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# ADMIRALTY FLEET ORDER

**GUNS AND MOUNTINGS, 20-mm. OERLIKON—FITTING—STOPS—RAILS—TELEPHONES—AMMUNITION LOCKERS AND STOWAGES—COCKING ARRANGEMENTS—MAGAZINES—TWIN MARK V AND VC MOUNTINGS, ETC.**

ADMIRALTY, S.W.1,  
25th May, 1944.

The following Order having been approved by My Lords Commissioners of the Admiralty is hereby promulgated for information and guidance and necessary action.

By Command of Their Lordships,

*H. V. Markham*

*To all Commanders-in-Chief, Flag Officers, Senior Naval Officers, Captains and Commanding Officers of H.M. Ships and Vessels, including Minor War Vessels (1 Copy), and Superintendents or Officers in Charge of H.M. Naval Establishments, concerned.*

Note:—For scale of distribution see A.F.O. 998/43.

HEAD OF "P" BRANCH

2705.—Guns and Mountings, 20-mm. Oerlikon—Fitting—Stops—Rails—Telephones—Ammunition Lockers and Stowages—Cocking Arrangements—Magazines—Twin Marks V and VC, Mountings, etc.

(D.N.O. (W.O.) 63/44.—25 May 1944.)

This order embodies all A.F.Os. in connection with Oerlikon guns and mountings which were in force on 7th March, 1944, except as follows:—

- (a) Orders which have been incorporated in the new edition of the handbook B.R. 274/43.
  - (b) Modifications to guns which have been ordered in A.F.Os. 3815/41, 1011/42, 2248/42, 3640/42, 4385/42, 3159/43, 3423/43, 3934/43, 4288/43, 6234a/43.
  - (c) Changes in the supply of tools and spares which have been incorporated in the Naval Proportion Book.
  - (d) Orders which apply only to individual ships or to classes of ships, e.g., Coastal Craft, and orders which deal with the 0.5-in. twin, Mark V, as well as the Twin Oerlikon, Mark V., i.e., A.F.Os. 2845/43, 4572/43, 702/44, 823/44.
2. Orders as regards Oerlikon ammunition are not included.
3. The only C.A.F.Os. in force are those about—

- (a) Fitting of gyro sights.
- (b) Ammunition.

4. This order is arranged as follows:—

Fitting	...	...	...	...	Paragraphs 5 to 36.
Stops, rails and telephones	...	...	...	...	Paragraphs 37 to 50.
Ammunition lockers and stowages	...	...	...	...	Paragraphs 51 to 59.
Cocking arrangements	...	...	...	...	Paragraphs 60 to 69.
Guns and magazines	...	...	...	...	Paragraphs 70 to 88.
Twin, Marks V and VC mountings	...	...	...	...	Paragraphs 89 to 98.
Miscellaneous	...	...	...	...	Paragraphs 99 to 108.

#### FITTING OF HANDWORKED OERLIKONS

5. The Mark VIIA, 20-mm., Oerlikon mounting production is now sufficient to enable all new construction White and Red Ensign and all additional armament to White or Red Ensign ships to be supplied with Mark VIIA mountings.

6. The Mark IIIA mounting production is ceasing and a limited number only will be available for issue to special services, e.g., temporarily in lieu of Mark IX mounting or to ships already prepared for Mark IIIA mountings—Mark IIIA mountings are not available for new construction.

7. There are now no more Mark IV mountings available for issue to new construction or additional armament to White or Red Ensign ships and Mark VIIA will be issued.

#### MARK IIA, IIIA AND V SINGLE MOUNTINGS

8. The deck ring for Mark IIA, IIIA and V single mountings should in general be of steel  $\frac{1}{2}$  inch in thickness at the point of highest deck camber and is to be of the following dimensions:—

Extreme diameter	...	...	...	...	2 ft. 5 $\frac{1}{2}$ in.
Internal diameter	...	...	...	...	1 ft. 11 $\frac{1}{2}$ in.

Ten holes are to be drilled on a pitch circle diameter of 2 ft. 3 $\frac{1}{4}$  in. for  $\frac{3}{8}$ -in. diameter holding-down bolts.

9. In some instances the deck camber or sheer may be so considerable as to preclude the economical fitting of the steel deck ring. In these circumstances the fabricated arrangement of gun support and false floor shown on the A.F.O. Diagram 150/44(1) should be substituted.

10. Where the mounting is to be fitted on a wood-covered deck, the planking need be removed in wake of the seating only, the ramp being connected to the wood and steel deck by angle lugs. The bolts securing the angle lugs to the deck should be tapped through the steel plating and well grommeted and washered to ensure water-tightness. If the steel deck is of a sufficient thickness to warrant plug tapping for these bolts, arrangements are to be made accordingly.

11. Wherever practicable, Oerlikon mountings should be supported by two stiffeners crossing at right angles below the mounting. If the plating of the existing deck or platform is less than 15 lb., a 15 lb. doubling plate should be fitted. The deck firing forces are 2.5 tons downwards at the rear and 1.26 tons upwards at the front of the mounting.

12. The mounting of guns on wood decks or wooden deck houses is the subject of separate instructions to the authorities concerned.

13. It has been found at a number of gun trials that the platform on which Oerlikons are mounted are not correctly stiffened and that excessive vibration of the mounting is thus caused.

For any existing ship in which undue vibration of Oerlikon mountings is experienced, the Commanding Officer is to insert an item, classification "A", in his next list of As. and As. to cover the fitting of additional stiffening in accordance with the above.

