SHORE WIRELESS STATIONS, AIR STATIONS. ETC.

TYPE 610ES and 610FS.

Owing to the shortage of Types 60, it has been decided to introduc- Type 610 generally in lieu, as a stop gap, until the Type 601 series sets become available.

The sets are:-

610FS - Supplied from 230 volts A.C.

610ES - Supplies from 24 volt batteries. This is a direct appropriation of a "bomber" set and the components in the power supply are not suited for continuous operation over long periods, for which type 610FS should be used.

The transmitter in Type 610 is transmitter 8D, which is R.A.F.T1154 considerably modified, particularly in the editions not yet in production, deliveries of which are expected to start late in May.

Modifications include

(a) Crystal control from 1,500 to 10,000 Kc/s.

(b) Extension of the frequency range from 3,000 to 10,000 Kc/s to 1,500 to 10,000 Kc/s.

(c) Alterations to keying, power and other circuits and to name plates and calibration charts.

A C.A.F.O. giving full particulars is in hand and action will be retrospective to all type 610 sets issued, but not to transmitter T1154B issued in the very early stages.

To avoid confusion, the modified transmitters should always be referred to by the Naval Title "Transmitter 8D" and never by the R.A.F. Title "T1154B".

TYPE 608ES and 608EFS.

These sets are being introduced for use in the United Kingdom only to replace and augment the stations fitted with Marconi TW12S series. They are also Marconi sets and will be installed and maintained by Marconi's.

SHORE STATION CONTROL SYSTEM, 1944 DESIGN (S.S.C.S.)

It is appreciated that the present system of control provided for shore stations does not meet requirements and a new system is being developed to overcome the difficulties reported and to provide a few increased facilities.

For this reason, no further reports concerning the existing system are required.

The system will be common to all shore stations, from the largest to the smallest size, including naval air stations. In this respect it will be capable of operation with aircraft direction outfits, etc.

The system is designed particularly to provide flexibility (including capability of expansion without difficulty) and simplicity of operation and ultra high speed operation beyond the limits normally used at present has been possibly sacrificed to obtain these ends.

DIVERSITY RECEIVING EQUIPMENT - RECEIVER OUTFIT CDT.

A new diversity receiving outfit, specially designed as such, named receiver outfit "CDT" has been developed by the Marconi Company and will be shortly introduced for service. It is intended that this outfit, which has considerable advantages over the existing outfit "CDS" should ultimately replace it.

STANDARD BUILDINGS.

Based on experience in Plan "R" a new range of tropical buildings for transmitting stations, receiving stations and combined communication offices is in hand and full specifications agreed with other Admiralty departments are expected to complete by 31st May, 1944. The standardisation of these buildings, which are in permanent construction, is necessary so that provision of all the stores (including apparatus such as air conditioning plants, etc.) can be made. Authorities abroad will therefore be invited to use these and to avoid proposals for special local types, which will entail delay amounting to many months.

MOBILE NAVAL RADIO STATIONS.

As a result of experience gained in the production of mobile equipment for operational use, standard arrangements of components are now in hand to form stations of the following types:-

(a) Mobile Air Radio Stations.

(b) Mobile Naval Radar Stations.

(c) Mobile Naval Wireless Stations.

These stations are built up of standard components, many of which are interchangeable between stations, known as "Naval Radio Vans". These vans are numbered, all vans having the same number being identical.

Information in detail will be issued for despatch to senior officers concerned by 31st May, 1944.

The "foundations" on which the great majority of Naval Radio Vans are built are of three kinds -

(a) Carts, Hand, Wireless Mark IV.

(b) Wheel-less Containers suitable for mounting on any normal 3 ton, 4 wheel drive truck.

(c) A.R.P. Trailers, used for mounting prime movers.

References to Naval Radio Vans should always quote the Van Number, to indicate the type, which is used in a manner similar to a Pattern Number.

