " (To be issued later) " after title of Chap. 4 in the List of Chapters,
 write " A.L. 4 " in the outer margin of the list, insert this Chapter, and
 make an entry in the Amendment Record Sheet.
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 Vol. I Sect. 3

CHAPTER 4

60 lb. SHELL—S.A.P./H.E., and PRACTICE

LIST OF CONTENTS

	<i>Para.</i>
Introduction	1
General description :	
Shell, H.E., 60 lb., S.A.P., No. 1, Mk. I, and No. 2, Mk. I	4
Shell, H.E., 60 lb., S.A.P., No. 1, Mk. II, and No. 2, Mk. II	9
Fuze No. 865, Mk. I	10
Fuze No. 878, Mk. I	13
Thermal initiator	14
Shell, practice (concrete), 60 lb.	16
Identification markings	18
Supply	19
Storage	21

LIST OF ILLUSTRATIONS

- Fig.*
 1.—60 lb. S.A.P./H.E. shell, No. 1, Mk. I
 2.—Sectional elevations of 60 lb. S.A.P./H.E. shell, No. 1, Mk. I, fuze No. 865, Mk. I and thermal initiator
 3.—60 lb. concrete practice shell
 4.—Identification markings on 60 lb. S.A.P./H.E. shell, No. 1, Mk. I

ARMAMENT

CHAPTER 4

60 lb. SHELL—S.A.P./H.E., and PRACTICE

Introduction

1 The Stores Ref. numbers and nomenclature of the 60 lb. shell are as follows :—

Stores Ref.	Nomenclature	Detail
12N/10	Shell :— H.E. :— 60 lb. :— S.A.P. :— No. 1 :— Mk. I (with delay)	With cover protecting adapter (Ref. 12S/682), and complete with fuze, percussion, base, No. 865, Mk. I and initiator, thermal, Mk. I.
12N/34	Mk. II (with delay)	As Ref. 12N/10 except for manufacturing details
12N/11	No. 2 :— Mk. I (non-delay)	As Ref. 12N/10 but with fuze, percussion, base No. 878, Mk. I.
12N/35	Mk. II (non-delay)	As Ref. 12N/11 except for manufacturing details
12N/13	Practice :— Concrete :— 60 lb. :— Mk. I	With cover protecting adapter (Ref. 12S/682)

2. The shell screws into the forward end of the rocket motor, see Chap. 2 of this section. Instructions for assembling the complete rounds of ammunition are given in Chap. 1 of this section.

3. The 60 lb. S.A.P./H.E. shell may be used for attacking tanks, merchant shipping, locomotives, gun emplacements, tank landing craft, and as an anti-personnel projectile. The 60 lb. concrete practice shell is used for training purposes and is designed to simulate the firing of the 60 lb. projectile only.

General description.

Shell H.E., 60 lb., S.A.P., No. 1, Mk. I, and No. 2, Mk. I, fig. 1 and 2.

4. The No. 1, Mk. I and No. 2, Mk. I shell

are identical, with the exception that the No. 1, Mk. I shell incorporates the No. 865 fuze (with delay), whilst the No. 2, Mk. I shell has a No. 878 fuze (non-delay).

5. The shell is made in two parts, the nose and the body. The nose is thickened at the tip, and is hardened to penetrate resistant targets. It is screw-threaded at the base for attachment to the body of the shell. The body of the shell is thin cased and parallel walled, its rear end being formed into a spigot and internally threaded to accommodate a two-piece adapter. The end of the spigot is squared to obtain a good fit with the rocket motor and so obviate gas leakage in flight.



Fig. 1—60 lb. S.A.P./H.E. shell, No. 1, Mk. I

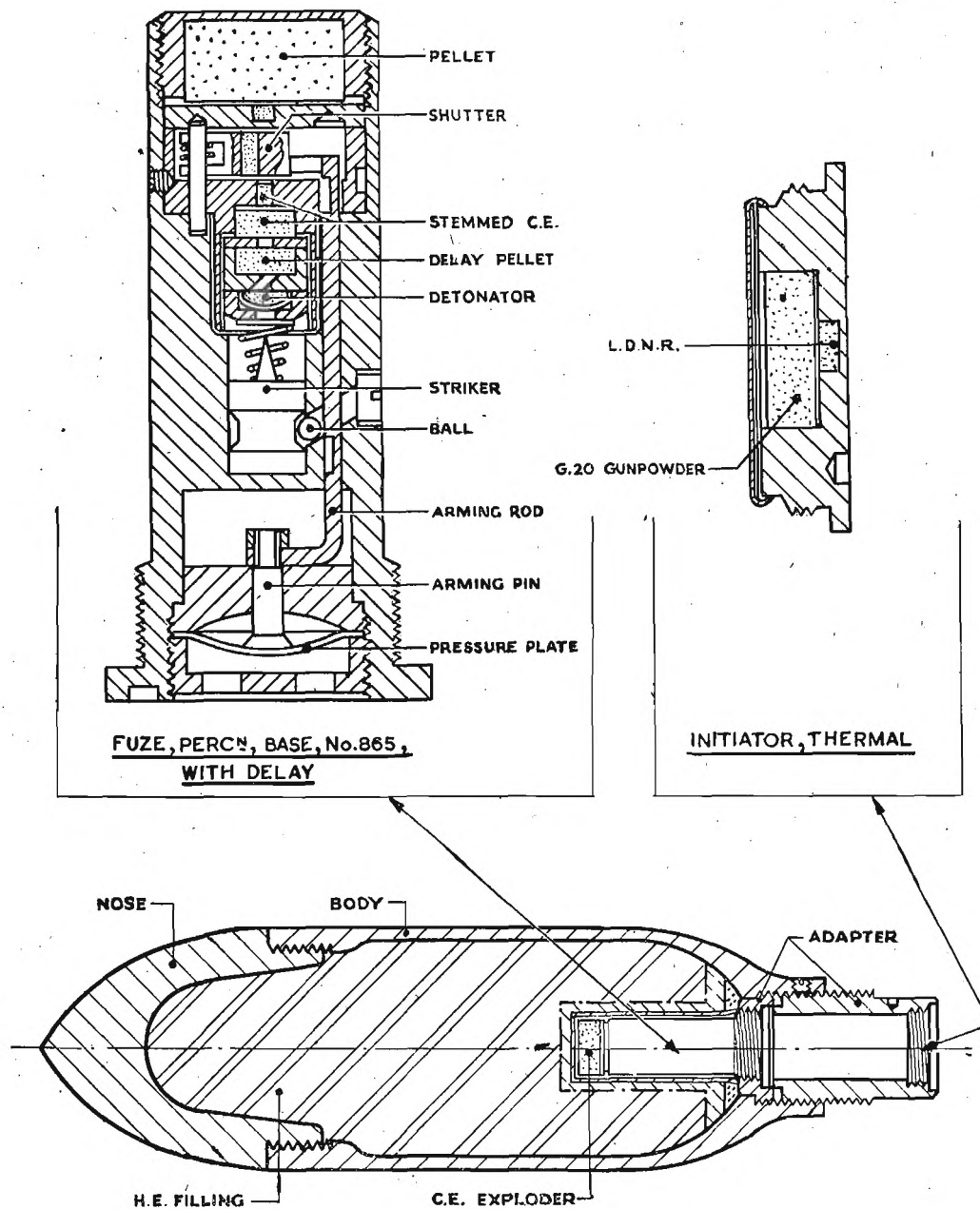


Fig. 2—Sectional elevations of 60 lb. S.A.P./H.E. shell, No. 1 Mk. I, fuze No. 865, Mk. I and thermal initiator

6. The forward portion of the two-piece adapter is internally threaded for securing the fuze, see para. 10 to 13, whilst the rear portion is likewise threaded to receive the thermal initiator, see para. 14 and 15. The adapter is externally threaded for attachment to the shell spigot and to the shell ring on the rocket motor. The front portion holds the fuze well into the body of the shell. The adapter is locked by a grub screw passing through the wall of the shell spigot.

7. The object of making the adapter in two parts is to ensure, as far as practicable, that the fuze will remain intact, and in a fit condition, to function, should the rocket motor and the portion of the adapter to which it is attached be broken off on impact with the target.

8. The high explosive filling of the shell consists of approximately 14 lb. of T.N.T. A C.E. exploder is arranged in front of the fuze.

Shell, H.E., 60 lb., S.A.P., No. 1, Mk. II, and No. 2, Mk. II

9. The No. 1, Mk. II and No. 2, Mk. II shell, only differ from the No. 1, Mk. I and No. 2, Mk. I shell, respectively, in that the shell body and nose are forged in one piece instead of in two parts.

Fuze, No. 865, Mk. I

10. The main components of the fuze, percussion, base, No. 865, Mk. I (with delay) are the fuze body, the striker mechanism, the detonator and delay system, and the arming arrangement. The arrangement of the components of the No. 865 fuze can be seen from fig. 2.