14. When Oerlikon guns are fitted on the quarterdeck in destroyers the mountings are to be kept as close down to the deck as possible. Deck camber should be corrected by levelling pads of a minimum thickness of  $\frac{1}{2}$ -in. at the inboard edge. Raised seats for levelling are not to be fitted as these require ramps to be fitted to enable the layer to reach the sights on depression of the gun, and result in increased obstruction and congestion on the quarterdeck. Safety depression rails fitted with such mountings are to be made portable.

#### MARK VIIA MOUNTING

15. The characteristics are:—

- (i) Short radius (3 ft. 4 in.) with a balance weight in the pedestal.
- (ii) Weight of mounting, gun and shield, 14-cwt.
- (iii) Holding down arrangements: L 8 in No.  $\frac{3}{8}$ -in. bolts on a P.C.D. of 20 $\frac{1}{2}$  in. Outside diameter of base = 22 $\frac{1}{2}$  in.
- (iv) A single step ramp, External diameter 6 ft. 8 in. Internal diameter, 5 ft. 0 in. Height, 8 in.
- (v) Prepared for fitting Mark XIV or Type VI sight.

16. A Mark VIIA (S/M) mounting is also being produced for submarine use, which is generally similar to the Mark VIIA, but is not fitted with a shield. The step dimensions are: external diameter, 5 ft. 10 in.; internal diameter, 4 ft. 8 in.; height, 8 in. This supersedes the Mark IIA (S/M) mounting.

17. The stiffening arrangements for the platforms, etc., are the same as for the Mark IIIA and Mark IV mountings.

#### MARK VIIIA MOUNTING

18. This is a light, single, low angle mounting approved for issue to certain Coastal Forces craft.

The characteristics of the equipment are:—

- (i) Low angle. Elevation 20°, depression 15°.
- (ii) Working radius 4-ft. Muzzle sweep 4 ft. 7 in.
- (iii) Height of trunnions, 3 ft. 3 in.
- (iv) Weight of mounting gun and shield, 6 $\frac{1}{2}$  cwt.
- (v) Holding-down arrangements, 12 in No.  $\frac{3}{8}$ -in. bolts on a P.C.D. of 1 ft. 9 $\frac{1}{2}$  in. Outside diameter of base, 2 ft. 0 in.
- (vi) No ramp is required.

19. The shield has two sets of securing holes, the upper of which should be used in the forward position in 70 ft. M.T.B. in order that the shield may be lowered sufficiently to clear the line of the torpedo sight.

20. The limits of depression obtainable by any individual gunlayer depend on his height, and where a pad piece is fitted under the mounting it should be as thin as possible, unless it can be extended to the working radius to raise the gunlayer to the height of the base of the mounting.

21. The stiffening arrangements will be the same as for Mark IIIA mountings.

22. In mountings, Nos. 1–12 inclusive, there is a possibility of a foul between the sight stay and the gun cotter securing the breech block to the breech bars. In these mountings it is essential that the cotter be inserted from right to left leaving the projecting position on the right.

#### MARK IX TWIN MOUNTING

23. This is a handworked H.A./L.A. twin mounting designed to meet special conditions. It is not suitable for general service as an H.A. equipment as it is not controllable efficiently at the higher elevations with any motion on the ship, but has been approved for initial issue to certain coastal forces craft and certain other vessels where the major requirement is for low angle fire or fire at low flying aircraft.

Gyro sights will not be fitted to these mountings.

The characteristics are:—

- (i) Weight of mounting and two guns, 10½ cwt. approx.
- (ii) Holding down arrangements as for Mark IIIA, ten holes for ¾ in. bolts on a P.C.D. of 2 ft. 3¼ in.
- (iii) The radius required for the muzzles is less than that required for the gunlayer, see paragraph 30.

24. Experience to date indicates that the stiffening arrangements for Mark IIIA and Mark IV mountings in ships will be suitable for the Mark IX but that in certain small craft additional stiffening may be required.

#### RAMPS, CLEARANCES AND OTHER PARTICULARS

25. The attached schedule shows the clearances and sizes of ramps and zarebas required for hand-worked Oerlikon equipments.

26. *Marks IIA, IIIA and V Mountings (with large radius ramp).*—Details of the ramp are given in A.F.O. Diagram 150/44 (1). The dimensions given in the schedule are applicable whether the top step has or has not been added to in accordance with paragraph 34 below.

27. *Marks IIA, IIIA and V Mountings (with short radius high ramp).*—The details of the ramp are given in A.F.O. Diagram 150/44 (2).

28. *Marks I and Mark IV Mountings (rising column).*—The ramp referred to is the optional low-angle ramp of which details are given in A.F.O. Diagram 150/44 (3). (See paragraph 35.)

29. *Mark VIIA Mounting (short radius).*—A single step ramp is required for low angle firing and details of this ramp are given in paragraph 15.

30. *Mark IX Mounting (twin hand worked).*—(i) Attention is drawn to the fact the ramp required is the original large radius low ramp without the addition to the top step. (See paragraph 34.)

(ii) The muzzle sweep of this equipment is less than the radius required for the gunlayer. An extension piece will therefore be fitted at the muzzle end, which will eventually be replaced by safety depression cam gear.

31. As a rule the ramp should enclose the mounting, but, where the area of fire will be improved by so doing the gun should be positioned at a distance of 3 ft. from the outboard edge of the deck or platform. In special cases this distance may be reduced to 2 ft. if the advantage gained overrides the disadvantage that reloading cannot then be carried out on all bearings.

