TIAD (LAB) NO.001
WORKSHEET NO.AN.1
DATE 15/12/69

WARHEADS 21-INCH MK.8

ASSEMBLY AND FITTING OF PISTOLS AND PRIMERS - FOR ISSUE TO SUBMARINES

Pt.1 - Items required, Limits, Introductory Notes, Precautions;
Pt.2 - Preparation of Pistols;
Pt.3 - Assembly of Warhead to Torpedo;
Pt.4 - Fitting Pistol and Primers in Warhead.

PART 1 - ITEMS REQUIRED, LIMITS, INTRODUCTORY NOTES, SPECIAL PRECAUTIONS, ASSOCIATED TECHNICAL INSTRUCTIONS.

ITEMS REQUIRED (FOR PT.2):

1.		Screwdriver ¼-inch blade N.S. pattern.
2.	643159 or 643275	Detonators Dummy in carrier Mk.4 = 2 Carrier Detonators Mk.4 complete with 2-Detonators Dummy
3.	551692	Bolts (Handles) Screwed Lifting Pistol = 2
4.	558301	Spanner Box Securing Pistol, and Det. Carrier in Pistol
5.	558277	Spanner Pin, Primer Nut Pistol
6.	552408	Lever Torque Test, Range Shaft Pistol
7.		Weight 5-oz. for use with item 6 - local manufacture
8.	551201	Bracket and Pulley Torque Test, Pistol (complete with weights 5½-oz. and 7-oz. clip and lanyard)
9.	558535	Spanner Box Winding Safety Range Pistol
10		Hammer light non-metallic - N.S. pattern
11		'Wee' Megger Pattern No.5047
12		'Avometer' Pattern No.47A
13	641670	Ohmmeter Safety N.1 St No.301
14		Apparatus electrical balancing Detonators (No.7053A)
15		Adaptor special, testing 'fitted' Carrier - local manufacture
16		Pliers side cutting (N.S. Patt.0275-910-5533 are suitable)
17		Tool Wire Stripper N.S. Pattern 14556
18		Tape Insulating - Tape Electrical P.V.C.I." 5970-66-L45637 (is suitable)
19		Wire Rod with hook - local manufacture
20	579236	Battery Dry cell No.3 (45-volt) Pistol)
21	579223	Battery Dry cell No.2 (45-volt) Pistol) One per pistol
22	579210	Battery Dry cell No.1 (45-volt) Pistol)

23	552115	Table Test, short legged, Pistol
24		Batteries Dry Cell N.S. Pattern (to 135-volts in series) for checking item 24
25		Grease L.G. 380
26	0442/4920	Varnish anti-tracking
27	517532	Scissors Magazine S.N. 94-94C
28		Box transporting 'Fitted' Pistols - local manufacture
29		Frame wood to hold pistol, local manufacture - as required

ITEMS REQUIRED (FOR PT.3)

1		Pad, felt approx. 4-ft x 4-ft x 2" thick - local manufacture
2	551679	Bolt Eye Lifting Warhead) alternatives
3	551666	Bolt Eye Lifting Warhead)
4		Wire Ribbon Strop (canvas covered) N.S. Patt. 4985
5	720695	Sling (2-legged with hooks)
6		Screwdriver large $\frac{3}{4}$" blade, N.S. Pattern
7		Screwdriver non-ferrous Air Test/Vent Plug
8	551001	Adaptor) Blank for nose piece
9	552104	Wrench)
10		Cradle, safety, Warhead - local manufacture
11		Block, Softwood, 3-ft x 3-ins x 2" - as required
12	557211	Clamps Warhead/Torpedo = 2
13		Spanners No.127 or N.S. Pattern for use with Item 12 = 2
14	558319	Spanners Box Coupling Screw
15	633543	Tool clearing Coupling - screw holes SN.292
16	558314	Spanner Box for use with item 15

ITEMS REQUIRED (FOR PT.4)

1	558301	Spanner Box Securing Pistol and Det. Carrier in Pistol (Item 4 Pt.2)
2	633556	Tool Clearing Pistol screw-ho es
3		Air Pressure apparatus comprising: Gauge 0-30 lb./Ins. 551365 Adaptor Air Test 0.312" dia. x 22 T.P.I. Adaptor Air Test Special 0.374" dia. x 24 T.P.I. 552905 Pump, foot air test
4		Nitrogen (Dry) Supply comprising) alternative to Standard bottle and flow regulator) Item 3 Delivery Pipe - local manufacture)
5		Oil OC.300 N.S. Pattern 0475-943-7238
6		Lanolin - N.S. Item
7		Tallow - N.S. Item

8		Torch Safety, Patt.19570, 19570^{S}, 16456 or 202907
9	558264	Spanner Pin Primer Nut Warhead
10		Earthing Plates) Complete with lead
11		Earthing Clips) local manufacture
12	552280	Guard Pistol - one per pistol.