A RELATIVE BEARING INDICATOR

The following suggestion for a Relative Bearing Indicator has been submitted by H.M.S. DOUKE DUKES and is reproduced here as being of interest.

PURPOSE.

For use in connection with Radar in ships not having a Gyro Repeater.

When such ships use their Radar, while at anchor or when in the company of other ships, there will always be a number of "standing echoes" received by the Radar. The true or compass bearings of these echoes are unchanging, but the relative bearings will change with each alteration of the Ship's head, due to swinging when at anchor, or to zig-zag when in company.

The Relative Bearing Indicator will enable the Officer of the Watch and Radar operators to have always before them the relative bearings of standing echoes.

As the idea necessitates a fresh plot for each different situation, it will be of more value to ships having regular anchorage positions (e.g., ships of the T.L.D.F.). In this case a set of plots could be made, one for each position, the appropriate one being used each time the ship comes to anchor.

DESCRIPTION OF INSTRUMENT.

A circular chart (Fig. A) is needed on which are plotted:-

(a) The ship's position (in the centre)

(b) The position of the "standing echoes" in true ranges and bearings from the ship's position.

(c) True bearings round the circumference.

(d) Range rings outward from the ship's position.

Over this chart is placed a circular piece of Perspex or other transparent material, the radius being equal to that of the chart (Fig. B). Round its edge should be marked:-

(a) A point to represent the ship's head.

(b) Relative bearings coincident with this point.

If the disc is placed so that its centre coincides with the ship's position on the chart and so that the point representing the ship's head is in line with the true bearing of the ship's head on the chart, a clear picture will be seen of the "standing echoes" and their relative bearings. (Fig. C).

A RELATIVE BEARING INDICATOR

FIGURE 'A'
CHART.
(FOR SHIP AT ANCHOR)

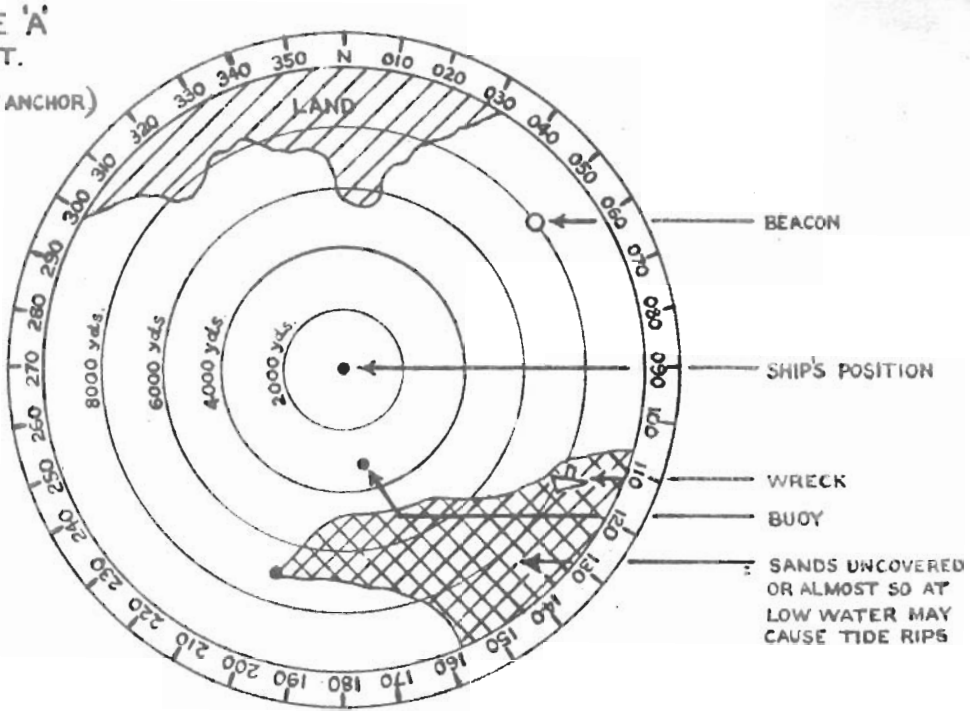


FIGURE 'B'
PERSPEX DISC.