32. In all cases where there is a difference between the minimum radius of the zareba in column 3 and the minimum distance to a vertical bulkhead in column 4, this is owing to the limitation of height of the zareba. At the medium elevations of the gun the gunlayer's head may, with certain men, overlap the vertical plane of the zareba at a height above that laid down for the maximum.

33. For all mountings it is essential that the muzzle rails do not foul the gunlayer on the reverse bearings.

34. Where the older type large radius ramp (see paragraph 26) is found to be too low the Commanding Officer of any ship so fitted should arrange for the fitting of suitable gratings to the steps to increase the height as required. An item, Classification "A," should be included in their lists of As. and As. to cover the work involved, which should be carried out by ships' staffs with material and assistance provided by a dockyard or repair base as necessary. D.E.M.S. S.Os. should arrange with base staffs for the necessary work to be carried out in merchant vessels.

35. To enable gunlayers of less than average height to use the eyepiece at full depression with Oerlikon, Marks I and IV equipments, a firing step will be necessary, as shown on A.F.O. Diagram 150/44 (3).

In some cases the advantage of getting full depression may not be sufficient to justify the obstruction caused by the firing step, and in other cases a step on specified arcs only may suffice.

Commanding Officers of ships concerned should, if desired, insert an item classified "A\*" in their next list of As. and As. to cover the work involved.

Firing steps are also to be provided and fitted by shipbuilders as required by ship's officers in ships being armed with Oerlikon, Mark I or IV equipment.

Clearances required for Oerlikon Mountings

Mounting (1)	Ramp (external radius) (2)	Zareba (internal radius) (3)	Minimum distance of vertical bulkheads from centre of mounting (4)	Muzzle sweep (5)	Height of trunnions (6)	Maximum depression of mounting (7)
(i) Mark IIIA and U.S.A., Mark V, with original large radius ramp (fixed trunnion).	4 ft. 7 in. radius with 4 in. extension on top step (3 step).	4 ft. 7 in. min. radius 4 ft. 3 in. max. height	4 7	4 7	5 2½	5°
(ii) Mark IIIA and Mark V, with high ramp (fixed trunnion).	3 ft. 10¾ in. radius (3 step)	3 ft. 11 in. min. radius 4 ft. 3 in. max. height	4 7	4 7	5 2½	5°
(iii) Mark I and Mark IV (rising column).	4 ft. 0 in. radius (1 step).	4 ft. 0 in. min. radius 3 ft. 4 in. max. height	4 7	4 7	5 2½ max. 3 10½ min.	5°
(iv) Mark VIIA (short radius)	3 ft. 4 in. radius (1 step).	3 ft. 4 in. min. radius 3 ft. 0 in. max. height	3 4	5 6	4 2½	15°
(v) Mark IX (twin handworked)	Old standard ramp without the extra 4 in. on top step, radius 4 ft. 7 in. (3 step).	4 ft. 7 in. radius 3 ft. 4 in. max. height	4 9	Approx. 5 0 with muzzle extension.	4 7	10°

## HOLDING-DOWN BOLTS

36. Stocks of holding-down bolts for 20-mm. Oerlikon, Marks IIA, IIIA and V single mountings are supplied to the gun mounting overseers at Coventry and Parkhead for issue to fitting-out and shipping ports where facilities for the manufacture of suitable bolts are limited.

The bolts, which are supplied in lengths of 5 in., 7 in. and 9 in., should be demanded in sufficient quantities to meet anticipated requirements, based on recent issues of Oerlikon equipments. Fitting-out ports should, according to requirements, lay in stocks of from 300 to 800 bolts, consisting of about 25 per cent. of 5 in. length, 65 per cent. of 7 in. length and 10 per cent. of 9 in. length. Shipping ports should maintain a stock of 9-in. bolts to provide for 10 bolts for each equipment shipped for transport abroad. Ports dealing with both fitting-out and shipment should vary their stocks as necessary.

## STOPS, RAILS AND TELEPHONES

37. The "rule of thumb" described in A.F.O. 5592/43 should be used for guidance in fitting stops and rails or safety cams.

38. Some mountings have all round training while others are provided with limit stops, and telephones to be fitted to such mountings are to be Mark XI handsets and Mark X headsets respectively.

39. Limit stops are not supplied as part of mountings and where fitted they have been provided by local resources.

## MARK IIA, IIIA AND V SINGLE MOUNTINGS

40. A drawing for guidance in the provision of limit and semi-permanent stops is shown in A.F.O. Diagram No. 150/44(4).

The limit stop consists of a steel bar secured to the shield stay on the side of the cradle, which extends downwards to engage a limit (or permanent) stop, consisting of a small block of steel welded to the top of the pedestal.

An extension of the bar carries a hinged portion capable of being pinned up in the inoperative position, or of hanging down, when it will engage stops, consisting of steel blocks welded to the pedestal at a lower level than the limit stop.

It will be seen that this hinged portion acts as a semi-permanent stop.

41. When fitting stops on these lines, care should be taken to ensure that the edges of the stops are well radiused, as otherwise they may cause the empty cartridge bag to hang up and tear.

42. The method of using a headset telephone at a 20 mm., Mark IIA or IIIA or V single mounting that does not have all-round training is shown in A.F.O. Diagram 150/44(5) together with the details of the necessary fittings at the mounting.

The lead passes through two swivel pieces, one on the pedestal and one on the carriage, the length of bight between the two swivel pieces being adjusted to suit the angle of training of which the mounting is capable.