11. The No. 865 fuze is armed by the pressure of the gases generated by the combustion of the black powder in the thermal initiator, see para. 14 and 15. The pressure of the powder gases causes the pressure plate to reverse. Attached to the pressure plate is an arming pin which passes through and is secured to the arming rod. The reversal of the pressure plate moves the arming rod forward and at the end of its travel, one slot in the rod comes opposite a ball and allows it to move into a recess drilled in the body of the fuze, so freeing the striker. The striker is still held away from the detonator, however, by the creep spring. Another slot at the forward end of the rod is brought opposite a projection on the shutter, which allows the shutter to move under the action of its spring. The movement of the shutter interposes a stemmed channel between the detonator system and the pellet in the base of the fuze. When the shutter moves over, a pin engages a hole in the underside of the shutter and locks it in position.

12. On impact of the shell, the striker sets forward against the action of the creep spring and hits the detonator, which ignites the explosive train consisting of a delay pellet followed by lead azide and C.E. The object of the delay pellet is to allow the shell to penetrate inside the target before being detonated.

Fuze, No. 878, Mk. I

13. The fuze, percussion, base, No. 878, Mk. I (non-delay) is identical in construction to the No. 865 fuze described in para. 10 to 12, with the exception that the delay pellet is omitted. It is used on targets where the delay given by the No. 865 fuze is considered excessive.

Thermal initiator, fig. 2

14. The chief purpose of the thermal initiator is to ensure that the shell is clear of the aircraft before the fuze is armed. It is positioned in the base of the shell adapter and when the shell is assembled to the rocket motor, it fits closely against the front obturator.

15. The initiator consists of a thin steel base, adjacent to which is a septum containing L.D.N.R., and above this is a chamber containing G.20 powder confined by a cardboard disc, which is held in position by a metal disc with a central hole. The heat from the burning propellant is conducted through the front obturator in the rocket motor to the base of the initiator and then to the L.D.N.R. which is ignited. The L.D.N.R. in turn ignites the G.20 powder and the pressure produced by the burning powder reverses the pressure plate of the fuze. This sequence of events takes sufficient time for the rocket to move some 15 ft. ahead of the aircraft before the fuze is armed.

Shell, practice, concrete, 60 lb., fig. 3

16. The 60 lb. concrete practice shell is cylindrical and has a steel adapter at the base for engagement with the shell ring of the rocket motor. The concrete is cast in a steel mould around a spider of reinforcing bars attached to the front of the adapter. The overall length of the shell is 23.83 in., the concrete body being 20 in. long and 6 in. diameter. A protecting cover is supplied with the shell to prevent damage to the screw thread on the adapter during storage and handling.

17. Although this practice shell is not a shell in the true sense of the word, it is so called in order to obviate any confusion between it and the 25 lb. concrete practice shot described in Chap. 3 of this section. The 60 lb. concrete practice shell is only used for training in the use of the 60 lb. projectiles.

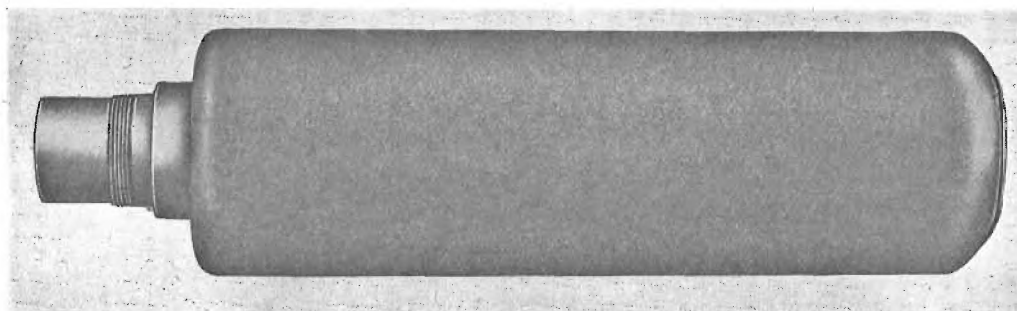


Fig. 3—60 lb. concrete practice shell

Identification markings, fig. 4

18. The various markings on the 60 lb. S.A.P./H.E. shell No. 1, Mk. I, are shown in fig. 4. The markings on the other shell differ from the No. 1, Mk. I only as follows:—

- (i) No. 1, Mk. II.—Mark number of shell.
- (ii) No. 2, Mk. I.—Number and mark of fuze (round base of shell).
- (iii) No. 2, Mk. II.—Mark number of shell, and number and mark of fuze (round base of shell).

19. The practice shell is not painted or marked as its appearance is considered sufficiently distinctive.

Supply

20. The shell are not supplied in boxes but merely have the covers over the screw threads of the adapters to protect them from damage during handling and storage.

Storage

21. The 60 lb. S.A.P./H.E. shell is classified, for storage purposes, in Group 5, Category Z, see A.P.2608A, Chap. 7.

22. The concrete practice shell is not classified as an explosive but should be stored in a dry place to obviate the risk of rusting of the adapter.

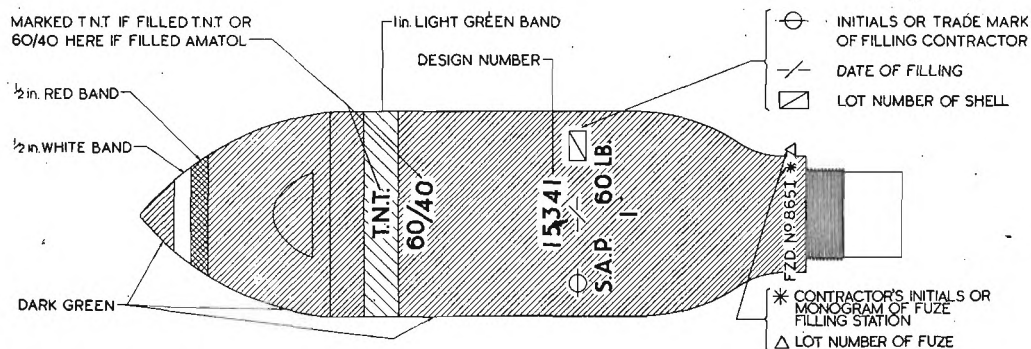


Fig. 4—Identification markings on 60 lb. S.A.P./H.E. shell, No. 1, Mk. I.

CHAPTER 5

SMOKE CONTAINER, No. 1, Mk. I

LIST OF CONTENTS

	<i>Para.</i>
Introduction	1
General description	4
Identification colouring and markings	7
Instructions for use	8
Supply	11
Storage	12

LIST OF ILLUSTRATIONS

Fig.

- 1.—Sectional view of the No. 1, Mk. I smoke container
- 2.—Smoke container fitted to 60 lb. practice shell

CHAPTER 5

SMOKE CONTAINER, No. 1, Mk. I

Introduction

1. The Stores Ref. number and nomenclature of the smoke container is as follows :—

Stores Ref.	Nomenclature	Detail
12N/42	Container :— Smoke :— No. 1 :— Mk. I :—	Packed 12 in box, M.204, Mk. I (with modified packing pieces)

2. The smoke container, No. 1, Mk. I, is fitted to the nose of the 60 lb. concrete practice shell, to indicate to the pilot, during practice firing, the point of strike.

3. The fitting of a container to the concrete practice shell makes no appreciable difference to the ballistics of the round.

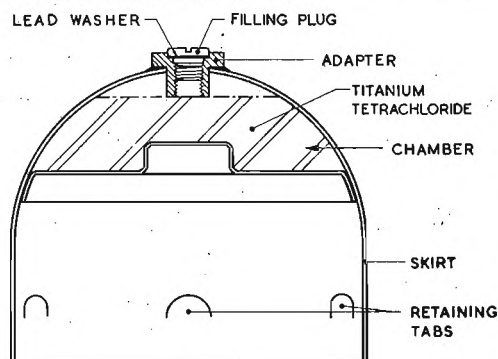


Fig. 1—Sectional view of the No. 1, Mk. 1 smoke container

General description, fig. 1 and 2

4. The smoke container consists of a hemispherical thin steel chamber, containing 15 oz. of titanium tetrachloride, having a skirt portion to fit over the nose of the practice shell. Six retaining tabs are provided on the skirt to hold the container firmly in position.

5. A steel adapter is fitted into the nose of the container. This adapter acts as a filling hole and is closed by a filling plug screwing on to a lead washer.

6. The filled container weighs approximately 2 lb., is approximately 5 in. long, and 6 in. in diameter.

Identification colouring and markings

7. The filled store is painted white and has two $\frac{1}{2}$ in. wide green bands, $\frac{1}{2}$ in. apart, painted round the nose of the container 1 in. below the filling plug. The following information is stencilled, in black, on the container :—

- (i) "Container, smoke, No. 1, Mk. I."
- (ii) The manufacturer's initials or recognised trade mark.
- (iii) The date of manufacture, month and year.
- (iv) The monogram of the filling station.
- (v) The lot number of the filled container.
- (vi) The date of filling, month and year.

Instructions for use

8. Remove the container from its package and examine it for signs of damage and leakage round the filling plug. A leaky filling plug may be tightened with a screwdriver.

9. After the rocket has been loaded on to the aircraft and before the electrical connections are made, push the container hard home on to the shell.

Note.—The container is to be fitted *after* loading the rocket because an accidental drop from a low height with the weight of the rocket and concrete shell behind it, will damage the container and cause leakage of the corrosive filling.