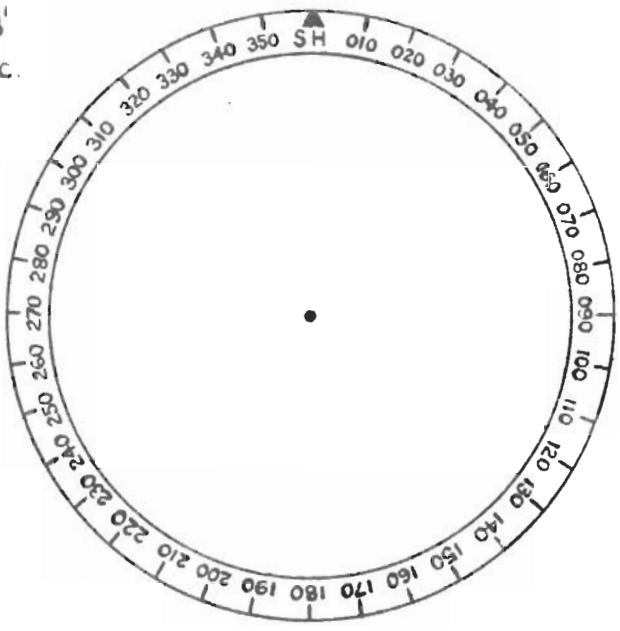
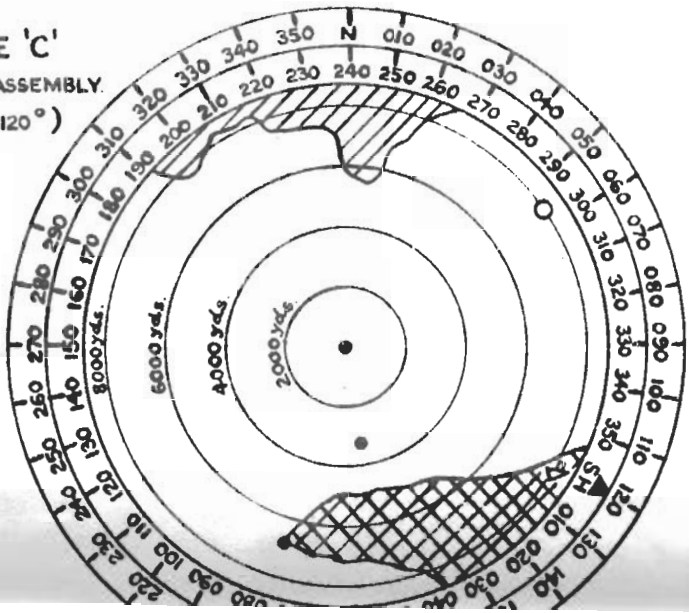


FIGURE 'C'
COMPLETE ASSEMBLY
(SHIP'S HEAD 120°)



HEIGHT FINDING BY RADAR

The importance of height-finding by Radar has increased considerably with developments in fighter direction. For fighter direction it is necessary to know accurately the position of the enemy aircraft in space, and it is just as easy to fail to intercept it owing to a height uncertainty as it is to fail through errors in range and bearing. Good height finding is, in fact, essential in all ships from which aircraft are to be directed. With the right technique it is possible with a W.A. set to get an accuracy of ± 1,000 ft. on low and medium flying aircraft and ± 2,000 feet on high fliers.

HEIGHT FINDING WITH W.A. SETS.

C.B.4224(42) "Heightfinding by R.D.F." explains how the range at which an approaching aircraft is first detected and the ranges at which the echo amplitude falls to a minimum may be used to estimate the height of aircraft. A new method has been developed which makes use of the variations of the amplitude of the echo. This method, which will be standard in future, has the advantage that it may be used when, owing to the operator concentrating on other echoes, the range of first detection is not obtained and it enables successively more accurate estimates of the height of the aircraft to be made as the period for which it is under observation increases. The method is fully explained in a C.B. which is in course of preparation and which will supersede C.B. 4224(42).