NOTE 1: Before co mencing work, ensure that you understand the limits of stores and operatives permitted in the room as shown on the black board.

NOTE 2: Filled warhead boxes are normally to be slung 'vertically'. If it is necessary to sling a box horizontally, it must be slung with the removable front uppermost.

NOTE 3: Never leave heavy articles slung while un-attended, always lower on to a bench or to the ground.

NOTE 4: Ensure that the torpedoes 'Top-Lug' is kept as near vertical as possible at all times.

NOTE 5: The separate instruction sheet (TIAD (LAB) NO.004 General Instructions, Appendix 'A') outlining the special ANTI-STATIC precautions necessary when dealing with electrically initiated stores must be available in the room and must be strictly complied with during all operations of preparing the pistol.

NOTE 6: Similiarly both Warhead and operative(s) must be effectively 'earthed' during the operation of inserting the pistol in the Warhead.

LIMITS FOR ROOMS:

The following are the authorised maximum number of items actually being worked on and the type of room in which the work should normally be carried out:

OPERATION	QTY	TYPE OF ROOM
ASSEMBLING WARHEAD TO TORPEDO INSERTING 'FITTED' PISTOL IN WARHEAD FITTING PRIMERS W/H (AUXILIARY AND NOSE)		
Torpedoes	2	Traversed. (See Note 2)
Warheads	2	
Primers Warhead	1 Box of each type	
'Fitted' Pistols	2	

OPERATION	QTY	TYPE OF ROOM
PREPARING AND FITTING PISTOLS WITH DETONATORS AND PRIMER		
Pistols	2	Traversed
Carriers fitted	2	
Detonators		(Anti-static
Primers Warhead Pistol	2	conditions)
ELECTRICAL TESTING:		
Detonators - loose	1	Traversed (Anti-
Carriers fitted		static
Detonators	1	Conditions.

NOTES: (i) One (1) box of carriers fitted detonators and one (1) box of Primers Warhead Pistol may be held in the pistol 'fitting' room, provided each are stowed in separate steel lockers. (Cases Transporting Detonators/Explosive are suitable)

(ii) Should any Primer (Warhead or Warhead Pistol) be found dama ed on being unpacked, the complete box is to be transferred to a laborabory 'Red Area' and dealt with in accordance with TIAD (LAB) NO.005.

INTRODUCTORY NOTES:

1. PISTOLS:

1.1 The pistol provided for use in the RAN Submarine Squadron is 545042 Pistol C.C.R. Mk.1** Mod.1. The pistol is wired with P.V.C. cable and is fitted with tropic proof capacitor.

1.2 Pistols are supplied by R.A.N. Torpedo stablishment and transported in 545051 Box Pistol which also contains two 551692 Bolts, screwed; four Dryers, N.S. Pattern 947, one rubber joint ring Store Reference No.581231 for sealing joint between pistol and warhead and a metal battery clip for securing No.1 H.T. battery in pistol.

1.3 The current required to fire the detonators is provided by three (3) 45-volt batteries connected in series, shunted by a capacitor.

1.4 Although a C.C.R. Rod is not required for 'Impact Only' operation of the pistol, it is necessary for a rod to be fitted in the rod pocket in order to retain the correct balance of the Warhead. Rods are fitted in Warheads by Armament Depot Staff.

2. PRECAUTIONS TO BE OBSERVED TO PREVENT DAMAGE TO PISTOL:

2.1 The pistol must always be lifted by the two lifting bolts which are provided in the pistol box. Unless the lifting bolts are used, damage to the pistol may occur and electrical shocks may be received by the operative.

2.2 For the same reason, care should be taken if the pistol has to be placed on its side on the bench, that all metal tools have been removed from the vicinity.

2.3 It will be found convenient to construct a small wooden frame on which to stand the pistol when carrying out routines.

3. 552115 TABLE TEST:

3.1 Before being fitted in a warhead, the pistol must be tested on the 21" C.C.R. pistol test table, the wiring and current diagram of which are given Plate No.1

3.2 The micro-ammeter fitted in the test table is heavily damped and it may be necessary to tap the face of the meter in order to help the needle to settle at the correct reading.

3.3 The correct adjustment of the test table can be checked in the following way:

Connect three good H.T. batteries in series, reading 135-volts by avometer, across the detonator firing circuit of the table, i.e. negative to the spring contact and positive to either of the two central spills. Place the changeover switch to the right and the meter needle should read 90 micro-amps.

If it does not do so the table is out of adjustment. The most likely faults are either that the externally connected shunt across the micro-ammeter is incorrectly adjusted, or that 0.5 megohm resistance is incorrect.

A tolerance of 10% is admissable; tables which do not come within this range should not be used but returned to the R.A.N. Torpedo Establishment.

4. FIRING CAPACITOR (STORE REF. NO.579204)

4.1 A 9.5 u.f.d. capacitor is connected across the terminals of the H.T. battery (terminals '2' and '5'). This capacitor can store considerable quantity of electrical energy and will remain alive unless it is discharged by shorting.

