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A.C.B. 0233/44 (7)

SOUTH-WEST PACIFIC

ANTI-SUBMARINE REPORT

JULY, 1944

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SOUTH-WEST PACIFIC

ANTI-SUBMARINE REPORT

JULY, 1944

ANTI-SUBMARINE
WARFARE DIVISION,
NAVY OFFICE,
MELBOURNE.

C.8763

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SECTION I

COUNTER MEASURES

1. REVIEW FOR JUNE

Japanese submarine activity during the month was limited to three areas - north of Mussau Island, the western coast of Bougainville and the approaches to Wewak. In only the first of these areas did counter-attacks develop, but there was one isolated attack by aircraft 20 miles north of Rabaul.

There were seven sightings during the first half of the month in the area north of Mussau (where the U.S. "hunter killer" group had some success during the last week of May) and U.S. Destroyer "TAYLOR" reports sinking a submarine of the "I"-Class 90 miles north of the island on June 10th. There were also two attacks by aircraft in this area, but no results were observed.

There were no attacks on shipping in the South West Pacific area and the scale of the activity in general is shown by the fact that no D/F bearings of submarines were obtained throughout the whole month.

2. DEFENCE AGAINST "GNATS"

A recent report by C-in-C. Eastern Fleet that "Gnats" (Acoustic Homing Torpedoes) are now being used by German U-boats in the Indian Ocean emphasizes the need for all A/S escorts to be on their guard against possible use of this weapon by the Japanese.

Arrangements have been made for A/S escorts in the New Guinea area to be equipped with F.X.R. gear in accordance with the allocation shown in C.C.N.O. 120.

An Anti-submarine Confidential Instruction on the use of F.X.R. is in the course of printing and will shortly be distributed to all A/S escort vessels. This A.S.C.I. also gives

details of the procedure to be adopted by ships not fitted with F.X.R. when the presence of a "Gnat" is considered possible.

SECTION II

CONVOYS

1. ANALYSIS OF CONVOYS - MAY, JUNE, 1944

AREA	No. of ships		Tonnage	
	May	June	May	June
Thursday Island - Darwin	22	12	82,842	46,696
New Guinea Area	81	163	588,619	1,087,146
Total	103	175	670,461	1,133,842

2. SINGLE ESCORTED SHIPS

AREA	No. of ships		Tonnage	
	May	June	May	June
New Guinea Area	97	99	639,495	666,320
Arafura Sea	8	14	18,831	49,823
Total	105	113	658,326	716,143

3. INDEPENDENT VESSELS, AUSTRALIA AND NEW GUINEA

AREA	No. of Ships		Tonnage	
	May	June	May	June
Eastern States - Western States	37	47	223,423	304,064
Melbourne - South Australia	80	80	347,158	358,069
Newcastle - Melbourne	183	173	749,232	729,124
Brisbane - Sydney	124	130	658,324	599,069
Barrier Reef - Brisbane	75	76	312,734	282,548
Coral Sea and New Guinea	536	439	3,314,210	2,693,967
Arafura Sea	2	2	2,728	5,078
Total	1,037	947	5,607,809	4,571,919

SECTION III

TACTICAL

1. VARIED USES OF RADAR EQUIPMENT

Commander (D) Milne Bay reports (1st May, 1944):-

Commanding Officers place great reliance on Radar and in particular the surface warning equipment. All express satisfaction with the highly satisfactory performance of the A.272, and the assistance it has been to effect rendezvous or to carry out escort duties efficiently.

The following accounts are listed as an indication of its usefulness in this area:

(i) "BENDIGO:" Recently this ship had to rendezvous outside China Straits with a U.S. Merchant ship at 1800L. Both ships were late on the rendezvous, visibility was poor due to heavy rain squalls, and "BENDIGO" continued on in search. At 2200L "BENDIGO's" low power supply failed and A. 272 search was continued by altering ship's head. At 2210L operator reported an echo, range 10,500 yards, opening. "BENDIGO" "gave chase", found the ship and escorted her safely to Milne Bay.

(ii) "BOWEN": Extract from H.M.A.S. "BOWEN's" Letter of Proceedings for March, 1944:-

"At 1643 on March 14th, "BOWEN" slipped and proceeded to escort NT 74 to the mainland. Heavy rain was experienced during the night of March 15th, and at daylight on March 16th visibility was estimated at about half a mile. Radar A. 272 and Asdic sets were working perfectly and no trouble was experienced in locating Euston Reef Beacon, which was abeam at 0838 on March 16th".