43. When not in use the "headset" is stowed in a box fixed to the right shield.

44. In future, connection to the flexible telephone cable is to be made by means of a junction box, Pattern 3730, sited on the pedestal of the mounting as shown in A.F.O. Diagram 150/44(6). The telephone plug box, at present fitted off the mounting is to be omitted.

Where communications are already fitted in accordance with A.F.O. Diagram 150/44(5) no further action is to be taken.

45. If not already fitted, the limit and S.P. stops should be manufactured and fitted with the telephones by ship's staff, assisted by repair establishments, an item classification "A" being inserted in ship's list of As. and As. to cover the work involved.

## MARK IV MOUNTING

46. A.F.O. Diagram 150/44(7) shows an arrangement and details of a training limiting stop for the 20 mm., Mark IV U.S. rising column mounting.

The bolt securing the trunnion bracket and pivot coupling nut is removed and replaced by the securing screw 8.

The securing screw 8 also retains the training stop 7 which is fitted into the recess in the trunnion bracket for the training housing catch.

Item 7 is machined to provide a recess for the training housing catch.

The stop face of the housing catch is machined as shown in the diagram to allow it to engage in the recess.

A strap, items 1 and 2, machined internally to fit the rising column, is firmly secured to the column by the nuts and studs, items 5 and 3, and is positioned radially by the dowel pin 6.

The projecting segment of the flange of item 2 engages the stop 7 and is positioned to suit the particular training limits required.

47. In order to prevent the strap from rising on the column, and so jamming the rotating trunnion bracket when the column is lowered, a loose brass bush should be fitted to the strap as shown in A.F.O. Diagram 150/44(8) (G.R. 6346).

When lowering the column the training stop strap is prevented from contacting the pedestal head by the loose bush engaging between the rotating trunnion bracket and the pedestal.

48. Isolated reports have been received of mountings in which the strap has been welded to the rising column. This method of securing the strap is undesirable and should on no account be adopted.

49. In vessels where training stops for Mark IV mountings are required, Commanding Officers should insert an item, classification "B" in their next list of As. and As.

## TWIN MARK IX MOUNTING

50. Reports have been received which show that a side blow on the fork of the depression arm of the 20 mm., Mark IX twin mounting, when training, allows the leading gun to come inside the muzzle rail.

To prevent this, the modification should be made as shown in A.F.O. Diagram 150/44(9) (Drawing No. G.R. 6504).

The modification entails bending the prongs of the fork out to 18.5 in. centres and bolting a 0.375-in. diameter screwed bar between them 4.0 in. from the front end.

Alternatively, a tube approximately 1 in. outside diameter by 17.15 in. long may be welded to inside of arms.

The work involved should be carried out by base staff.

## AMMUNITION STOWAGE AND LOCKERS

51. *Ammunition stowage.*—Oerlikon ammunition manufactured in U.K. and U.S.A. is classification group VI for storage and the balance of outfit and practice which is not stowed in ready use stowages can be accommodated in S.A. or Q.F. magazines. In ships not fitted with these magazines, stowage should be arranged in accordance with N.M.E.R., Appendix III.

*Ready use stowages.*—Standard type lockers are provided as follows:—

- (a) Magazine locker, for replenishment or Oerlikon magazine drums at gun positions.
- (b) Ready use locker for stowage of Oerlikon magazine drums.

52. Details of the magazine and R.U. lockers are as follows:—

*Magazine Lockers*—Pattern 7105:—

- (a) Length 4 ft. 6 in., width 2 ft. 1½ in., height 3 ft.
- (b) Empty weight, 5 cwts.
- (c) Capacity, four boxes of ammunition.
- (d) Allowance, one per equipment, generally.

*Ready Use Locker*—Pattern 7103:—

- (a) Length 2 ft. 6 in., width 1 ft. 6 in., height 2 ft. 6 in.
- (b) Empty weight, 2 cwts.
- (c) Capacity, four magazines (240 rounds total).
- (d) Allowance, two R.U. lockers per equipment.

*Note.*—For Coastal Forces craft a special light type R.U. locker, Pattern 7104, weight 150 lbs. empty (design D.N.C. 2/A.574A) will be supplied.

53. (a) Where two or more Oerlikon guns are to be mounted in reasonably adjacent positions, and satisfactory stowage in magazines below exists, one magazine locker between each two guns should be sufficient for replenishing magazine drums—thus saving deck space and economizing in lockers.

(b) Conversely, where no magazine is available for stowing the balance of outfit, such as in certain D.E.M.S. and auxiliaries, two magazine lockers will be required to stow the full outfit of 2,400 rounds.

(c) In other cases, particularly in small ships, lack of sufficient deck space may prohibit fitting any magazine lockers—in which circumstance reliance must be placed on R.U. lockers only and arrangements made for rapid replenishments from below.

54. Therefore, in each instance, the number of magazine lockers and R.U. lockers actually required should be demanded—the demand stating the number of Oerlikon guns mounted—direct from the Director of Stores, Admiralty, London.

55. If the lockers are not immediately available in any particular instance, lockers should be manufactured by the shipyard to drawings:—

D.N.C. 2/A 574—Arrangement and details of R.U. locker.

Po.M.C.D. 016598 (Sheet 1)—Arrangement and details of magazine locker.

Copies of these may be obtained on application to the Director of Naval Construction, Admiralty, Bath.

Alternatively, where time does not permit of the construction of the necessary lockers, magazines and outfit should be stowed in washdeck lockers, or other suitable weather-deck stowage provided, as a temporary measure until the standard lockers can be supplied.