10. If it is found necessary to remove the container it should be done while the round is still on the aircraft.

Supply

11. The smoke containers are packed 12 in a wooden box M.204 with modified packing pieces. The stowage dimensions of box M.204 are 21 in. by 15 in. by 10.25 in. The filled box weighs 36 lb approximately.

Storage

12. The containers are classified, for storage purposes, as "Dangerous Stores" see A.P.2608A, Chap. 7 and should be stowed in open-sided sheds or under tarpaulins.

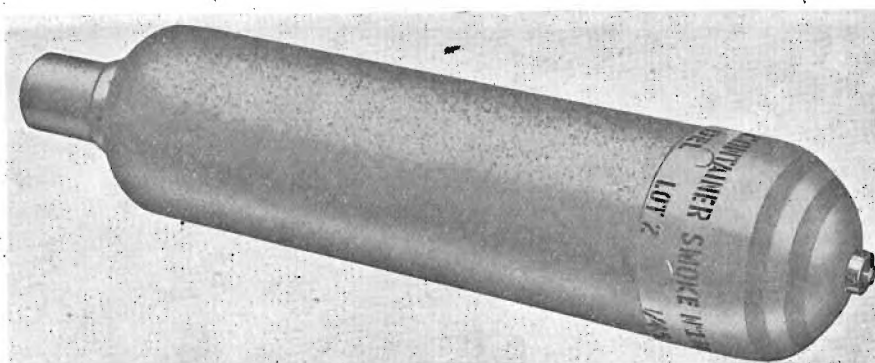


Fig. 2.—Smoke container fitted to 60 lb. practice shell

CHAPTER 6

H.E. SHELL, 60 lb., "F", and FUZE, D.A., No. 899, Mk. I

LIST OF CONTENTS

	<i>Para.</i>
Introduction	1
General description—	
Shell, H.E., 60 lb., "F", No. 1, Mk. I	6
Fuze, D.A., No. 899, Mk. I	9
Fuze body	10
Air arming arrangement	12
Safety devices	18
Detonator	19
Magazine	20
Functioning	21
Identification colourings and markings	25
Ballistics	29
Safety precautions	30
Instructions for use	31
Supply	38
Storage	40

LIST OF ILLUSTRATIONS

- Fig.*
- 1.—Shell, H.E., 60 lb., "F", No. 1, Mk. I
 - 2.—Fuze, D.A., No. 899, Mk. I

CHAPTER 6

H.E. SHELL, 60 lb., "F", and FUZE, D.A., No. 899, Mk. I

Introduction

1. The Stores Ref. numbers and nomenclature of the 60 lb. "F" shell and the No. 899 fuze are as follows :—

Stores Ref.	Nomenclature	Detail
12N/25	Shell :— H.E. :— 60 lb. :— "F" :— No. 1 :— Mk. I	Unboxed, complete with nose plug and cover, protecting adapter (Stores Ref. 12S/682).
12N/33	Fuze :— D.A. :— No. 899 :— Mk. I	For use with 60 lb. "F" shell. One fuze packed in tinplate cylinder No. 468, Mk. I (Stores Ref. 12S/827), eight cylinders being packed in Box B.546, Mk. I (modified Box B.354, Mk. I, Stores Ref. 12S/828).

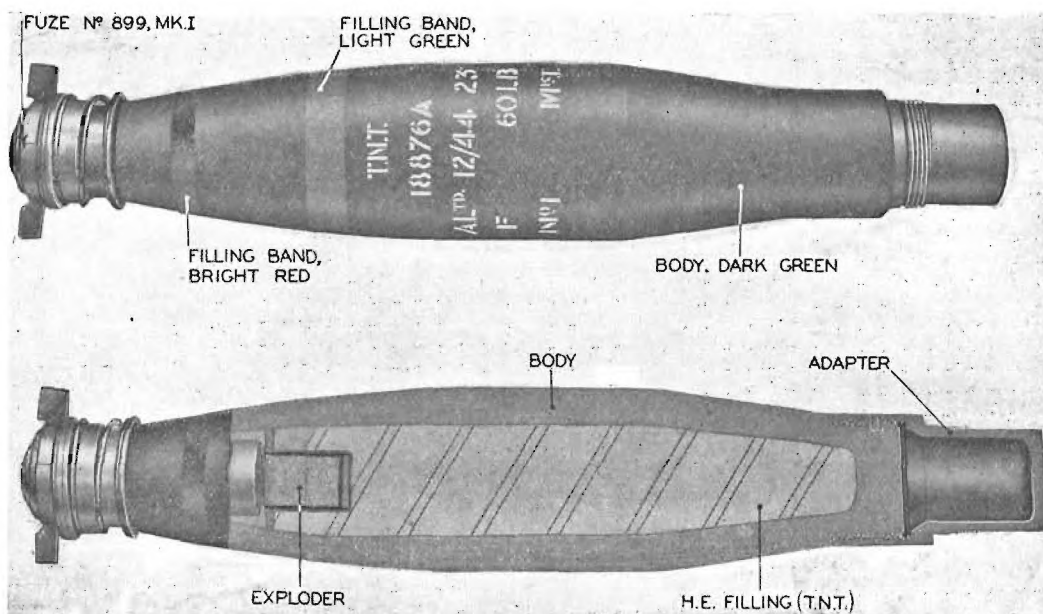


Fig. 1.—Shell, H.E., 60 lb., "F", No. 1 Mk. I

2. The shell screws into the forward end of the rocket motor, see Chap. 2 of this section. Instructions for assembling the complete rounds of ammunition are given in Chap. 1 of this section.

3. The 60 lb. "F" shell is a fragmentation shell for use against thin-skinned vehicles, such as motor transport, and as an anti-personnel projectile. It is not suitable for use against heavily armoured vehicles.

4. It has a lower charge/weight ratio and a thicker wall than the 60 lb. S.A.P./H.E. shell, see Chap. 4. It produces heavy fragments which can inflict damage at a considerable distance from the point of burst.

5. The "F" shell is fitted with fuze, D.A., No. 899, Mk. I which is a direct acting nose fuze.

General description

Shell, H.E., 60 lb., "F", No. 1, Mk. I, fig. 1

6. The shell is a converted 4.5 in. howitzer shell, 22 in. long, with a maximum diameter of 4.5 in. and weighing 50.5 lb. It is of stream-lined shape with an average wall thickness of 0.85 in. to give good fragmentation. The rear end of the shell is threaded to receive an adapter, which is locked in position with a dowel pin passing through the adapter into the shell wall.

7. The rear portion of the adapter is formed into a spigot and is externally threaded for attachment to the shell ring of the rocket motor. The rear face of the spigot is squared to give a good fit with the front obturator of the rocket motor.

8. The high explosive filling of the shell consists of approximately 4 lb. of T.N.T. or R.D.X./T.N.T., and at the forward end of the shell is a C.E. exploder held in place by a felt washer. A wooden distance piece is provided between the transit plug and the exploder to keep the latter in position during transit and storage.

Fuze, D.A., No. 899, Mk. I, fig. 2

9. The No. 899 fuze consists of Army fuze No. 721, Mk. II* or III fitted with additional components rendering it safe for carriage on aircraft. The main components of the No. 899 fuze are the fuze body, the air arming arrangement and other safety devices, the detonator, and the magazine. The arrangement of the components can be seen from fig. 2.

Fuze body

10. The fuze body is threaded externally to screw into the shell and has a flange with holes drilled to receive a tommy bar for tightening purposes.

11. The body is recessed to accommodate a striker with a mushroom shaped head. The striker is held in the inoperative position by a shear wire which passes through a transverse hole in the striker and fuze body, and by a striker sleeve.

Air arming arrangement

12. The air arming arrangement consists of a centrifugal spinner, a spring circlip, an inertia collar with an inner sleeve, a spring, and a spring retaining washer.

13. The centrifugal spinner is in two halves, each fitted with a vane, the halves being held together in position below the striker head by the spring circlip. One of the halves of the spinner is fitted with a locating pin or projection to ensure correct positioning of the circlip.

14. The inertia collar is flanged to support the spring and the flange is slotted to engage with the vanes of the spinners and prevent their rotation when the fuze is stationary or during the flight of the aircraft up to the time of projection of the rocket. Inside the inertia collar is a small screw to engage in a slot in the inner sleeve and so prevent relative rotation of the collar and sleeve.

15. The inner sleeve is prevented from rotating on the fuze body by the bent over ends of the shear wire which are accommodated in two slots in the sleeve. The sleeve is prevented from upward movement by a circlip located in a groove round the fuze body.

16. The spring is positioned between the flange on the inertia collar and the spring retaining washer which fits against the flange on the fuze body.