(iii) "WARREGO" and "GOULBURN": These ships effected rendezvous by the use of I.F.F. "WARREGO" gained contact at 24 miles when "GOULBURN" had adopted State L2 - the policy in force. Had "GOULBURN" been instructed to switch on I.F.F. earlier than 2210, a better range would have been obtained. Unfortunately "GOULBURN" did not appreciate this method of making a rendezvous as her A.286P was not switched on. A picking up range of 11,500 yards was obtained by A.272.

(iv) "GASCOYNE": Recently detected a U.S. Troopship at 35,000 yards with 271. This occurred during good visibility by day some mimutes before visual contact was made.

(v) "BENDIGO": Reports excellent results with A.272 in assisting safe navigation of convoys through partly charted waters to the Admiralty Islands. Also reports that Seeadler Y.H. Beacon is of great assistance to ships when approaching Manus Island.

(vi) "GLENELG": Detected a U.S. Task Force, range 20 miles, with A.286P. I.F.F. from the Guardship was also observed. This is an interesting case of "freak performance" of the A.286P, and indicated the exact location of the Task Force which "GLENELG" knew to be in the area.

(vii) "CASTLEMAINE": Led six Liberty Ships through Raven Channel to Milne Bay, A.M. Saturday 29th April. All ships had been waiting outside till the weather cleared, but visibility remained very poor for the whole of the day. The Channel was indicated to "CASTLEMAINE" by the combined use of Radar and Asdic.

There are many more such examples, but the above selection will suffice to show how Radar has been used to advantage in this area.

2. TRIALS WITH BATHYTHERMOGRAPH

The following are extracts from a report from H.M.A.S. "TOWNSVILLE" on trials carried out with the Bathythermograph:

Between Port Jackson and Sandy Cape the presence of an isothermal layer to a depth of from 80 to 120 feet is very noticeable. Inside the Barrier Reef the temperature is constant from the surface to the full depth of which the unit was streamed. Between Grafton Passage and the New Guinea coastline the effect of every degree of weather from cyclone to flat calm has been studied. The most outstanding features of the bathythermograph slides were:

Firstly: The immediate reaction of the water conditions to various wind forces and the constant relegation of "diurnal or afternoon effect" to be a factor for consideration only when wind of forces less than Force 3 were experienced.

Secondly: The absence of reverberation reflected by the Continental Shelf and the consequent absence of "Skip Effect".

During the week preceding February 12, this ship was engaged in escort duty with H.M.A.S. "WARRNAMBOOL". During the voyage to and from Brisbane, H.M.A.S. "WARRNAMBOOL" made available by V/S, reports of Bathythermograph slides. In anticipation of being fitted with the unit, I checked each range received by transmitting so that an echo would be obtained from merchant ships and found the range error even at this depth, to be about 21% of the predicted ranges. It is realised that this method is not very satisfactory.

Then on 21 March a doubtful contact was obtained in a position 10° 04' South, 153° 20' East, range 1700 yards. This contact was held until the range was 1100 yards, then was regained at 800 and held to instant echoes. These ranges were approximately predicted by a slide which had been streamed 1 hour 20 minutes previously so that I was able to avoid the confusion normally subsequent to loss of contact, and moreover, we were able to estimate the depth of the target from these factors.

3. PLOTTING OF RADAR CONTACTS

Considerable assistance in determining the nature, movements, and possible intentions of unknown targets picked up by Radar can be obtained by plotting.

Plotting should be started whenever an unidentified contact is obtained, particularly when no other means of identification is readily obtainable.

In future, Radar operators will be trained in this direction, primarily to improve their work and interest by acquainting them with the "picture" that can be obtained from Radar reports. Later, it is hoped they will reach a standard of proficiency and reliability that will enable this work to be entrusted to them with confidence. They should be further instructed at sea whenever opportunity offers.

Where separate plotting facilities are not provided, plotting can be conveniently carried out on the Chart table. Reports from the Radar office should be received direct by telephone. The plotter should be provided with a headset, thus leaving his hands free for plotting.

In small ships, aircraft contacts can be plotted with sufficient accuracy on a Manoeuvring Board Chart No. 5003 as the effect of own ship's speed compared with that of the target is negligible, and air warning sets fitted in these ships have such small picking up ranges.

A quick method of ascertaining enemy's true course and speed from a relative plot by means of a resolving ruler is outlined in A.F.O. 2517/43, and A.F.O. Diagram 176/43.