56. Ammunition lockers should be fitted clear of the working radius, but close to and quickly accessible from the gun position. In cases where two magazine lockers per gun are required the relative positions of these lockers should be staggered as convenient, to obviate sympathetic detonation.

57. Two magazine loading frames and two loading handles per gun will be supplied. The loading frames should be secured to stools, or to folding brackets fixed to convenient bulkheads, the stools or brackets being about 2 ft. square and 2 ft. 6 in. above the deck.

Alternatively, where space is limited or it is more convenient to the layout, suitable studs to take the loading frames should be welded to the top of magazine lockers.

58. It is desirable that Oerlikon ready-use ammunition lockers should be within the protection of the screens round the mountings but this is not often practicable.

Where ready-use lockers have to be fitted outside the screens it is advantageous for the lockers to be fitted against the screens with their lids level with the tops of the screens. This enables the guns' crew to reach the magazine without climbing out of the screens. This arrangement where practicable should be fitted in ships building and is recommended for existing ships subject to:—

(a) The locker being supported at the base only and no additional fittings being secured to its sides.

(b) Any additional weight involved in providing the necessary supports being acceptable.

(c) No delay being caused in completion of ships refitting or under construction.

Commanding Officers of ships in service in which improvement in the position of Oerlikon lockers is essential should include an item, classified "A" in the ship's list of As. and As. to cover the work involved.

59. Where difficulty arises in finding space for the full allowance of R.U. ammunition in lockers, or in new construction where a more economical stowage is obtained, ready-use magazines or cupboards should be provided.

A Drawing, D.N.C. 2A/1028, showing in detail a bracket type stowage for the Oerlikon magazines is available, and application should be made to Curator of Drawings, Admiralty, for necessary copies.

Where R.U. magazines or cupboards are proposed in lieu of lockers, a drawing of the proposed positions should be submitted for Admiralty approval.

#### COCKING ARRANGEMENTS

60. The arrangement of the one-man cocking device for Mark IIA, IIIA and V single mountings is shown in A.F.O. Diagram 150/44(10).

The device consists of a steel pin "B" which fits into the crosshead of the gun and is held in place by the bolt securing case, barrel spring. One eye of a wire lanyard "A" is fitted over the pin "B" and the other permanently secured round the special bolt "C" or in the alternative arrangement round the sleeve on the bolt "D".

61. The special bolt "C" should be adopted for all mountings not fitted with a satisfactory one-man cocking device and where facilities exist for machining the special bolt. Where facilities do not exist for machining of special bolts a standard  $\frac{5}{8}$ -in. bolt with sleeve and standard tubing cut to suitable length, as shown in the alternative arrangement "D", may be fitted.

62. The bolt is positioned centrally in the lifting holes in the trunnion bracket.

63. The strop should be made so that it just slips over the gun bolt when the gun is at maximum depression.

64. All Oerlikon guns are to be modified by fitting steel pins B. The pins are to be made by staffs of H.M. ships and bases where possible, otherwise by R.N. armament depots. New guns are supplied with pins already fitted. U.S. barrel casings without holes for pin "B" are to have  $\frac{3}{8}$ -in. holes drilled through both trunnions.

65. Difficulties in the use of the one-man cocking device may arise due to the stretching of the strop. If the strop is found to be too long it may be shortened slightly by twisting up a few turns.

66. To cock the gun, place the free end of lanyard over pin "B" and bear downwards on the shoulder pieces until the gun is cocked. On raising the shoulder pieces from this position the lanyard will fall clear.

67. Where possible the work involved should be done by the ship's staff. Where this is not possible, arrangements should be made for the work to be done by a dockyard or a repair establishment at a convenient opportunity.

68. A cocking arrangement similar to that described for the Mark IIA and IIIA is supplied with the VIIA mountings.

69. Where one man cocking arrangements are not fitted Oerlikon guns must be cocked by means of a double-ended lanyard of 2-in. hemp rope. The tails of the lanyard should be approximately one fathom long, and a out splice should be formed in the centre of the lanyard just large enough to pass over the exterior of the barrel spring casing and bear against the front ends of the breech bars of the gun, before the trunnions on the barrel spring casing.

#### GUNS

70. *Breech Face Pieces.*—Arrangements for the exchange and modification of breech face pieces are described in A.F.Os. 4288/43 and 6234a/43.

71. *British and American Guns.*—Oerlikon machine guns of British, Mark II pattern, manufactured in the United States of America for the British Government are designated Mark IV, except for guns of early manufacture, which are stamped Mark II.

72. American made Marks II and IV guns are completely interchangeable with each other; and a trial has indicated that components of these guns can generally be interchanged with corresponding parts of British made Mark II guns subject to fitting where necessary.

American and British made magazines and sights (200 and 300-knot) are interchangeable as units but sub-assemblies are not interchangeable.

73. To avoid difficulty in making replacements, however, spare parts of British and U.S.A. manufacture are, for the present, to be held on charge separately under the respective marks of gun, and demands from H.M. ships are to show clearly the mark of gun for which parts are required.

74. A number of 20-mm. Oerlikon machine guns and barrels manufactured in U.S.A. bear registered numbers and prefixes which correspond to those already assigned to guns manufactured in the U.K. To avoid confusion between guns and barrels of British and American manufacture, the mark of gun or barrel and all other markings should be quoted in all correspondence and reports, as well as the registered number and prefix.

75. *Collapse of Barrel Springs, Mark I.*—Barrel springs, Mark I, of 20-mm. Oerlikon machine guns, Marks II and IV, are to be replaced and returned to the nearest Armament Depot when they have collapsed to such an extent that no initial compression exists with the gun in the fired position (i.e., recoiling parts fully forward).