It must be remembered that with these methods success is unlikely unless:-

(a) Care is taken to calibrate the set accurately and every opportunity is taken to check the calibration at frequent intervals.
(b) The performance of the set is kept at a constant level.
(c) The operators are given a very full training in the subject.

A performance meter will shortly be fitted to Type 281 and later to Type 79 which will greatly assist in meeting requirement (b).

TYPE 277.

The fitting of Type 277 has introduced a new height-finding technique, the determination of the angle of sight by using an aerial array with a narrow vertical beam width. The height finding range of the set is, however, limited as, when the beam is elevated, there is no reflected radiation from the surface of the sea and a drop of about 40% occurs in the maximum range. It will seldom be found possible to obtain heights on aircraft beyond 25 miles and this set must be considered as a supplement to the W.A. sets for height finding.

THE HEIGHT FILTERING POSITION.

Height finding becomes much simpler if there is some central point in the ship to which height information can be passed for filtering. This is particularly so in a ship with more than one set providing the information, but even with only one set it is unsatisfactory to have to make height determinations without a proper height plot, display plot, etc. Ultimately all height finding will be done in the Radar Display Room, incorporated in the Action Information Centre, but it will be many years before all ships are fitted out for this. Where a Radar Display Room is not fitted the aim is to provide a Height Filtering Position, usually in one of the Radar Offices. The following is typical of the equipment required for a Height Filtering Position:-

(a) Height Plot - A plot showing the polar diagram and amplitude curves.

(b) Local Display Plot - A plot showing the general air situation, usually fed with filtered information from the Aircraft Direction Room.

(c) Radar Equipment.

From Type 281 - P.P.I. and L.44.
From Type 79 - L.44 and Bearing repeater.
From Type 277 - P.P.I., H.P.I., L.37 and Aerial Control gear.
From Type 293 (or 276) - P.P.I.

(d) Communications.

Note: P.P.I. is a Plan Position Indicator.
H.P.I. is a Height Position Indicator, a display from which can be read the distance and height of an aircraft.
L.37 and L.44 are remote displays on long afterglow cathode ray tubes which operate on selected bearings only.

HANDBOOKS

Upwards of 35,000 volumes of "H" Books have been distributed during the last 2½ years, and their fame (some might say notoriety) is spreading over the face of the world. Even the C.B. distributing authority at Colombo has been moved to request by signal "particulars regarding and stocks of, these esoteric publications".

But now there are to be no more "H" books. The Hydrographic department have protested that W.R.N.S. C.B. Officers telephone their headquarters daily demanding large numbers of H books, and refuse to be satisfied when they say they have not got any. To disturb the serenity of a navigator is an unforgivable sin, and an edict was therefore issued that some new index letter or letters must be chosen. Considerable research ensued in the endeavour to seek some self evident index letter which would not confuse with any other department in any Government Department, but as usual, it was found that all the best letters were already copyright. The final decision has been to adopt the index letters RH for Radio Handbook.

The new series will carry on in numbers where the old series left off, to minimise the risk of error in reference. It will be used for books of security category "Confidential R" and above only. All books of security category below "Confidential R" will in future be issued in the S.S. series as store articles whether preliminary or final books.

NEW RADAR HANDBOOKS

Below is given a list of new Radar Handbooks, etc. not shown as available in C.B.3090, Section O, as corrected up to Amendment No. 4.

LIST A.

A.S.E.Publications,"H" Books.