4.2 Occasionally a defective capacitor will be discovered in a pistol. This will either be a short circuit between the plates, or else due to a break in the leads; it will be found impossible to charge the capacitor. In this event return the pistol to the R.A.N. Torpedo Establishment for replacement of capacitor.

5. WATERTIGHTNESS OF PISTOL:

5.1 It is essential for its correct operation that the pistol be kept dry. If any moisture is allowed to enter the pistol the batteries will quickly deteriorate. The joint between pistol and pistol pocket of warhead must therefore be carefully made and the watertightness test of the warhead conscientiously carried out.

6. DETONATORS AND TEST OF DETONATORS:

6.1 The C.C.R. 'Impact O ly' pistol uses two Detonators Electric No.1 Mk.2 supplied fitted in a Mk.4 Mod.1 Carrier.

6.2 The Mk.4 Carrier must only be used with Mk.1** and Mk.1** Mod.1 pistols fitted with Type A** or B Primers.

6.3 The detonators wired in their carrier are to be tested before the carrier is first fitted into a pistol for service and subsequently at yearly intervals.

They are to be tested for continuity only be measuring the resistance of the detonator bridges, using a 641670 Ohmeter Safety N.1. The resistance of the detonators in parallel should be approximately 0.5 to 0.7 ohms; i.e. approximately 1.0 to 1.4 ohms each.

NOTE: Although TIAD (LAB) NO.004 prohibits the testing of fitted carriers as a laboratory operation, in his instance BR.1732 (Regulations for Maintenance of C.C.R. Pistols) requires that the carriers be tested.

7. INCORPORATION OF 1000 YARDS SAFE RANGE IN 'IMPACT ONLY' PISTOLS.

7.1 All C.C.R. Impact Only Pistols supplied to the Fleet have the following stencilled in BLACK lettering on top of the pistol body in ¼-inch type:

'1000 YARDS S.R.'

This indicates that a modification has been carried out to enable ships to set the safety range up to the maximum of 1000-yards.

7.2 In order to prevent a torpedo which has suffered a directional failure from endangering the firing ship, the safety range is always to be set to:

'1000-YARDS FOR SURFACE SHIPS'

'300-YARDS FOR SUBMARINES.'

8. BATTERIES:

8.1 Tested batteries are supplied by R.A.N. Torpedo Establishment with each pistol. Detailed instructions on storage and handling are laid down in BR.1732 and TIAD (Torps) No.006.

8.2 Batteries are supplied with their tags covered with a plastic covering to protect the sleeving and tags. Before the batteries are brought into use in pistols, this plastic protection which is like a shellac varnish must be removed from the spade end by scraping with a knife.

9. WARHEADS:

9.1 While Warheads will be received in serviceable condition they should be visually inspected before being assembled to torpedoes to ensure they are free from dents, damage or any other defect liable to affect their serviceability.

9.2 Warheads filled Torpex or HBX are to be vented and subjected to a full laboratory examination between 10 and 14-months after filling (BR.1030(2) - Appendix 4.1). Only warheads which have been vented are normally to be issued to ships.

10. TORPEDOES:

10.1 Torpedoes are supplied 'blown down' (air vessels empty) but fitted with Igniters.

10.2 Safety devices fitted to the torpedo are:

a. Safety Air Lever Stop;

b. Propeller Guard and Clamp;

c. Long Screw.

Whilst it is most important that the safety devices remain in position during all operations, emphasis must be placed on the necessity for the presence of the long screw which holds the Depth Gear Weight central during all transport movements.

11. ASSOCIATED TECHNICAL INSTRUCTIONS:

11.1 The following technical instructions must be available in the room(s) as appropriate and must be strictly complied with:

TIAD (LAB) NO.001 .... WARHEADS

Worksheet No.1 - unpacking and external examination of warhead.

TIAD (LAB) NO.004 .... DETONATORS

Worksheet No. 1 - Unpacking and examination of filled cylinders;
Worksheet No. 8 - Electrical testing;
Worksheet No.16) - Examination of filled carriers and removal
Worksheet No.18) - and fitting of detonators

11.1 (continued)

TIAD (LAB) NO.005 - PRIMERS WARHEAD

Worksheet No.3 - Unpacking.

PART 2 - PREPARATION OF PISTOLS

1. SUMMARY OF ROUTINES (OPERATIONS).

1.1 Preparation of the pistol prior to its insertion in the Warhead is divided into a number of standard routines (operations). Paragraph 1.2 details the routines and the order in which they are required to be undertaken.