17. During transit and storage the spring retaining washer is held in position by a retaining collar (not illustrated) screwed on to the threads on the fuze body. *This collar must be removed before screwing the fuze into the nose of the shell.*

Safety devices

18. The safety devices incorporated in this fuze are:—

- (i) The *centrifugal spinner*, see para. 13.
- (ii) The *shear wire*. This passes through the fuze body and the striker, holding the striker in position above the detonator until the wire is broken by the force of impact.
- (iii) The *striker sleeve*. This is C-shaped in plan and is of thin gauge metal. It is clipped round the striker stem between the underside of the striker

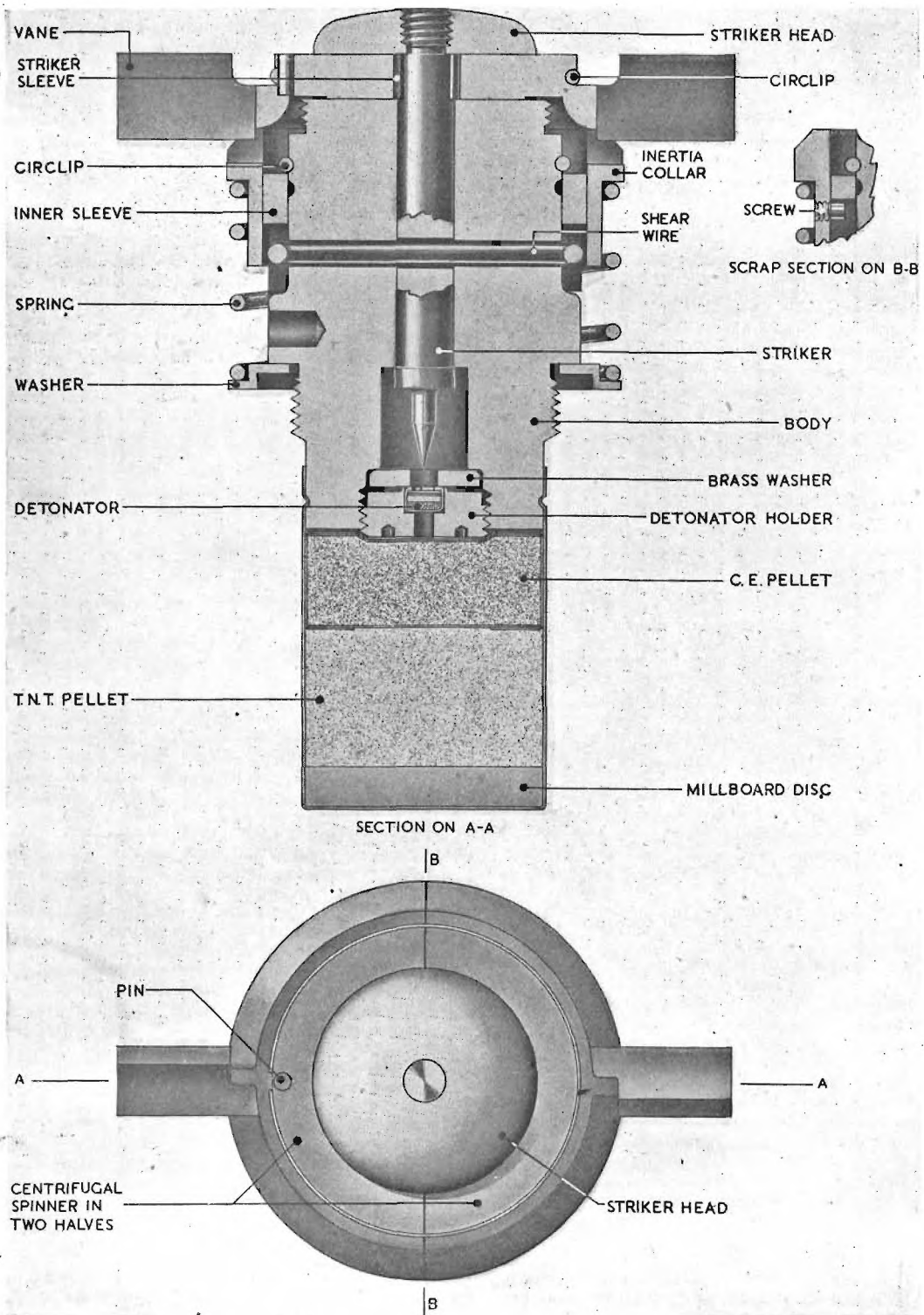


Fig. 2—Fuze, D.A., No. 899, Mk. I

head and the top of the fuze body, and prevents air functioning of the fuze after centrifugal release of the spinner, in the event of a broken shear wire. On impact the sleeve is crushed and the fuze functions normally.

Note.—The striker sleeve was not fitted to the first 5,000 fuzes.

Detonator

19. The detonator is housed in a holder screwed into the base of the fuze body and located in position by a brass washer.

Magazine

20. The magazine is crimped on to the fuze body and contains a C.E. pellet and a T.N.T. pellet packed with a millboard disc.

Functioning

21. On projection of the rocket from the aircraft, set-back causes the inertia collar to move back against the action of the spring, thus freeing the spinner which then rotates by air pressure acting on the vanes.

22. When the spinner rotates at a speed of approximately 3,000 r.p.m., centrifugal force overcomes the retaining influence of the circlip and the two halves of the spinner fly clear of the fuze. The striker is then only held by the shear wire and the striker sleeve.

23. The spinner is released and the fuze armed about 0.7 sec. after firing and in this time the projectile will be about 60 yds. ahead of the aircraft.

24. On impact, the striker head is driven in, crushing the striker sleeve, breaking the shear wire, and firing the detonator. The flash from the detonator ignites the C.E. and T.N.T. pellets in the magazine, which in turn initiate the detonation of the H.E. filling of the shell.

Identification colourings and markings

25. The H.E. shell, 60 lb., "F" is painted dark green with a 1 in. light green band near the centre to indicate an H.E. filling. Near the nose of the shell is the usual bright red band ($\frac{1}{2}$ in. wide) to indicate that the shell is filled, whilst the type of filling, that is "T.N.T." or "R.D.X./T.N.T.", is stencilled in yellow in three places equi-spaced round the body.

26. The following markings are stencilled in yellow on the shell :—

- (i) The design number of the method of filling.

- (ii) The initials or recognised trade mark of the filling contractor.
- (iii) The date of filling, month and year.
- (iv) The lot number of the filled shell.
- (v) "F. 60 lb. No. 1, Mk. I".

27. The following markings are stamped on the shell :—

- (i) The initials or recognised trade mark of the manufacturer of the empty shell.
- (ii) The lot number of the empty shell.
- (iii) The date of manufacture.
- (iv) The initials or recognised trade mark of the converting contractor, or approved inspection stamp.
- (v) The date of conversion.

28. Each vane of the spinner is stamped "No. 899, Mk. I".

Ballistics

29. The ballistics of the 60 lb. "F" shell are the same as those of the 60 lb. S.A.P./H.E. shell and the same sight settings should be used.

Safety precautions

30. The fragments of the "F" shell travel further than those of the 60 lb. S.A.P./H.E. shell and it is therefore inadvisable to fire the "F" shell at ranges of less than 600 yds. owing to the possibility of the aircraft being damaged by fragments from the shell at shorter ranges.

Instructions for use

31. Assemble the shell to the rocket motor as described in Chap. 1, tightening hard home by means of strap wrenches.

32. Unscrew and remove the transit plug from the shell and remove the wooden distance piece.

33. Remove the fuze from its package and ensure that one of the halves of the spinner has a locating pin or projection and that the circlip is correctly positioned with its ends against the pin.

Note.—If there is no locating pin on either of the halves of the spinner, the fuze must be set aside as defective, since, in the absence of a pin the circlip might be positioned so that the spinner will fly off as soon as the shell is fired and the fuze become prematurely "live."

34. Holding the fuze with the fingers gripping the spring retaining washer, unscrew the retaining collar from the fuze threads.

35. Screw the fuze into the shell and tighten with a tommy bar, inserting the tommy bar into the holes provided on the flange in the fuze body.

Note.—*Do not use the vanes of the spinner or the inertia collar for tightening as there is a danger of breaking the shear wire.* Slight circular adjustment of the spring may be necessary to make the hole in the flange accessible to the tommy bar.

36. Check that the inertia collar slides freely on the inner sleeve and that the spinner is capable of free rotation.

37. Before loading the rocket on the aircraft check that the vanes of the spinners are held securely in the slots of the inertia collar.

Supply

38. The shell are supplied unboxed, with a nose plug and cover, protecting, adapter.

39. The fuze is supplied packed in cylinder No. 468, Mk. I, 8 cylinders, each containing one fuze, being packed in Box B.546, Mk. I (modified Box B.354, Mk. I).

Storage

40. Shell, H.E., 60 lb., "F" are classified for storage in Group 5, Category Z, and the fuze No. 899 in Group 6, Category Z, see A.P.2608A, Chap. 7.

CHAPTER 7

SADDLES No. 1, 2, 3 and 5

LIST OF CONTENTS

	<i>Para.</i>
Introduction	1
General description—	
No. 1 and 2 saddles	3
No. 3 saddle	6
No. 5 saddles	10
Front saddle	11
Rear saddle	16
Instructions for use	18
No. 1 and 2 saddles	19
No. 3 saddles	20
No. 5 saddles	21
Supply	23
Storage	25

LIST OF ILLUSTRATIONS

Fig.

- 1.—No. 1 saddle
- 2.—No. 2 saddle
- 3.—No. 3 saddle
- 4.—No. 5 front and rear saddles

CHAPTER 7

SADDLES No. 1, 2, 3 and 5

Introduction

1. The saddles described in this chapter are for single-round loading only. Saddles No. 4 and 8 for tier-carriage loading are described in Chap. 8. Saddles No. 7 and 9 for triplex ammunition are described in Chapter 11.