In the event of replacement not being possible, they may, in emergency, be used until metal-to-metal recoils occur at high elevations of fire.

Available spare barrel springs should be redistributed on the basis of one spare set (one left-hand wound and one right-hand wound) for six or less guns mounted. Ships carrying springs in excess of this allowance should land the surplus for redistribution.

76. *Blown Out Caps.*—Instances have occurred of stoppages in Oerlikon guns being caused by caps blowing out of the cartridge cases.

A stoppage of this type usually takes the following form :—

- (a) After the gun has fired, the breech block is driven to the rear, ejecting the empty case, and leaving the loose cap which falls into the lip of the breech face piece.
- (b) As the breech block moves forward, the rim of the round being fed cannot reach its seating in the lip of the breech face piece because of the presence of the cap. This causes the round to enter the chamber at a higher level than normal.
- (c) As the breech block continues to move forward, interference between the chamber and the cartridge case attempts to drive the cartridge in a downward direction. The cap, however, prevents this and severe distortion and jamming of the cartridge case in the chamber results.

This type of stoppage is cleared as laid down on pages 14 and 15 of B.R. 274/43. If the cartridge is firmly jammed in the chamber it may be necessary to start the recoiling parts to the rear by means of a lead hammer on one of the breech bars while hauling on the cocking lanyard.

#### MAGAZINES

77. Investigations into the failure of Oerlikon magazines indicate that in many cases it has been caused by stripping and re-assembly by unskilled personnel.

78. No magazine should be stripped unless this becomes an absolute necessity where exchange cannot be conveniently effected.

Should stripping be essential it is only to be done by an experienced artificer.

79. Magazines will, in future, be stencilled with the following instructions :—

“Handle with care. DO NOT STRIP.”

80. Magazines will, following proof, inspection or overhaul at R.N.A. depots, be sealed with a wire and lead seal.

81. All serviceable magazines should accordingly be sealed and stencilled by R.N. Armament Depots and O.C.A.S. as shown on A.F.O. Diagram 150/44 (11) before issue. Bolts, sealing (item 471) are on order and should be demanded from D.A.S. (Branch A) Bath. The seals, which are to be made locally, are to bear the monogram of the sealing authority. Magazines manufactured in the future will be sealed by the manufacturer and stamped with a monogram after passing proof.

82. The following defects have been found in some American magazines. American magazines can be distinguished by the end plates, which are embossed by a continuous spiral approximately  $\frac{1}{4}$  in. wide. In the case of British magazines the ends are riveted or plain.

- (i) Failure to seat properly on the breech casing of the gun. This is caused by the 4-mm. radius on the front corners of the mouthpiece adjacent to the trunnions not being maintained.

- (ii) Failure of the magazine spring tension indicator to read zero when spring tension is slacked off as far as it will go with the loading lever.

Magazines may be issued unexamined for these defects but individual American made magazines which are known to be defective are to be rectified before issue.

83. Action should be taken by H.M. Ships as follows :—

- (a) All ships should try each American magazine received on board on every gun in the ship, and again on any new gun mounted. Should any magazines fail to seat properly on any of the guns the mouthpiece should be adjusted as shown on A.F.O. Diagram 150/44(12) by ships or base artificers. If this cannot be done defective magazines should be landed.

After check or adjustment, magazines are to be stencilled with letter “C” in white near mouthpiece trunnions. Boxes containing magazines which have been checked or adjusted are also to be stencilled with letter “C”.

- (b) All ships should examine each American magazine received on board to see if the tension indicator at the forward end reads zero when spring tension is slacked off as far as it will go with the loading lever. Some magazines may be found where the indicator will not go right back to zero. Such magazines are to be exchanged and are to be modified by Armament Supply Department by grinding away the indicating lines and numbers on the cover plate (with the exception of No. 60 and its line, which are correct) and re-engraving in the correct position. Officers in Charge of Armament Supply who have no facilities for doing this work should send the magazines to the nearest main Naval Armament Depot.

84. R.N. Armament Depots when issuing unexamined American magazines should draw the attention of ship's officers to this Order.

85. American magazines required for D.E.M.S., submarines, landing craft and coastal force craft, or for shipment abroad, must be checked and adjusted where necessary in respect of the mouthpiece and tension indicator before issue from R.N. Armament Depots.

86. As far as possible, a proportion of magazines, sealed and stencilled as in paragraphs 70 to 74 should be included in the outfits of guns on first issue; otherwise there is no necessity to prepare magazines to take seals where this is not already done or to renew stencilling.

87. In order to improve strength and to simplify manufacture and assembly, future 60-round Oerlikon magazines will be fitted with a plain unthreaded cross pin, Item 452, in lieu of the present threaded type for securing the ring securing, Item 450, which retains the coupling sleeve spring.

In the event of plain-type cross pins being used with earlier magazines the thread in the ring securing, Item 450, is to be removed with a No. 21 drill in accordance with A.F.O. Diagram 150/44(13).

88. Approved allowances of magazines are :—

Submarines	...	...	...	...	...	...	...	...	10	per gun
L.C.F.	...	...	...	...	...	...	...	...	12	per gun
H.M. Ships other than submarines and L.C.F.	...	...	...	...	...	...	...	...	8	per gun
D.E.M.S.	...	...	...	...	...	...	...	...	8	per gun
Guns mounted in Hazard mobile mountings	...	...	...	...	...	...	...	...	12	per gun

Ships and establishments should demand the quantity of magazines required to complete to the approved allowance from the nearest Naval Armament Depot.