1.2

ORDER	ROUTINE	PARAS
1	Test torque to revolve range shaft and paddle wheel.	2.1 - 2.15
2	Mating and allocation of detonators and primer	3.1 - 3.8
3	Check the insulation of the pistol	4.1 - 4.2
4	Insert batteries	5.1 - 6.1
5	Test battery wiring insulation	7.1
6	Test and record battery voltages	8.1
7	Test operation of pistol on test table	9.1 - 9.10
8	Fit detonators and primer	10.1 - 10.10
9	Fit splash covers	11.1 - 11.2

2. TESTING TORQUE OF RANGE SHAFT AND PADDLE WHEEL.

IMPORTANT: A detonator carrier complete with dummy detonators must be fitted to the pistol for the tests.

2.1 Remove the two dummy detonators from the carrier (item 1 or 2 of items required) and place on bench. Set aside carrier until completion of tests.

2.2 Remove a detonator carrier complete with live detonators from a cylinder, unscrew the connecting screws and remove the detonators. Replace the live detonators in the cylinder for temporary stowage, until tests are completed.

Fit the two dummy detonators to the carrier and set the fitted carrier aside for insertion in pistol when required.

2.3 Open pistol box, remove and set aside the loose metal battery clip and rubber joint ring. Check the serial number of the pistol against the number stencilled on the box. Report any difference.

2.4 Fit the two 551692 Lifting Bolts to the pistol, screw fully home and remove pistol from box.

2.5 Stand pistol on bench; remove the split pin, collar and worm wheel from the range shaft and ship the 558535 Spanner Box Winding on the square of the shaft. Set aside split pin, collar and worm until required to be replaced later.

2.6 Remove the two plastic splash covers from pistol and set aside on bench.

2.7 Lay the pistol on its side on the bench with the securing stud (screw) of the travelling contact block uppermost. Using the 558535 Spanner Box Winding, run off sufficient yards of safety range to enable the securing stud to be engaged. Using 558301 Spanner Box, unscrew and remove the securing stud.

2.8 Withdraw the travelling contact block from the pistol and insert the detonator carrier fitted with the dummy detonators in its place. Replace the securing stud to secure the carrier in position.

2.9 Remove spanner box winding and ship the 552408 Lever Torque on the square of the range shaft.

2.10 Using the 5-oz. weight, measure the torque required to revolve the range shaft at several different stages along the full travel of the shaft. The torque must be even throughout and should not exceed 25.in./ozs. until the safety switch commences to make, when 35 in./oz must not be exceeded.

NOTE: Any stiffness encountered may be due to the detonator carrier or to the packing of the range shaft gland. If the cause is traced to the detonator carrier, ease the flange of the carrier with a fine file. The filed surfaces should then be cleaned and treated by applying Varnish Anti-Tracking - N.S. Pattern 0442-4290 with a fine brush. The varnish should be allowed to dry for approximately 12-hours.

2.11 Unship the lever from the range shaft; replace the spanner box winding and run back the carrier by revolving the range shaft.

2.12 Stand the pistol on the bench and attach the 551201 Bracket and Pulley to the perimeter of the pistol - using two studs securing pistol and 558301 Spanner.

NOTE: A locally manufactured wood frame (Item 29, Pt.2 of Items required) suitable for standing the pistol in may be used if found more convenient.

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2.13 Attach the appropriate weight by means of the lanyard and clip to the paddle wheel and measure the pull required to revolve the wheel. This should not exceed 5½-oz. in the 25 in./ozs. condition and 7-ozs. in the 35 in/ozs condition in the previous test. The pistol should be vibrated by light tapping (Item 11 Pt.2 of items required) during this test.

2.14 Run back the carrier on completion of tests by revolving the range shaft.

2.15 Set aside and report any pistol failing test for rectification at the R.A.N. Torpedo Establishment.

3. MATING AND ALLOCATION OF DETONATORS AND PRIMERS.

3.1 Place the pistol on its side with the stud (screw) securing the detonator carrier uppermost. Using 558277 Spanner Pin Primer Nut Pistol, remove the primer retaining ring-nut at the base of the pistol casting.

3.2 Remove a Primer Warhead Pistol 11-oz. from its box and insert it in the primer recess in the pistol. Replace the retaining ring-nut and screw fully home to secure primer in place.

3.3 Operate the range shaft to test that the dummy detonators in the carrier will enter the primer correctly in any position which the clearances will allow. Remove primer from pistol and replace retaining ring-nut.

3.4 Remove the detonator carrier from the pistol; replace and secure the travelling contact block in the pistol.

3.5 Remove the dummy detonator from the carrier. Replace and secure the live detonators in the carrier and return the fitted carrier to its cylinder.

3.6 Mark the cylinder and the primer with the date of test and the serial number of the pistol in which they have been tested and to which they are now allocated. Restow the carrier cylinders and the primer in their respective lockers.

NOTE 1: The test of detonators detailed in para. 6.3 (Pt.1, Introductory Notes) is to be carried out subsequent to the mating test, but before the carrier is fitted into the pistol. Refer para. 3.7 of this Section.

NOTE 2: Mark 4 detonator carriers must only be used with Mark 1** and Mark 1** Mod 1 pistols matched with Type 'A**' or 'B' primers.