2. The following table gives the stores reference numbers, nomenclature, and particulars of the projector with which each saddle is used:—

Stores Ref. No.	Nomenclature	Projector with which used
12N/16	Saddle, rocket, aircraft, 3 in., No. 1	Mk. I, IA and IB
12N/17	Saddle, rocket, aircraft, 3 in., No. 2	Mk. I, IA and IB
12N/18	Saddle, rocket, aircraft, 3 in., No. 3	Mk. IIIA, IIIB, V and VI
12N/40	Saddle, rocket, aircraft, 3 in., No. 5	Mk. VIII and IX

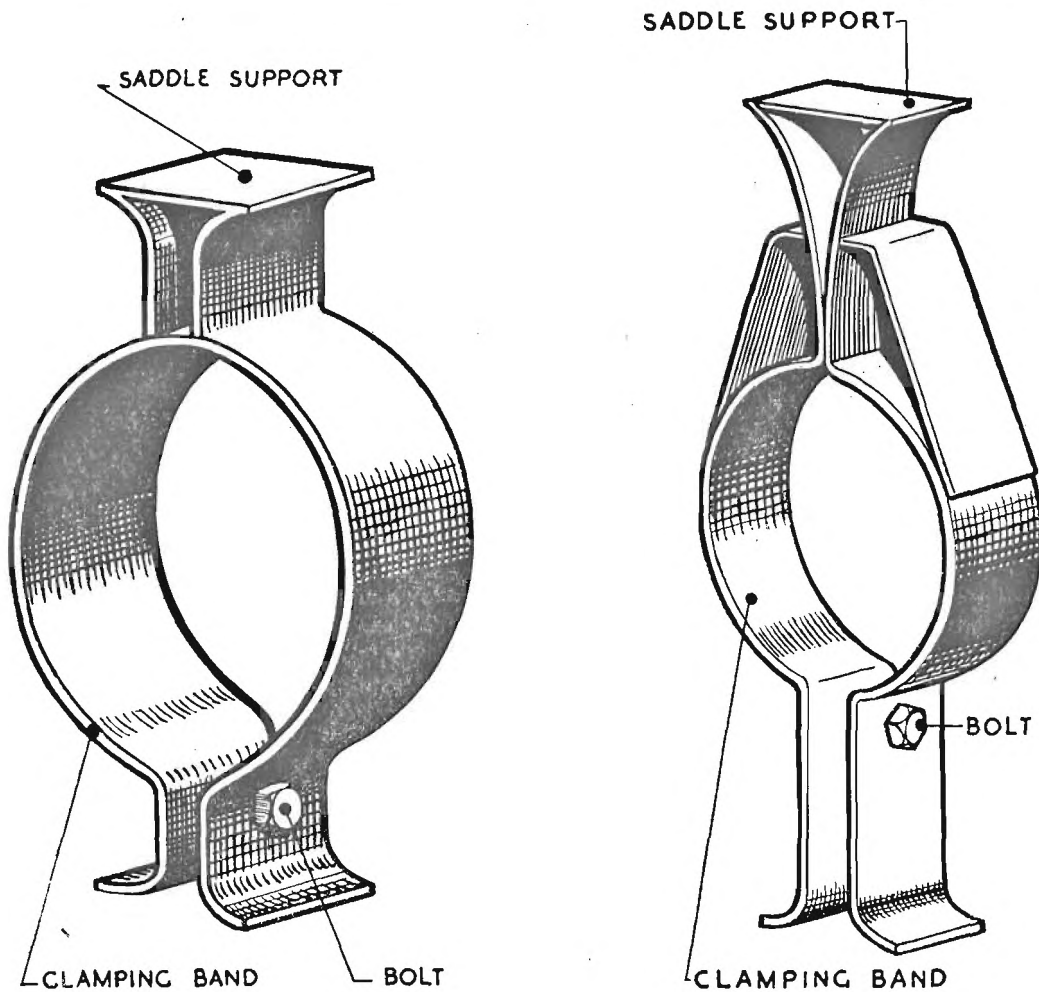


Fig. 1.—No. 1 saddle

Fig. 2.—No. 2 saddle

General description

No. 1 and 2 saddles, fig. 1 and 2

3. The No. 1 and 2 saddles, which are now obsolescent, are similar in construction, the main difference being that the No. 2 saddle suspends the rocket motor a greater distance from the Mk. I projector rails to cater for the larger diameter rocket heads.

4. The front and rear saddles are identical, consisting of a circular clamping band, of steel strip $1\frac{1}{2}$ in. wide, to hold the rocket motor, and secured by a $\frac{1}{4}$ in. B.S.F. bolt and nut at the bottom. Welded to the upper edge of the clamping band is the saddle support which is shaped to fit over the rails of the Mk. I projector beam.

5. The No. 1 saddle is used with the 25 lb. A.P. and S.A.P. shot and the No. 2 saddle with the 60 lb. S.A.P./H.E. shell, "F" type shell, and concrete practice shell, and 25 lb. concrete practice shot.

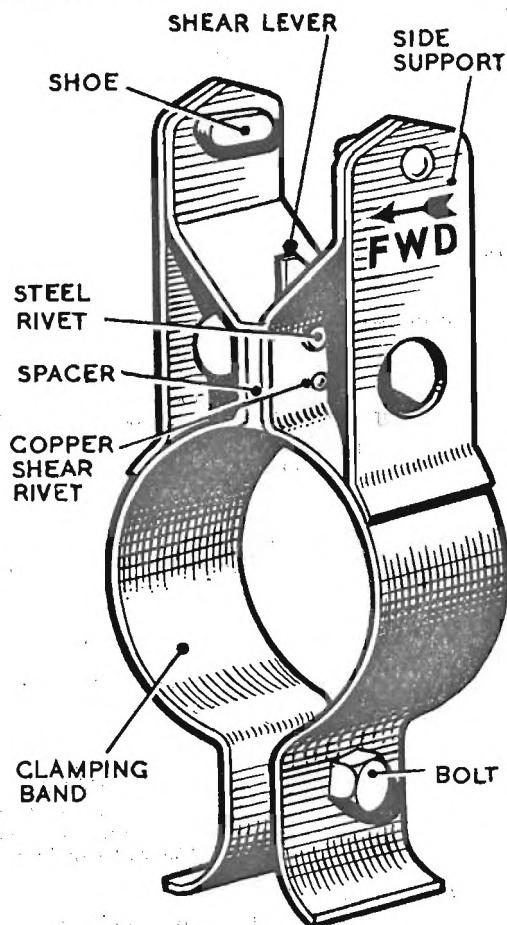


Fig. 3.—No. 3 saddle

No. 3 saddle, fig. 3

6. The No. 3 front and rear saddles are identical and are used with the Mk. IIIA, IIIB, V and VI projector beams. The saddle consists of a circular clamping band of $1\frac{1}{2}$ in. wide steel strip to hold the rocket motor and secured by a $\frac{1}{4}$ in. B.S.F. bolt and nut. Two side supports are welded to the top of the clamping band, each carrying on its top inner face a pivoting shoe. These shoes run in the saddle grooves formed in the sides of the projector beam, thus supporting the round on the projector. An arrow and "FWD" are stamped on the side supports to indicate the direction in which the saddle is to be assembled on the rocket motor.

7. The clamping band is formed in two halves, the upper ends being welded together with a spacer interposed to form a housing for a shear lever, and to brace the side supports. The shear lever is pivoted on a steel rivet which passes through the lever and the sides of the housing. Beneath the steel rivet is a copper shear rivet. The top of the lever protrudes above the housing to contact the stop assembly mechanism of the projector beam.

8. Early issues of the No. 3 saddle were fitted with an aluminium shear rivet. Such saddles, if encountered, must not be used as rear saddles, but must be expended as front saddles only. Also, the base of the saddle was originally lengthened to provide aerodynamic balance, but this has been found to be unnecessary and discontinued.

9. The No. 3 saddles can be used with all 25 lb. and 60 lb. rocket heads.

No. 5 saddles, fig. 4

10. The No. 5 front and rear saddles are different and are issued to the Service as a set. The saddles are used on rocket projectors Mk. VIII and IX.

Front saddle

11. A circular clamping band to hold the rocket motor is of steel strip, $1\frac{1}{2}$ in. wide, and is secured at the bottom by a $\frac{1}{4}$ in. B.S.F. bolt and nut. A notch $\frac{3}{8}$ in. wide and $\frac{1}{8}$ in. deep is cut in the top forward edge of the band, for use when positioning the saddle on the motor in the positioning jig, No. 2, Mk. 2.

12. The saddle is supported on the front carrier of the projector by a $\frac{1}{8}$ in. bolt and nut positioned between two side supports welded to the top of the band. A shear lever is pivoted on the suspension bolt and is retained centrally between two distance pieces fitted over the bolt. An arrow and the letters "FWD" are stamped on the side supports to indicate the direction in which the saddle is to be assembled on the rocket motor.