H.442	Preliminary Notes on Gyro Vertical Stabiliser for Aerial Outfit AUH.
H.464) H.464A)	Preliminary Notes on Indicator Outfit JK (Skiatron) Parts I and II.
H.480	Preliminary Notes on Type 253MW.
H.490A	Preliminary Notes on Panel L34, (To be read in conjunction with H.490, Notes on Panel L24).
H.520) H.520A)	Preliminary Notes on Type 255.
H.546) H.546A)	Preliminary Notes on Type 276, 277 and 293.
H.548	Maintenance Instructions for Type 970.
H.551	Preliminary Notes on Aerial Outfit AUK.
H.554	Operational Notes on Type 970.
H.555	Notes on Modifications to Type 970.
H.557	Preliminary Notes on the Plan Display of I.F.F.
H.562	Preliminary Handbook for Type 970.

LIST B.

Books in C.B.Series.

C.B.3130 General Description of Radar (In Dutch)

C.B.4310A)Handbook for Type 281/281B, Parts I, II & III
C.B.4310B) (Superseding:-
H.353, Preliminary Notes on Type 281, Parts I, II & III.
H.353A Appendix A to Preliminary Notes on Type 281.
H.353B Addendum B to H.353.
H.453 Preliminary Notes on Type 281B.
H.468 Preliminary Notes on Control Unit 20D).

C.B.4325 Handbook for Type 257/S.

C.B.4232A) Handbook for Type 291, (Superseding:-
C.B.4232B) H.440Z, Notes on Type 291 and 291Y.
H.440 Preliminary Notes on Type 291.)

C.B.4356 Handbook on Wavemeter G82A.

C.B.4350 Handbook for Test Set S.E.2.

USE OF RADAR FOR NAVIGATION

It is considered that the following Report No. 11, extracted from Admiralty Radar Bulletin No. 5 is of such general interest as to warrant reproduction here:

"Ever since its inception Radar has proved of use for navigation and station-keeping; the development of Plan Position Indicators (PPI's) has recently added a fillip to these applications.

2. As is now generally known, the PPI is a means of displaying a Radar detection in range and bearing simultaneously. Theoretically, therefore, a circular 'plan' is produced showing all objects within Radar range, own ship being in the centre. An aerial rotating continuously at fairly high speed is necessary to maintain a complete "picture" of the locality.

3. As far as the use of Radar in open sea is concerned, the ideal of a true PPI picture can in general be achieved. There are, however, one or two snags, the chief of which are:-

(a) Side echoes which are due either to interference from own ship's rigging, funnels, etc. (i.e. due to bad siting of the Radar set), or to the close proximity of large targets such as ships of a convoy. Side echoes may often seriously hamper a Radar Operator in reporting detections at close range; training and experience alone will enable him to sort out the sheep from the goats.

(b) Clutter, i.e. the ground and sea returns, which may obliterate even the largest targets up to a few thousand yards.

(c) The width of the Radar Beam which makes a single target appear as an arc (or 'sausage') on the PPI tube.

4. For these reasons the interpretation of PPI even in the open sea is not always so easy as it might sound, though the development of narrower beam sets and anti-clutter devices will improve matters.

5. Turning to the use of PPI for inshore work (e.g. during Combined Operations) a number of further points have to be borne in mind.

6. In the first place, confusion through side echoes off land masses will sometimes make the PPI interpretation a difficult matter, particularly as regards detection of small objects close to the shore; nevertheless, a useful general picture will usually be obtained.

7. Further, pictures of the coast line may look considerably different from the coast line itself, due to the fact that the width of the beam smears the finer detail, the fact that prominent objects tend to mask smaller objects behind and below them, because the beam is always inclined upward at a small angle to the horizontal. The first object to be recorded on the PPI in a given direction will never be the shore line unless it is precipitous. It follows, therefore, that at places suitable for landings the PPI picture will seldom be a reproduction of the chart. When looking at a PPI the tendency is always to regard it as though it was the surrounding area viewed from a great height; it must be remembered that this is only a cleverly produced illusion and that the view is in fact taken from approximately sea level, looking up at a small angle to the horizontal; realisation of this principle will greatly help in the interpretation of a PPI. With practice it is possible to gain from a PPI map a reasonable impression of what the coast line is actually like.