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3.7 Test the fitted carrier for electrical continuity observing the conditions and precautions of TIAD (LAB) NO.004, Worksheet No.8 (see also Para. 6.3, Pt.1 of Introductory Notes).

In particular:

a. Use and check 641670 Ohmmeter N.1 in accordance with paras. 1 and 3 of the worksheet;

b. Fit the special adaptor (Item 15, Pt.2 of items required) to the carrier before placing carrier in the test apparatus (Item 14, Pt.2 of items required);

c. Carry out the test in accordance with paras. 4-13 of the worksheet, substituting the word 'Detonator' in para. 7 with the words Adaptor and Detonator.

d. The resistance of the detonators should read 0.5 to 0.7 ohms i.e. 1.0 to 1.4 ohms each detonator.

3.8 Replace carrier in its cylinder, mark cylinder with date of test and resistance recorded. Return the cylinder to its locker until carrier is required to be fitted to pistol.
Pack separately any carriers failing test. Mark cylinders clearly 'Failed Test'; do not return to pistol room but set aside for possible exchange of detonators.

4. CHECK THE INSULATION OF THE PISTOL:

4.1 Using a 'Wee Megger', Pattern No.5047, check the insulation resistance to earth of the pistol wiring and terminals. Infinity readings except where indicated below will normally be obtained in these tests. Occasionally, and particularly in tropical climates, lower readings may be found. The insulation resistance of the pistol wiring should not be less than 10 megohms. If lower readings are obtained in any of the tests detailed below, the pistol wiring should be carefully examined, and if the fault cannot be located or rectified, the pistol must be returned to the R.A.N. Torpedo Establishment.

NOTE 1: A test of the firing capacitor is incorporated in the insulation tests.

NOTE 2: To simplify the location of faults, the insulation tests of the battery wires and cases are included at a later stage of the routines (see para. 7.1).

4.2 Proceed as follows:

4.2.1 Check that the IMPACT, FILAMENT and DETONATOR ISOLATING switches are 'OPEN' (indicator showing 'Dots. out').

4.2.2 Close the safety range switch by turning the toothed wheel located beneath the range setting window in the head of the pistol.

NOTE 1: The action of the switch closing can be observed and checked during this operation.

NOTE 2: The range setting window will register '0' (Zero) feet when the switch is made.

4.2.3 Disconnect the positive (RED) lead of the firing capacitor from terminal '2'. Discharge the capacitor by shorting the lead to terminal '5' (holding lead by its P.V.C. covering) and then temporarily insulate the tag of the lead with insulating tape (refer Item 18, Pt.2 of Items Required).

4.2.4 Connect the 'EARTH' lead of the megger to the pistol frame and touch 'LINE' lead to the following points in turn:

a. Terminals 2, 3, 7, 10, 11 and 12 and the terminals on the travelling contact block (not less than 10 megohms);

b. Remove the insulation from the RED lead of the firing capacitor.

4.2.5 Connect 'EARTH' line of megger to terminal '5', turn handle of megger steadily and touch 'LINE' lead to the tag of the disconnected RED lead of the firing capacitor. The needle should deflect at first toward zero and then build up rapidly to not less than 50 megohms as the capacitor is charged. Remove 'LINE' whilst the megger is still being turned and the capacitor should remain charged. Test the capacitor by shorting the capacitor RED lead to terminal '5'; this should give a spark on discharge.

4.2.6 Disconnect the megger from terminal '5'. Connect the positive (RED) lead of the firing condenser to terminal '2'. Open the safety range switch.

5. INSERT BATTERIES:

IMPORTANT: Before inserting batteries, test and record their voltages, using Avometer Pattern No.47A. The voltage of each battery MUST NOT be less than 43-volts.

5.1 INSERT 579210 BATTERY NO.1 on the right hand (starboard) side of the pistol as follows:

5.1.1 Stand the battery on edge facing towards the centre of the pistol with the edge from which the leads protrude forward and outboard.

5.1.2 Remove the insulation or tape from the tag of the positive (RED) lead. Reeve the positive (RED) lead through the fair lead on the left-hand side at the back of the battery housing and draw it through with a hooked wire to the underside of the terminal block at the after end of the pistol; then draw the lead through the fairlead in the vertical brass support immediately beneath No.2 terminal. Replace the insulating sleeve (or tape) on the lead tag.

5.1.3 Reeve the negative PURPLE lead through the fairlead at the right hand bottom corner of the battery housing and draw it towards the battery junction block on the forward side of the pistol, passing outside the inertia weight. Push the battery into its housing and secure with the loose battery clip supplied with the pistol.

5.1.4 Connect the positive (RED) lead to terminal '2'. Check that the negative (PURPLE) lies on the outboard side of the inertia weight, and connect it to terminal '10'.