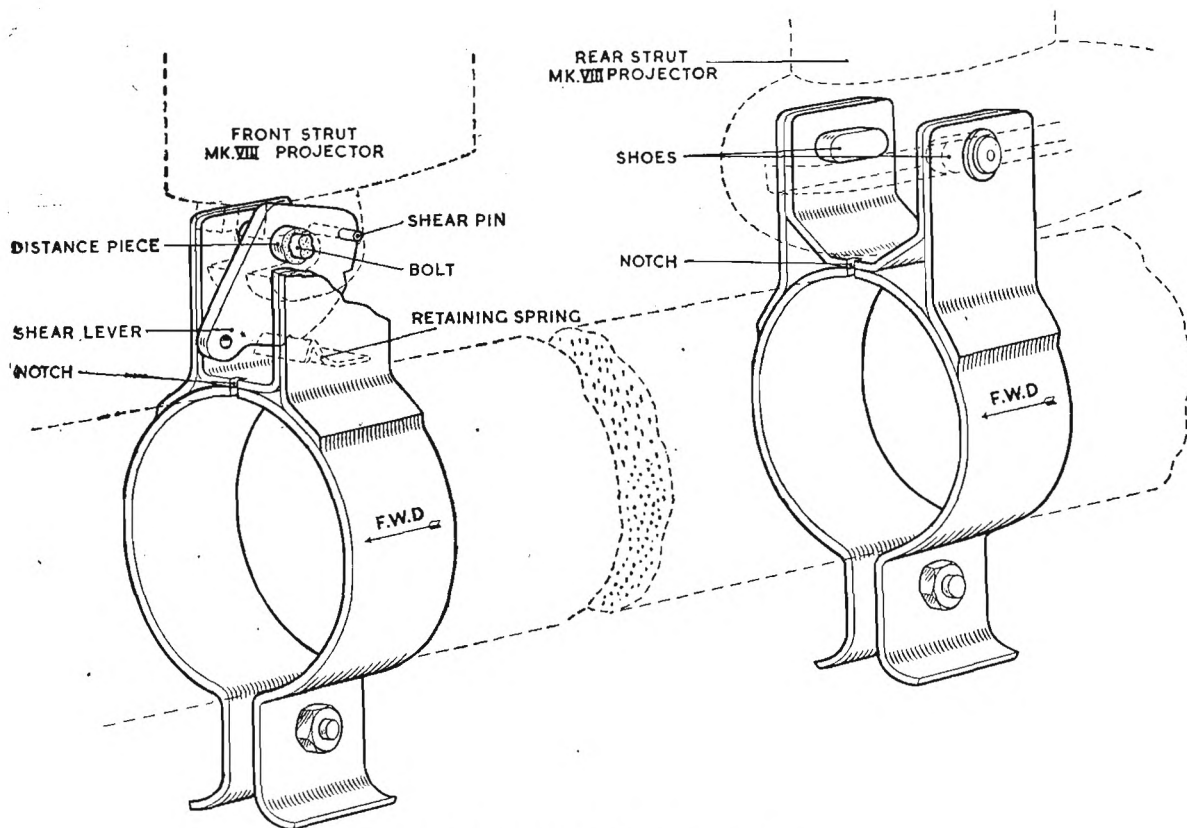


Fig. 4.—No. 5 front and rear saddles

13. The shear lever has a projecting arm at its forward end and a No. 10 S.W.G. copper shear pin in its rear end. Two "V"-shaped notches are cut in the lower surface of the lever and these notches engage the curved end of a flat retaining spring mounted on the top of the band between the side supports. The lever is positioned so that when the rear notch is engaging the retaining spring the shear pin is to the bottom, to allow the saddle to be loaded on to the front carrier.

14. In loading (which is done from the front) the shear lever passes through the slot in the hook of the front carrier and the saddle is supported by the bolt and distance pieces. If the forward projecting arm of the shear lever is now depressed until the front notch is engaging the retaining spring, the shear pin moves behind the rear face of the hook. Thus, forward movement of the rocket is prevented by the shear pin engaging the rear face of the hook and backward movement by the distance pieces in the jaws of the hook.

15. When the rocket is fired, the shear pin is sheared off leaving the lever free to pass through the slot in the hook.

Rear saddle

16. The circular clamping band of the rear saddle is similar to that of the front saddle, see para. 11, but the supporting arrangements are different. Two side supports are welded to the top of the band and are strengthened by two inner supports. The side supports are set wider apart than those of the front saddle to suit the dimensions of the rear carrier. An arrow and the letters "FWD" are stamped on the side supports to indicate the direction in which the saddle is to be assembled on the motor.

17. A small pivoting shoe is fitted to the inner face of each support, to engage the saddle grooves on the rear carrier of the projector.

Instructions for use

18. All saddles when issued to the Service are protected with a coating of D.T.D.663 preservative. *This coating must be thoroughly removed with petrol or white spirit immediately prior to assembling the saddles to the rocket motor.*

No. 1 and 2 saddles

19. The No. 1, Mk. 2 positioning jig is used for assembling the No. 1 and 2 saddles to the

rocket motor, and reference should be made to Chapter 9 of this section for detailed instructions.

No. 3 saddles

20. The No. 1, Mk. 2 and the No. 2, Mk. 2 positioning jig may be used for assembling No. 3 saddles to the rocket motor, and reference should be made to Chap. 9 and 10, respectively, of this section for detailed instructions.

No. 5 saddles

21. The No. 2, Mk. 2 positioning jig is used for assembling the No. 5 front and rear saddles to the rocket motor, and reference should be made to Chap. 10 of this section for detailed instructions.

22. If a No. 2, Mk. 2 jig is not available, as an interim measure a Mk. VIII or IX rocket projector may be used for jiggling the saddles as follows:—

- (i) Fit four Mk. 1 or Mk. 2 fins to the rocket motor in the manner stated in Sect. 3, Chap. 1.
- (ii) Fit front and rear saddles loosely on the motor with the rear saddle nearest the fins ensuring that the arrows on both saddles are pointing towards the shell ring end of the motor.
- (iii) Carefully position the front saddle so that its forward edge is the appropriate distance (according to the particular aircraft) from the front edge of the shell ring and the shear lever is aligned *centrally* between any two adjacent fins. In most instances, this distance is $2\frac{1}{2}$ in.
- (iv) Securely tighten the $\frac{1}{4}$ in. B.S.F. clamping bolt and nut at the bottom of the saddle and check that the saddle is positioned as stated in sub-para. (iii).

- (v) Check that the projecting arm of the shear lever is in the raised position, and lift the rocket motor and engage the front saddle on the front carrier hook. (Two men are required for this).
- (vi) Hold the front saddle firmly pressed to the rear against the hook and adjust the position of the rear saddle until the shoes are positioned centrally in the grooves of the rear carrier. When correctly positioned, securely tighten the clamping bolt and nut at the bottom of the saddle.

Note.—The shear lever on the front saddle is NOT to be used to hold the front saddle in position as damage may result to the shear pin.

- (vii) Remove the motor from the projector by moving it forward until the saddles are clear of the projector.

WARNING.—ON NO ACCOUNT MUST THE ASSEMBLED ROCKETS BE RESTED ON THE GROUND OR BENCH WITH THE FINS OR SADDLES ACTING AS SUPPORTS.

Supply

23. The No. 1 saddles are packed 24 in wooden box, M.201, 21.5 in. × 9.25 in. × 9.3 in.; the No. 2 saddles are packed 24 in wooden box, M.202, 20.75 in. × 13.35 in. × 9.3 in.; the No. 3 saddles are packed 24 in wooden box, M.208, 22.25 in. × 13.125 in. × 9.3 in. The filled boxes weigh 48 lb. approx.

24. The No. 5 saddles are packed 12 sets in wooden box, M.212, 16 in. × 13.75 in. × 8.9 in. The filled box weighs 50 lb. approx.

Storage

25. Saddles should be stored in a dry place to obviate the risk of corrosion.

CHAPTER 8

SADDLES No. 4 and 8

LIST OF CONTENTS

	<i>Para.</i>
Introduction	1
General description	5
No. 4 saddles—	
Upper front saddle	9
Lower front saddle	13
Upper rear saddle	18
Lower rear saddle	19
Conversion clamp	22
No. 8 saddles—	
Upper front saddle	24
Lower front saddle	28
Upper rear saddle	29
Lower rear saddle	32
Conversion clamp	33
Instructions for use	34
Firing restrictions with tier-carriage loads	39
Supply	41
Storage	43

LIST OF ILLUSTRATIONS

Fig.