#### TWIN MARK V AND VC MOUNTINGS

89. Sight tests of Twin Mark V and VC mountings are to be carried out in accordance with A.F.O. Diagram 150/44(14) (G.R. 6117).

Note.—For mountings with Mark XIV gyro sights, see A.F.O. 1815/44.

90. Stocks of sight testing instruments, Pattern G.2022, for Twin Mark V and VC mountings are available at H.M. Dockyard, Portsmouth, for distribution.

Demands on that yard should be made on the following basis :—

- (a) Coastal Force Bases—two per base.
- (b) Vessels other than Coastal Craft fitted with these mountings—one per ship.

91. Attention is drawn to the correct method of inserting the drop-nose pin into the locking-pin which secures gun to cradle of the Twin Mark V and VC mountings.

The drop-nose pin is to be fitted in its hole so that the drop-nose end is remote from the muzzle end of the gun, thus ensuring that there is no possibility of the pin falling out during elevation of the cradle and gun assembly.

As an additional precaution the drop-nose end of the pin is to be secured in the down position by a simple wire-seizing.

92. Instances have been reported of damage to the firing gear of Twin Mark V and VC mountings when elevating, or depressing, with the gun safety catches to "SAFE". This can only occur if the gear is out of adjustment, and the following procedure is to be adopted when adjusting or testing the firing gear:—

- (a) Unload, train mounting on to a safe bearing to ensure that the safety firing gear is inoperative, put gun triggers as far to "FIRE" as they will go and tie them in this position (gun safety catches must be to "FIRE").
- (b) Press control-handle firing trigger and check that the clearance between the firing levers and gun triggers does not alter appreciably while elevating and depressing through the full range, i.e., surface of the firing cam must be concentric with the trunnion centre under "FIRE" condition.
- (c) Release firing trigger and check that firing piston movement is 0.875-in. minimum and 1-in. maximum.
- (d) Untie gun triggers, ensure that firing piston is in "OFF" position and is as far down as it will go, leave gun safety catches to "FIRE" and elevate to maximum elevation.
- (e) Adjust lengths of firing rods so that when gun safety catches are to "SAFE" there is  $\frac{1}{32}$  of an inch clearance between the firing levers and the triggers of the guns.

On depressing the guns it will be noted that this clearance increases considerably up to 20° elevation and reduces again towards 10° depression.

93. The fluid in the hydraulic system of the Twin Mark V and VC mountings does not provide sufficient hydraulic locking action under conditions of heavy roll when the main pump is not running.

Mountings now under manufacture are being fitted with a training housing-stop, positioned in such a manner that the gear can be disconnected by the gunner from his seated position.

A.F.O. Diagram 150/44(15) shows a design of housing-stop and the method of fitting to mountings now in service.

Vessels concerned are to treat the manufacture and fitting of the gear as a defect item, to be carried out by ships' staffs and Coastal Force Base maintenance staffs, assisted by dockyards as necessary.

94. In a number of ships some difficulty is being experienced in finding a position for the power units close to the Twin Mark V and VC mountings.

A distance not exceeding 20 ft. between the power unit and the mounting can be accepted without undue loss of pressure. It is, however, most important that the power unit should be fitted as close as possible to the mounting so as to reduce the risk of splinters cutting the power supply pipes.

When a position cannot be found on the gun deck it will usually be necessary to fit the unit on the deck below, but it may sometimes be practicable to sling it from the underside of the gun deck, and consideration should be given to this if the length of exposed supply piping is thereby reduced.

It is an important requirement that the power unit should be easily and quickly accessible from the gun mounting position.

The supply piping should be guarded from accidental damage and if the mounting has a screen of protective plating the exposed pipes should be protected by plating of similar quality.

95. Reports have been received concerning corrosion of the elevating ram spindles on the Twin Marks V and VC mountings.

Such corrosion, if permitted to continue, will eventually result in damage to the hydraulic seals in the ram cylinder glands.

Modification to the material surface of new manufacture ram spindles is in hand, in order to stop corrosion taking place, but it can be arrested if not altogether prevented, on existing mountings by observance of the following procedure:—

- (a) When the mounting is not in use and the canvas cover is not in place the guns are to be set at maximum elevation, in which position the ram spindles are fully withdrawn inside the ram cylinders.
- (b) Before the mounting is finally secured, with canvas cover in position, the ram spindles are to be carefully wiped off and the exposed surfaces coated with a grease suited to the climatic conditions.

Should a mounting be in use for look-out purposes when it would normally only be operated in training the guns are to be elevated and depressed through the full range at frequent intervals, in order to clear deposits of moisture which are likely to accumulate on the ram spindles.

96. Twin Mark V mountings, registered Nos. 1 to 434, inclusive, are fitted with a design of firing piston which is likely to fail in service across the hole drilled in the spindle immediately below the double-eye end.

Mountings registered Nos. 435 onwards are fitted with a modified design of firing piston in which the hole in the spindle is deleted.

Modified firing pistons are now available at H.M. dockyard, Portsmouth, for retrospective supply to vessels fitted with mountings, registered Nos. 1 to 434, and are to be demanded by ships and Coastal Force bases concerned, as required, on a basis of one fitted and one spare, making a total of two per mounting.

Interchangeability of pistons and cylinders cannot be relied upon, and the modified pistons are therefore being supplied complete in their cylinders.