NOTES: a. It is important that the battery should be inserted with the edge from which the leads protrude forward to avoid any possibility of the leads fouling the toothed wheel which drives the safety range switch.

b. It is also important to run the negative (PURPLE) lead outside the inertia weight to avoid fouling the weight locking mechanism when the latter is run down.

c. In certain pistols, No.2 terminal plate will be found to have two connecting screws. In this case, the battery and firing condenser positive (RED) leads are to be connected to the lower terminal.

5.2 INSERT 579236 BATTERY NO.3 ON THE LEFT-HAND (PORT) OF THE PISTOL AS FOLLOWS:

5.2.1 Remove the insulation from the spade tag of the negative (BLACK) lead of the battery. Reeve the lead up through the fairlead at the back of the battery housing and draw it round to the portside of the terminal block on the after end of the pistol. Secure the lead terminal '5', to which terminal the negative (BLACK) lead of the firing capacitor should also be connected in the impact only version of the pistol.

5.2.2 Connect the positive (RED and BLACK or GREY) lead to terminal '11'. Place the battery into its housing with the edge from which the leads protrude forward and the label outboard and set up the clamping screw and lock-nut hand taut.

5.3 INSERT 579223 BATTERY NO.2 ON THE FORWARD SIDE OF THE PISTOL AS FOLLOWS:

5.3.1 Remove the insulation from the spade tags of the leads. Connect the positive (PURPLE) lead to terminal '10'; the negative (RED and BLACK or GREY) lead to terminal '11' and the 10.5 volt (WHITE) lead to terminal '12'.

5.3.2 Steps must now be taken to ensure that the three leads from the No.2 battery and the positive (RED and BLACK or GREY) lead from No.3 battery cannot foul the weight locking mechanism. These four leads and the permanent GREEN lead connected to terminal '11' can either be bound together withaa length of insulating tape, or one of the leads can be bound round the other four in such a way that no lead can be caught beneath the weight locking mechanism when the safety range is run off. Alternatively the four leads from the batteries can be passed through a piece of $\frac{1}{2}$" diameter Sistoflex tubing 2-$\frac{1}{2}$" long, before they are secured to their respective terminals.

5.3.3 When the leads have been bunched together by one of these means insert No.2 battery with the edge from which the leads protrude aft and the label forward, set up the securing clamp and the lock-nut hand taut.

6. UNFITTING AND CHANGING BATTERIES:

6.1 Any of the batteries can be unfitted and changed singly. To remove, reverse the process described in paras. 5.1 to 5.3; insulating the ends of the battery leads (insulating tape is suitable) as soon as they have been disconnected from their terminals or pulled back through their fairleads.

7. TEST INSULATION OF BATTERY WIRING:

7.1 Using the Wee Megger Pattern No.5047, test the insulation of the battery as follows:

7.1.1 Disconnect the battery negative (Black) lead from terminal '5'.

7.1.2 Connect 'EARTH' of the megger to the pistol frame and 'LINE' of the megger to the battery negative (Black) lead. The reading should not be less than 10 megohms.

7.1.3 Disconnect the megger leads and connect the battery negative (Black) lead to terminal '5'.

8. TEST AND RECORD THE BATTERY VOLTAGES:

8.1 Using the Avometer Pattern No.47A, measure in turn and record the battery voltages:

a. Total H.T. voltage between terminals 2 and 5 (not less than 129 volts).

b. No.1 Battery, between terminals 2 and 10 (not less than 43 volts).

c. No.2 Battery between terminals 10 and 11 (not less than 43 volts).

d. No.3 Battery between terminals 11 and 5 (not less than 43 volts).

NOTE: Any battery which is below these voltages must be replaced.

9. TEST THE OPERATION OF THE PISTOL ON THE 552115 TABLE TEST.

9.1 Test the test table, using the three H.T. Batteries (135-volts in series) as described in Part 1 para. 3.3 - Introductory Notes - Set aside and report for correction if the table is found to be out of adjustment.

9.2 Confirm that the travelling contact block is fitted to the pistol, and that the primer retaining nut-ring is screwed well up and is not proud of the bottom of the pistol casting.

NOTE: The nut-ring if left proud of the pistol casting can prevent a good contact between pistol and test table.

9.3 Run off the safety range until the indicator shows 'DETS IN'.

9.4 Close the safety range switch (if this has not already been done) by turning the gear wheel of the range setting mechanism.

NOTE 1: The Action of the switch closing can be observed and checked during this operation;

NOTE 2: The range indicating window will register '0' (Zero) feet when the switch is made.

9.5 Place the pistol on the test table with the impact switch towards the front of the table.

9.6 Put the test table change-over switch to the right - marked 'TEST'. Deflect the inertia weight until the spring loaded plunger engages in the annular groove. The micro-ammeter should then show a steady reading between 80 and 100 divisions to the right. This indicates the firing circuit is correct.

9.7 The inertia weight should move reasonably freely by hand, there should be no undue friction, and the mating surfaces of the mechanism should be thinly coated with grease L.G. 380.