8. Also it must be recognised that since large targets tend to spread out circumferentially on the PPI due to the width of the Radar beam, the bearing of the end of a peninsular observed from a position roughly at right angles to its length will in general not be correct, as it will still produce an echo on the PPI when the centre of the beam is in fact pointing out to sea beyond the peninsular. Similarly, if a bay is flanked on one side by higher cliffs than on the other side, the bearing of the centre of the opening on the PPI picture will not be the bearing of the centre of the bay. The errors can be calculated with reasonable accuracy, but are difficult to estimate as they vary rapidly with range.

9. For Operation HUSKY a number of 'PPI Charts' were produced and proved fairly accurate when using Radar Type 970. This will no doubt be repeated for any future operation, but general provision of PPI charts is unlikely for some time since, as explained above, the chart depends on so many factors (e.g. the type of Radar set, the height at which fitted, the particular locality and the direction of approach).

10. It is recommended that the attention of all officers concerned in Combined Operation Navigation should be drawn to paragraphs 7 and 8 above.

TYPE 970

This set is used for navigation in connection with coast landing, bombardments and control of assault craft. Preliminary trials showed that it did this job well, although side lobes were troublesome. Further trials proved that discrimination was not good enough, minimum range was excessive, and that the size of the side lobes and lack of remote indication called for a high degree of skill in operation.

To overcome these drawbacks, experiments were carried out with an improved aerial scanner to reduce side lobes and improve the discrimination. The modification to reduce the minimum range to 150 - 200 yards was determined, and a remote PPI indicator in a watertight box was designed. Trials of all these modifications were carried out with good results.

There are now a large number of 970's fitted in Combined Operations' craft, all of which have been modified for reduction of minimum range. The first ten of the modified scanners have been fitted, and distribution of the remote PPI's will begin this month. Further improvements include the fitting of corner Reflectors to certain assault craft, all of which are being started this month.

Handbooks presented a difficult problem, but a further eighty of the provisional handbooks adapted from the Air Ministry publication are now nearly ready for distribution, and it is hoped that these will effectively bridge the gap until a more complete 970 Handbook, covering the operation, maintenance and application of the set is produced shortly.

An appendix detailing the equipment needed for the various modifications to 970 with pattern numbers, availability and specifications is shown, for the guidance of those interested.

EQUIPMENT FOR TYPE 970

APPENDIX.

Equipment	Type or Pattern	Availability	Specification etc.
970 Aerial Outfit Power Supply	Outfit APM Outfit DUR	Allocation monthly by D.R.E.01001/44. 20 - 30 per month.	B.310/43. Specification. S.D.0296 - Provisional handbook to be reissued as H.562. H.548 - Maintenance instructions. H.555 - Modification to minimum range. H.554 - Operational notes. B.323/43 - DUR. M.564 - Plan Packing Schedule.
Improved Scanner	Outfit APY	Priority allocated by ANCXF.30-40 per month.	Addendum "D" to B.310/43.
Interrogator Interrogator Aerial.	Lucero) TR.3160) TR.3190) Outfit APN)	A Priority allocated by ANCXF 30 per month.	Addendum "C" to B.310/43.
Remote Indicator	Indicator A.P.54917 Box W.T. A.P.54918 Connector A.P.54919 Bracket A.P.55107	Priority allocated by ANCXF 30 per month.	Addendum "B" to B310/43.
DR. Mk.1 Compass		Now being fitted in M.L's.	Addendum "E" to B.310/43.
Associated Corner Reflector	Outfit ADF Reflector A.P.55051 Mast AP55052	40 per month	
Associated Portable Shore Beacon.	Type 951	Available shortly.	

RADAR FOR TORPEDO CONTROL

The main problem at the moment in using radar for torpedo control is how to make the best use of the information available and how to supply it to the torpedo control officer in the most convenient form. It is not, at the moment, possible to fit a special radar set solely for torpedo control, so use must be made of the information provided by either the WS set or the Gunnery set.