- 1.—No. 4 front and rear saddles
- 2.—No. 8 front and rear saddles
- 3.—Tier-carriage loading schemes 'A' and 'B'
- 4.—Diagram of pigtail connections to the projector

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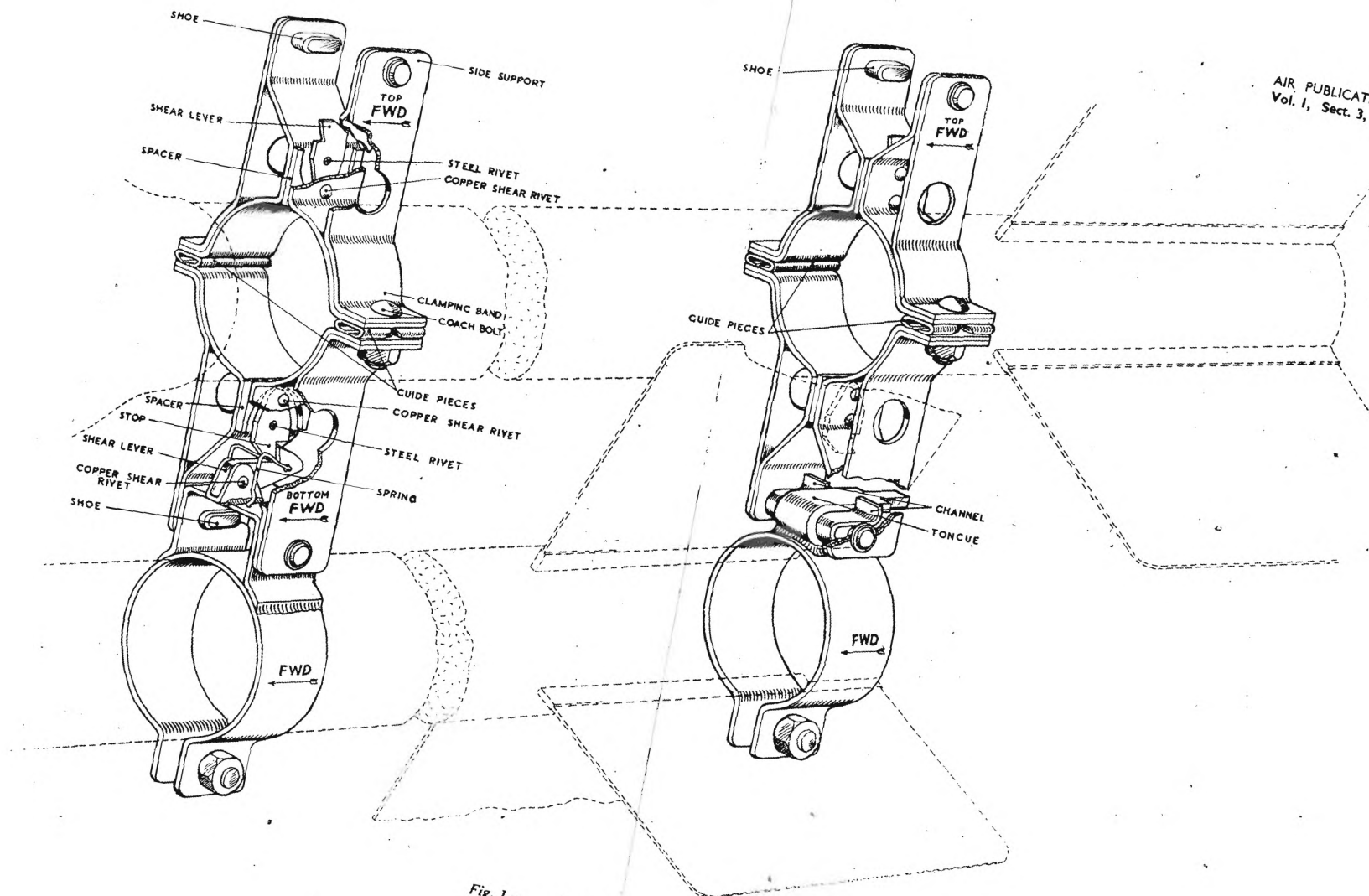
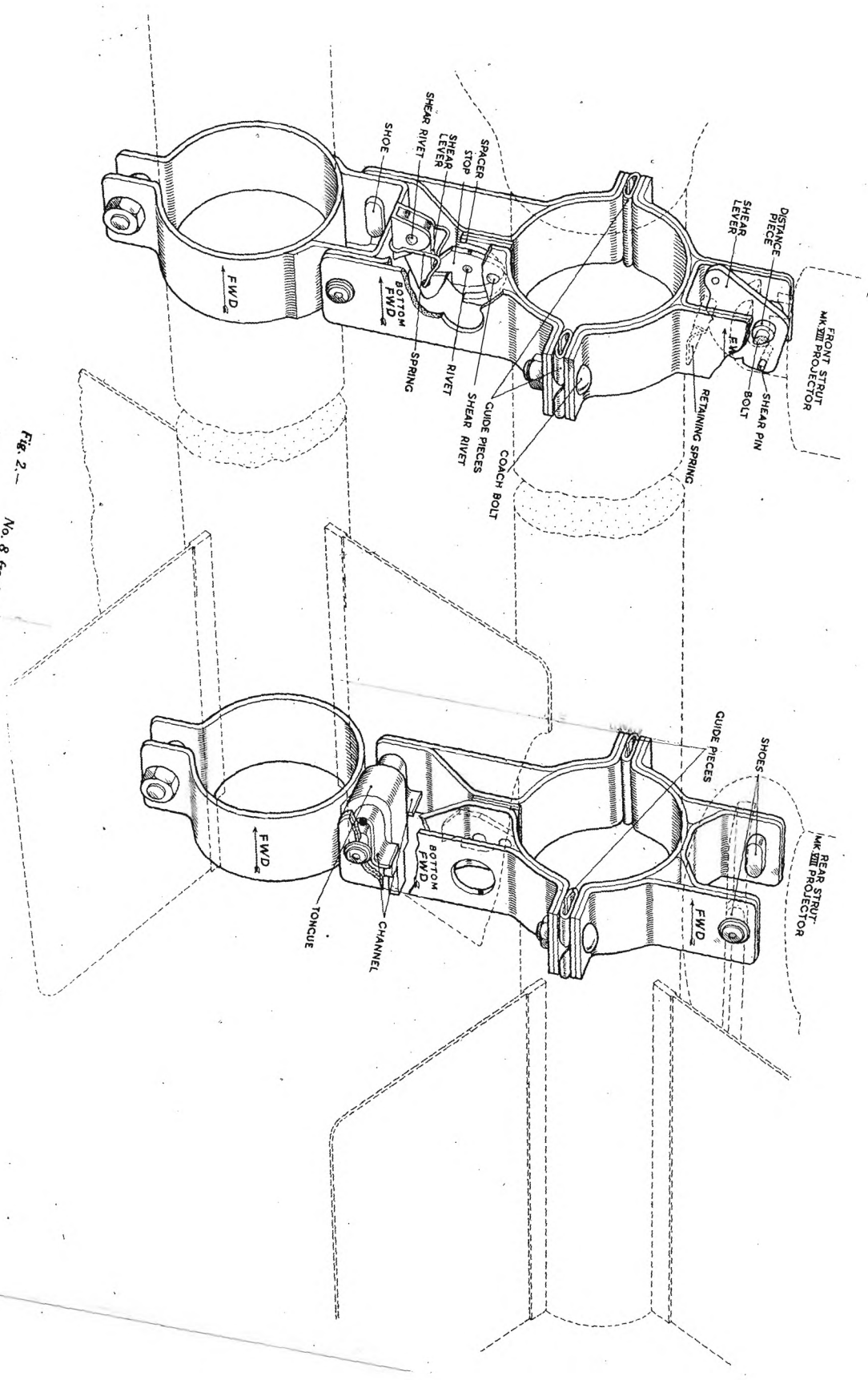


Fig. 1.— No. 4 front and rear saddles.

Fig. 2.
No. 8 front and rear saddles



Lower front saddle

13. The lower front saddle has a one-piece clamping band secured at the bottom by a $\frac{3}{8}$ in. B.S.F. hex./hd. bolt and nut. A support bracket is welded to the top of the band and has a slot on each side to engage the shoes on the bottom edge of the upper front saddle.

14. Attached to the top of the support bracket is a U-shaped bracket carrying a shear lever pivoted on a 12 S.W.G. copper shear rivet. The shear lever has a hook at its rear end and is spring-loaded in an upward direction by a double-armed spring fitted between the lever and the support bracket.

15. An arrow and the letters "FWD" are stamped on the side of the clamping band to indicate the direction of assembly of the saddle to the motor.

16. To assemble the lower saddle to the upper saddle, the rear edges of the slots in the support bracket are engaged over the front edges of the upper saddle shoes, and the lower saddle moved to the rear. As the lower saddle is moved back, the spring-loaded shear lever rides over the stop on the upper saddle and the forward face of the hook on the lever is held by the spring into engagement with the notch on the stop.

17. On firing the lower rocket, the 12 S.W.G. copper shear rivet in the shear lever of the lower saddle is sheared off, allowing the shear lever to drop down free of the notch on the stop of the bottom half of the upper saddle.

Upper rear saddle

18. The upper rear saddle is identical to the upper front saddle, see para. 9 to 11, but has in addition a channel piece clipped over the shoes on the lower half of the saddle to form an anchorage for the lower rear saddle.

Lower rear saddle

19. The lower rear saddle has a one-piece clamping band secured at the bottom by a $\frac{3}{8}$ in. B.S.F. hex./hd. bolt and nut. A U-shaped tongue with an extending arm to the rear is mounted centrally on the top of the band. This tongue slides on to the channel piece of the upper rear saddle to hold the two saddles together. The two saddles are held together only by friction.

20. An arrow and the letters "FWD" are stamped on the side of the clamping band to indicate the direction of assembly of the saddle on the rocket motor.