9.8 Recock the impact switch. The micro-ammeter should now return to zero.

9.9 Run back the pistol safety range to 300 yards (for Submarines) and check that the indicator shows 'Dets Out'.

9.10 Remove the pistol from the test table and transfer to bench for fitting detonators and primer. Alternatively if pistol 'fails', set aside and report for rectification by R.A.N. Torpedo Establishment.

10. FIT DETONATORS AND PRIMER.

IMPORTANT: The fitting (and unfitting) of detonators and primers in pistols is to be carried out by a Laboratoryman or Assistant Laboratoryman under the general supervision of the Laboratory Foreman. The Laboratory Foreman need not be present in person, but he is to ensure that the operative carrying out the duty is conversant with and follows in detail, the appropriate instructions laid down in the worksheet.
If circumstances necessitate these operations being performed by other personnel, the Laboratory Foreman is to witness the operation.

10.1 Disconnect the positive (RED) lead of No.1 Battery and the positive (RED) lead of the firing capacitor from terminal '2' and insulate the tags.

10.2 Note particularly that the impact switch is cocked, that the safety range switch is broken and that the indicator is right UP showing 'DETS OUT'.

10.3 Remove the travelling contact block (refer para. 3.4 of Part 2).

10.4 Take the pair of detonators in the carrier which has been allocated to the pistol, note the date and the result of the detonator continuity test (date must be within one (1) year - refer para. 6.3 Part 1 - Introductory Notes).

10.5 Secure the carrier in place in the pistol.

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10.6 Check that the carrier is fully home and correctly secured by seeing that the white indicator line on the tongue of the safety switch contact block is continuous with the lines on the guide lugs of the detonator carrier, and by pulling gently on the detonators.

NOTE: It may be necessary to run off a few yards of safety range when fitting the detonator in order to engage the screw securing the carrier.

10.7 Take the primer already allocated and fit it to the pistol (refer para. 3, Part 2 of this Worksheet).

10.8 If any range was run off when securing the detonator carrier, operate the range shaft and ensure that the safety range indicator is completely 'UP'. If not already done, replace worm wheel and collar on the square of the range shaft and secure with split pin. (Refer para. 2.5).

10.9 Confirm that the safety range has been set at the requisite 300-yards for submarines - refer para. 9.9.

10.10 Replace the positive RED lead of No.1 H.T. Battery and the positive RED lead of the firing capacitor on to terminal '2'.

11. FIT SPLASH COVERS.

11.1 Fit the forward and aft plastic splash covers to the pistol.

It may be necessary to trim a corner or edge of the covers to get them into place. This can be done with a knife or pair of scissors. Replace the knurled ring securing the aft cover in position.

11.2 Place 'fitted' pistol in the special transport box (Item 28 of Items required Pt.2) pending fitting in warhead.

Attach a -

'HANDLE CAREFULLY - WARHEAD PISTOL FITTED
DETONATORS AND PRIMER'

warning label to the box.

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PART 3 - ASSEMBLY OF WARHEAD TO TORPEDO

1. PREPARATION OF WARHEAD.

1.1 Unpack and examine warhead externally in accordance with TIAD (LAB) No.001 Worksheet No.1. Set aside and report any warhead found defective.

NOTE: When removing the removable front of the warhead box, it is first necessary to raise the front a distance of approximately 2-inches.

1.2 Position the soft wood block on the felt pad (items 11 and 1 - Part 3 of items required) and lower warhead to a horizontal position on the felt pad with the nose of the warhead resting on the soft wood block. In this position the lifting strop (item 4, Pt.3, items required) can be secured around the warhead body without further lifting.

2. PREPARATION OF TORPEDO.

2.1 Examine torpedo for presence of Long Screw, Safety Air Lever Block, Propeller Guard and Propeller Clamp. Set aside and report any torpedo deficient of any of those items.

2.2 Check position of torpedo in cradle and re-position the torpedo as necessary to obtain easy access to the coupling-screw holes on the underside of the torpedo body.

NOTE: When moving the torpedo, ensure lifting strop is secured at the centre of gravity and that the long screw projecting from the underside is protected from possible damage and remains clear of the cradle fittings.

3. ASSEMBLY OF WARHEAD TO TORPEDO.

3.1 Confirm torpedo is securely strapped in its cradle.

3.2 Secure the lifting strop around the body of the warhead at the centre of gravity.

3.3 Using overhead lifting gear raise warhead to level of torpedo, ensuring first that the 'registers' of warhead will be in line with the location grooves of the torpedo body.

3.4 Position warhead in front of torpedo and assemble the torpedo by easing the 'registers' into the locating grooves of the torpedo. Use 557211 Clamps and Spanners No.127 as necessary to pull warhead home.

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NOTE 1: The warhead cradle (Item 10, Pt.3 of items required) should now be placed under the warhead as an added safety feature and remain there while the warhead is being coupled to the torpedo.

NOTE 2: The cradle should be of a height sufficient for it to slip easily into position; it is required to take the full weight of the warhead in the event of an emergency.