The picture from the WS set will appear on the P.P.I. in the A.I.C. and the picture from the Gunnery set will appear on the P.P.I. in the T.I.O. As the T.I.O. is immediately adjacent to the A.I.C. it should not be difficult to obtain the required information from one or other of these two P.P.I.'s. As it is unlikely that, at any rate at night, the guns will be fired before the torpedoes, the fact that the T.I.O. has to supply information to the T.C.O. should not cause confusion.

The next point is how to get the information from the plot to the sight. As a temporary measure it is intended that a magslip transmitter driven by hand or a torpedo bearing indicator should be fitted immediately adjacent to either the plot, or a P.P.I. fitted from a WS set or the Gunnery set.

It may be decided that it is a requirement to have a P.P.I. for the sole use of the torpedo control officer. This P.P.I. can be worked either from the WS set or one of the Gunnery sets. This should enable the sight to be kept on for bearing by one T.C.O. when the target is invisible from the bridge. The problem of providing a transmitting cursor on the P.P.I. which automatically works a magslip transmitter as the cursor is turned and kept on the target, is being investigated. But as it will involve considerable re-design of the present P.P.I. it is unlikely to be at sea for some time.

When power driven torpedo sights are fitted they can be worked direct from the magslip transmitter or the bearing indicator, but when the sights are not power driven some form of "follow the pointer" system will have to be used.

RADAR IN SUBMARINES

For some time now submarines have been fitted with Type 291W. This set will provide adequate air-warning and fair surface warning, but the bearing accuracy of the set is such as to preclude its use for blind torpedo firing.

The new set at present being developed for submarine use will be known as Type 267W. It is a "hybrid" form of Type 291. Two separate aerials are fitted. One, known as Aerial Outfit APT, is exactly the same as the aerial at present used in Type 291W, and it will be retained in its present position. A new aerial, known as Aerial Outfit APS, will be mounted on the forward side of the forward periscope standard. In order to give all round visibility it will project some 18" above the top of the standard. The mast, in this case, is fixed and cannot be raised or lowered. Only one of these aerials can be used

at once, but it is possible to change from one to the other by moving one switch, which only takes a matter of seconds.

The same receiver display units, in the radar office, are used for both aerials, thus saving space, a consideration of primary importance in submarine radar. Presentation will be by P.P.I. and "A" scan in the office and a P.P.I. in the control room. Accurate bearing can be obtained from the P.P.I., but accurate ranging must be done with the "A" scan. For this purpose a Range Transmission Unit 52 is fitted in the Radar office. This will give range accuracy to 25 yds. A range receiver will be fitted above the chart table for plotting purposes.

It is hoped to commence fitting these sets in June, 1944. The above gives a brief outline of the new submarine radar set, and future development will be dealt with in the next issue of this bulletin.

RADAR CONTROL OF SQUID

In order to make the best use of the "Squid" against surfaced U-boats, a form of control and firing by radar has been devised. This can be fitted with radar Type 271Q, 276 and 277. The possibility of fitting it with Type 272 is being investigated. In this system a range scale has been provided giving 0-3,000 yards range, with very accurate range from 300 - 1,000 yards. The system works as follows :-

The range transmission unit (in this case R.T.U.54) is used as the echo is followed down on the "A" scan. The range transmitter works an "M" motor which is attached to the A/S recorder. This motor works the cord which in turn works the stylus and marks the paper in the same way as for an ordinary asdic attack on a submerged U-boat. A similar arrangement is being designed by A/S.E.E. Fairlie for marking the trace of the bearing recorder. If the U-boat dives before it comes within range of the "Squid", control can be taken over by the A/S operator within a matter of seconds and his oscillator will be already on the correct bearing. If the U-boat is still on the surface when the "Squid" comes within range, the "Squid" is automatically fired by the usual contacts on the range recorder.