21. On firing the lower round, the rocket moves forward and the tongue slides off the channel piece.

Conversion clamp

22. The conversion clamp consists of $1\frac{1}{2}$ in. wide metal strip formed into a semi-circle with flanges on its ends to mate with those of the clamping band of the upper saddles.

23. By unscrewing the clamping nut of the front and rear upper No. 4 saddles, four identical assemblies are obtained, except that the coach bolts and guide pieces are fixed in each upper half. If now a conversion clamp is bolted to each of these assemblies, four No. 3 saddles are produced.

Note.—It is not considered necessary to fit additional guide pieces.

No. 8 saddles, fig. 2

Upper front saddle

24. The upper front saddle is in two halves secured together by two $\frac{3}{8}$ in. B.S.F. special coach bolts and hex./hd. nuts passing through flanges in each half. Guide pieces are inserted between the flanges as in the No. 4 saddles, see para. 9.

25. The upper half of the saddle is identical to the upper half of a No. 5 front saddle, see Chap. 7, having a clamping band, side supports, suspension bolt, shear lever, shear pin, and retaining spring.

26. The lower half of the saddle is identical to the lower half of the upper front No. 4 saddle, see para. 10.

27. An arrow and the letters "FWD" are stamped on the side support to indicate the direction of assembly.

Lower front saddle

28. The lower front saddle is identical in all respects to the lower front No. 4 saddle, see para. 13 to 17.

Upper rear saddle

29. The upper rear saddle is in two halves bolted together in the same way as the upper front saddle.

30. The upper half is identical to the upper half of a No. 5 rear saddle, see Chap. 7, having a clamping band, side supports, and saddle shoes.

31. The lower half is identical to the lower half of the upper rear No. 4 saddle, see para. 18.

Lower rear saddle

32. The lower rear saddle is identical in all respects to the lower rear No. 4 saddle, see para. 19 to 21.

Conversion clamp

33. By unscrewing the nuts from the upper front and rear No. 8 saddles, and fitting a

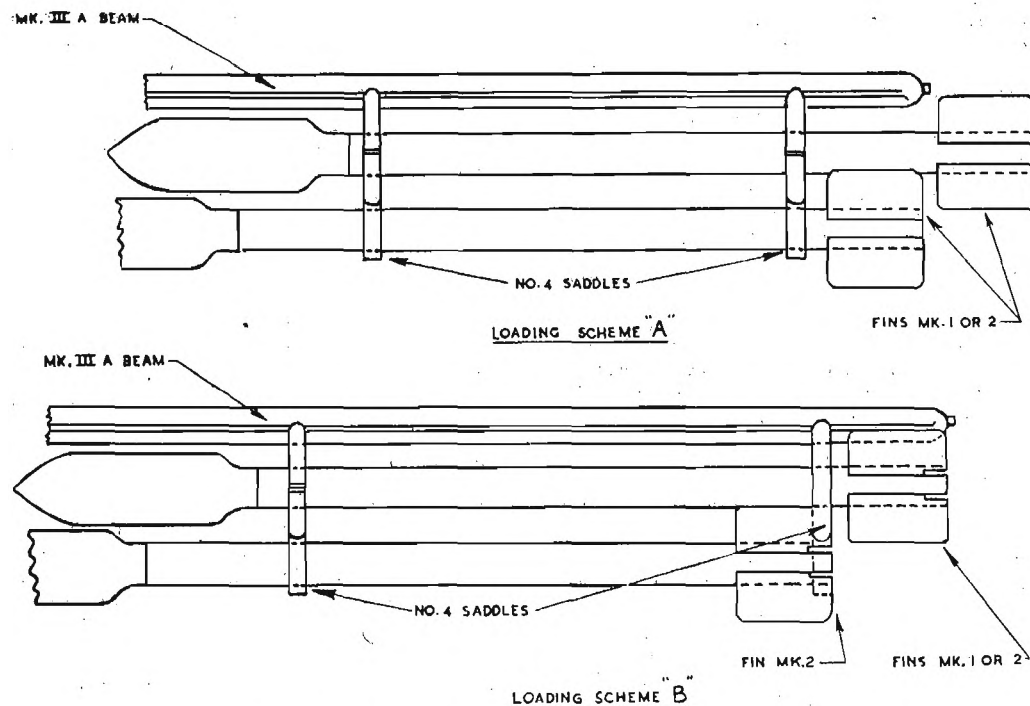


Fig. 3.—Tier-carriage loading schemes 'A' and 'B'

conversion clamp, see para. 22, to each of the four assemblies so formed, a set of No. 5 saddles is produced from the upper halves of the front and rear saddles, and a pair of No. 3 saddles from the two lower halves.

Note.—It is not considered necessary to fit additional guide pieces.

Instructions for use, fig. 3 and 4

34. All saddles, when issued to the Service, are protected with a coating of D.T.D.663 preservative. *This coating must be thoroughly removed with petrol or white spirit immediately prior to assembling the saddles to the rocket motor.*

35. The No. 2, Mk. 2 saddle positioning jig, see Chap. 10 of this section, is used for assembling the No. 4 and 8 saddles to the rocket motor.

36. There are two loading schemes for tier-carriage loading known as loading scheme 'A' and loading scheme 'B', see fig. 3. In loading scheme 'A', both rockets are fitted with Mk. 1 or 2 fins, and the fins on each are aft of the rear saddles. In the loading scheme 'B' the upper rocket is fitted with Mk. 1 or 2 fins and is carried in the upper saddles with its fins aft of the rear saddle, whilst the lower rocket is fitted with Mk. 2 fins only and is carried in the lower saddles with its fins forward of the rear saddle, which is placed on the extreme end of the motor.

37. The lower rounds of tier-carriage loads must be fitted with Mk. 4/TH rocket motors, the upper rounds may have either Mk. 3/TH or 4/TH motors.

38. The method of connecting up the pigtail leads to the 2-way adapters, see para. 4 in the Niphan sockets of an eight station installation, is shown diagrammatically in fig. 4.

Important Note.—In connecting up it always must be remembered that the lower rounds are projected before the upper rounds and that in consequence to avoid interference between the upper and lower round pigtails, those of the lower rounds must lie to the rear of those of the upper rounds. To achieve this, the *upper* round leads must be connected first and to the *lower* socket of the 2-way adapter or socket, followed by the *lower* round leads into the *upper* sockets.

Firing restrictions with tier-carriage loads

39. Salvo-release of rockets in tier is not recommended except in an emergency where jettisoning of the rounds is required, for the following reasons:—

- (i) Upper and lower rounds launched simultaneously will most likely fail to separate in flight.
- (ii) If H.E. rounds do not separate, correct functioning of both rockets may not occur as, on impact, the shell of the lower round, being forward of the upper round, may detonate first and cause only partial detonation of the upper round.

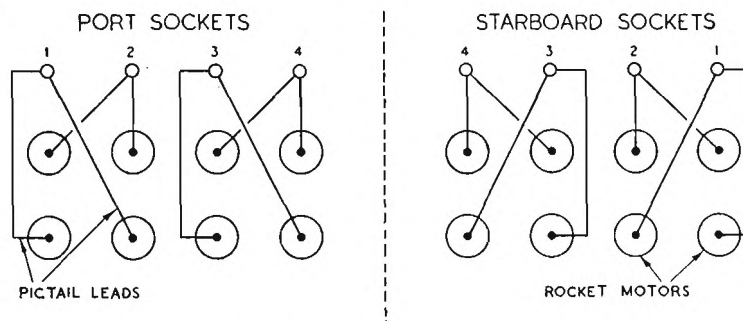


Fig. 4.—Diagram of pigtail connections to the projector

- (iii) If A.P. rounds do not separate before water entry, the underwater travel of both rounds will likely be prejudiced.
- (iv) If the lower of the two rockets fails to fire, the upper round will dive steeply to earth, carrying the lower round with it.

Note.—This is likely to occur whether the rockets are fired in salvo or the upper and lower rounds are fired separately, for in the latter instance the lower round may fail to fire when required and be carried away subsequently by the upper round.

40. To avoid the risk of damage to the aircraft from flying into debris or the fragmentation of rockets falling short this way, the following restrictions are to be observed in firing against ground targets:—

Head	Limitation	Remarks
25 lb. shot, and practice (concrete) shot 60 lb. inert filled (H.E.S.) and practice (concrete) shell	Not to be fired in attacks at less than 15° angle of dive, i.e. 600 yds. range.	Risk to aircraft from debris if the lower motor fails to fire.
60 lb. S.A.P./H.E. shell	Not to be fired in attacks at less than 30° angle of dive, i.e. 1,000 yds. range.	Risk to aircraft from fragmentation if the lower motor fails to fire.

Supply

41. The No. 4 saddles are packed 8 sets in wooden box, M.211, 30.75 in. × 13.65 in. × 9.0 in. The filled box weighs 70 lb. approx.

42. The No. 8 saddles are packed 8 sets in

wooden box, M.215, 28.25 in. × 13.65 in. × 9.0 in. The filled box weighs 70 lb. approx.

Storage

43. The saddles should be stored in a dry place to obviate the risk of corrosion.

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Section 4

SIGHTS AND SIGHTING