3.5 Insert coupling screws and screw hard home using 558319 Spanner Box Coupling Screw. Clear coupling screw-holes as necessary using 633543 Tool Clearing and 558314 Spanner.

3.6 Slack away the overhead lifting gear; remove strop from warhead and secure around the body of thetorpedo at a position approximate to the new centre of gravity.

3.7 Take the weight of the torpedo with the overhead lifting gear and release the straps securing the torpedo in the cradle.

3.8 Raise the torpedo slightly and check for centre of gravity. Lower torpedo and re-position lifting strop as necessary to the new centre of gravity.

3.9 Re-position torpedo so that the new centre of gravity is once again in the centre of the cradle; care being taken not to damage the long screw and to ensure that the long screw remains clear of the cradle fittings.

3.10 Fasten straps securing torpedo in its cradle and remove warhead safety cradle.

3.11 Release overhead lifting gear and remove lifting strop from torpedo; despatch torpedo for fitting with pistol or as otherwise instructed.

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PART 4 - INSERTING 'FITTED' PISTOL AND PRIMERS IN WARHEAD.

1. INSERTING 'FITTED' PISTOL:

1.1 Remove screws (studs) securing Pistol Pocket Blank using 558301 Spanner Box.

1.2 Fit the two 551692 Lifting Bolts and lift the Blank from the pistol pocket together with I.R. ring.

1.3 Examine pistol pocket and confirm it and the joint ring flange are clean and dry. Wipe clean as necessary using clean dry cloth.

1.4 Remove 'fitted' pistol and I.R. joint Ring from transport box.

1.5 Check that the I.R. ring is in good condition and smear it evenly with warm tallow. Fit the joint ring to the pistol; ensure the ring is not rucked or twisted.

1.6 Insert and secure the pistol in the warhead, tighten down evenly on all eight screws (studs) with 558301 Spanner. Clear threads of screw holes as necessary using 633556 Tool Clearing and 558314 Spanner.

1.7 Apply a 20-lb/sq.in. air pressure test to the warhead as follows:

a. Remove the air-test/vent plug of the warhead;

b. Screw in the test set (adaptor and gauge) using either 551365 Adaptor (0.312 in.diam. 22 T.P.I. or Special Adaptor (0.374 in. diam., 24 T.P.I.)

c. Connect 552905 Pump to the adaptor of the test set.

1.8 The 20-lbs./sq.in. pressure should be held for 10-minutes without dropping. While the pressure is in the warhead test for leaks around the pistol/pocket joint and around the glands and joints in the head of the pistol - using Oil OC.28 to show up the air bubbles should leakage occur.

1.9 All leaking joints must be made good. Where leakage is evident around the pistol/pocket joints, repair should be attempted by endeavouring to further tighten the screws securing the pistol and/or by replacing the I.R. joint ring.

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1.10 Leakage around the glands and joints in the head of the pistol require rectification at the R.A.N. Torpedo Establishment; any pistols found with this defect are to be removed from the torpedo and set aside for 'unfitting' and return to that Establishment.

1.11 Check the condition of the leather washer of the air-vent/vent plug and renew as necessary. Remove the test set from Warhead and replace plug.

NOTE: If more convenient the warhead may be charged with dry Nitrogen (20-lbs/sq,in) as an alternative to the air pressure method described in para. 1.7.

Ensure nitrogen bottle is fitted with a standard flow-meter before connecting delivery pipe to adaptor of test set.

1.12 Check that all moving parts in the head of the pistol have been lubricated as necessary with Oil OC.300 - N.S. 0475/943/7238 (temperate climate) or lanolin (hot climate).

1.13 Fit 552820 Pistol Safety Guard to pistol and secure in position.

2. FITTING AUXILIARY AND NOSE PRIMERS:

2.1 Unpack primers in accordance with TIAD (LAB) NO.005, Worksheet No.3. Confirm primers are in good physical condition; set aside and report primers found damaged or other wise defective.

2.2 Remove lifting eye bolt from nose of warhead and check that primer tube is dry, clean and free from foreign matter. Clean thoroughly where found to be necessary. Use Torch Safety (Item 8, Pt.4) of items required to assist inspection

2.3 Insert Primer Warhead Auxiliary 1-lb 6-oz. (spring last).

2.4 Insert Primer Warhead Nose 4-lb 4½-oz. Secure primers in position by screwing home the gland nut of the nose primer, using 558264 Spanner Pin Primer.

2.5 Replace lifting eye bolt in nose of warhead; recover screwed Blank for Nose-piece and Locking Bolt (para. 3, Worksheet No.1 TIAD (LAB) NO.001); pack in small cloth bag and secure bag to propeller guard of torpedo.

NOTE: The lifting bolt is required to be left in position in the warhead for transport purposes and striking down in the submarine, where it will later be replaced by the screwed blank and lockkng bolt.

2.6 Complete details in Laboratory log book and despatch torpedo as instructed.