Old pattern components thus replaced are to be modified by ships' or base staffs in due course and retained for use as spares.

97. The circlip fitting retaining the Twin Mark V and VC mountings safety firing gear cam rail roller is proving unsatisfactory in service.

The circlips are to be removed at the first opportunity and the spindles modified in accordance with A.F.O. Diagram 150/44 (16) (G.R. 6396).

The work is to be carried out by ships' staffs and coastal force base staffs.

98. The Twin Mark VC, mounting "C" set of spares should include one vane type training oil motor, but it is understood that a number of the early issues of "C" spares are not complete with this item.

A sufficient quantity of training motors to make good the deficiencies are available at the Admiralty Gunmounting Store, Parkhead, Glasgow.

Commanding Officers of ships fitted with 20-mm., Twin Mark VC, mountings should arrange for the "C" spares to be checked, and should demand spare training motors from the Admiralty Gunmounting Store, Parkhead, as required, on the basis of one training motor per "C" set.

#### MISCELLANEOUS

99. *Modification of Cradles.*—Arrangements have been made for the comprehensive modification of the cradles of 20-mm., Oerlikon, single-gun mountings to be carried out by contract and details are being promulgated in C.A.F.Os.

The modifications include machining to permit stripping the guns while mounted. Where considered desirable, however, ships' staffs may carry out the modification shown in A.F.O. Diagram 150/44 (17) (G.R. 6355). The modification consists of machining two elongated holes to enable the rear pins retaining the breech bars to be removed when removing or shipping the barrel springs.

100. *Muzzle Covers.*—Muzzle covers made of a transparent plastic known as Bexoid are in supply for Oerlikon guns.

The outside diameter of the barrel at the muzzle has until recently varied widely. Covers may be made to fit all barrels by adoption of one or the other of the following expedients:—

- (a) If the barrel is too small, resulting in the cover being a slack fit, insulating tape may be wrapped round the muzzle until the cover fits tightly over it.

(b) If the barrel is too large, preventing the cover from going on, the barrel may be carefully filed on its outside diameter until the cover can be made to fit. This work should only be undertaken by an Ordnance Artificer or R.N. armament depot.

101. *Mark IIIA Top Pivot Bearing.*—It has been reported that difficulty has been experienced in lubricating the top pivot bearing of the Mark IIIA mounting.

A modification to the lubrication to ensure that grease is supplied to this bearing is shown on A.F.O. Diagram 150/44 (18).

102. An additional lubricator, Pattern No. 4986, is fitted as shown in the diagram and positioned so that the  $\frac{3}{16}$  in. diameter radial hole through the bearing housing and the top pivot bearing does not penetrate any of the existing grease grooves.

The new lubricator should be positioned 60° round the bearing from the existing one.

A vertical groove is cut in the bearing from the  $\frac{3}{16}$  in. hole to the annulus at the bottom of the bearing.

Care should be taken to ensure that all swarf is removed from the lubrication holes and the bearings.

103. The work involved should be done by dockyards and depots concerned. Arrangements should be made by base staffs for this work to be carried out to mountings in D.E.M.S.

Commanding Officers of ships concerned should insert an Item, Classification "A" in their next list of As. and As. to cover the work involved.

104. *Grease Guns.*—Admiralty Pattern 4720 Tecalemit grease guns, for use on Marks IIA and IIIA mountings, are available for supply on demand by the Admiralty Gun Mounting Overseer, Coventry, or the Admiralty Gun Mounting Overseer, Parkhead.

Provision has been made for an allowance of one grease gun per ship, or in cases where mountings are issued in batches for shipment abroad, one grease gun per four mountings.

Depots concerned should, from time to time, forward demands for sufficient grease guns to cover anticipated commitments.

Ships carrying these mountings should each demand one grease gun from the nearest depot, but this is only to be done in cases where no suitable grease gun is already on board.

105. *Solder on Ammunition.*—If has been found, owing to the use of an excessive amount of solder when sealing boxes containing Oerlikon ammunition of British manufacture, that the solder has run inside and in some instances has stuck to the cartridges.

Care should be taken when loading magazines to see that no solder is attached to the rounds.

Isolated rounds of ammunition found in this condition should be thrown overboard into deep water; but if a number are present they are to be returned to the nearest Naval Armament Establishment for rectification.

106. *Covers for Magazine and Magazine Openings.*—A design of cover for the magazine and magazine opening of the Oerlikon gun is shown in A.F.O. Diagram 150/44(19). If required these covers should be made by ships' or base staffs.

107. A cover for use when the gun is unloaded and in the fired position is described in A.F.O. 1350/44.

108. *Greasing of Gun Securing Bolt.*—Care should be taken that this bolt is kept greased to prevent it from seizing in the bolt hole.

(A.F.Os. 3815/41, 1011/42, 2248/42, 3640/42, 4385/42, 2845/43, 3159/43, 3423/43, 3934/43, 4288/43, 4572/43, 5592/43, 6234a/43, 702/44, 823/44, 1350/44 and 1815/44.)

(A.F.Os. 5155/42, 942/43, 1200/43, 1413/43, 1451/43, 2266/43, 2267/43, 2501a/43, 2741/43, 3283/43, 3422/43, 3562/43, 3935/43, 3939/43, 4072/43, 4188/43, 4295/43, 4296/43, 4702/43, 4822/43, 5091/43, 5857/43, 6112/43, 6117/43, 575/44, 693/44, 699/44, 700/44 and C.A.F.Os. 1480/42, 1185/43, 1524/43, 2029/43, 2204/43 are cancelled.)