A modified form of "Gladstone" plotter with special plotting pad is proposed for the plotting of surface contacts, where the movement of own ship has an appreciable effect on the accuracy of the plot. The scale will be reduced to allow of contacts being plotted up to 25,000 yards. Until these modified plotters become available for ships, the "Gladstone" plotter Mark III, Patt. No. A.2124 in its present form can be used for Radar contacts beyond 2,500 yards by reducing the scale as necessary. It will be noted that the time intervals on the "distance run" scales will have to be multiplied by the same co-efficient as the graduations of the range scale.

The Bearing and range accuracy of most WS sets should enable quite an accurate surface plot to be developed, but owing to the wide beam of most WC sets, its bearing accuracy is rather poor. It can, however, be improved with practice and should be sufficient for the purposes of a rough plot of aircraft movements.

In order to assist operators to distinguish echoes of known targets (such as from ships in company) from other echoes, a small form of manoeuvring board covered with roughened "Perspex" is proposed. It will be small enough to be fitted in a convenient position to the operators in the Radar Office. Approximate positions of known targets can be roughly plotted on this board together with the positions allotted to other escort vessels by the Senior Officer of the escort force. This information should be supplied and kept up to date by the Bridge (vide C.B. 4180 (A) Section I Para. 3).

4. BEARING OF RADAR BEACONS BY TYPE A.286

Owing to the wide beam of this set it is not possible to measure bearing with very great accuracy by the usual method of training the aerial until the indication is seen to be at its greatest height above the trace.

In practice the aerials can usually be trained over quite a wide arc without noticeable change in height of indication.

This method of measuring bearing, known to Radar operators as "maximising" is not very satisfactory for obtaining a Radar "fix" on shore navigational beacons.

The following procedure has been used with a fair degree of success for this purpose:-

(i) A line is drawn across the surface or the transparent "Perspex" shield in front of the Cathode Ray Tube, parallel to the trace and about ¾" above it.

(ii) When the long "dash" of a beacon signal is observed, the aerials should be trained until it is observed to be at approximately its maximum height.

(iii) If necessary the receiver "gain" control is adjusted to bring the top of the beacon signal about ¼" above the line.

(iv) The aerials are trained in both directions from the rough bearings until the top of the beacon signal falls to the line.

(v) The two bearings at which this occurs are then noted and the difference between them is halved and added to the lesser.

This is the best bearing of the beacon.

Reports from various ships indicate that with care and experience, operators can measure bearings of beacon to an accuracy of 2° or better.

5. ASDIC CONDITIONS IN SOLOMON SEA AREA

In her monthly Report of Proceedings for May H.M.A.S. "LITHGOW" reports:

"Non sub echoes obtained from fish etc. in the Solomon Sea area are sometimes amazingly clear, with small extent of target and slow movement and are often difficult to classify. Asdic conditions are excellent and good clear echoes have been

obtained up to 7,000 yards without difficulty."

Another A.M.S. in the same area has reported echoes from reefs up to 8,500 yards.

SECTION IV

NARRATIVES

1. TWO LONG HUNTS IN THE ATLANTIC

Two very long hunts were made by the First Escort Group on the 29th February-1st March, and by Group C.2 on 5th-6th March respectively. A total of nearly 600 depth-charges as well as eight Hedgehog salvoes, were expended; in both cases the weather, after being very favourable, deteriorated - always a danger to the success of long hunts.

Before their hunt on the 29th February - 1st March, the First Escort Group had already sunk "U-91".

Three days later, at 0507 on the 29th February, H.M.S "GARLIES" made contact by Asdic at 1,600 yards range. "AFFLECK" closed and holding contact down to 300 yards made a Hedgehog attack, the Senior Officer choosing this weapon because, if it failed, it would not "scare the enemy into some wild evasion." There was no result at 0612 "GARLIES" was started upon a creeping attack, which promised well. Unfortunately, at the eighteenth charge, due to a sudden defect in the frigate's main machinery, she stopped amid her own pattern, unable to do anything. "AFFLECK" had, of course, to delay her attack and decided to wait for an hour when it would be daylight.

In perfect asdic conditions - there was bright sunshine and a flat calm sea - "GORE" resumed the attack at 0758, "AFFLECK" following up. The group was able to keep continuous contact but, as soon as the range was closed to distances varying between 650 and 950 yards, the echo would fade and disappear. It was thought that the U-boat was keeping at between 900 and 1,000 ft. and, though the frigate attacked repeatedly throughout the day, it was with the realization that they were doing little harm to a redoubtable opponent. At 1615 a first-class H/F D/F naval enigma was obtained within twenty miles and "GARLIES" and "GORE" were sent off to investigate. "AFFLECK" and "GOULD" continued to attack at intervals until 1742, when it was decided to cease for the night. At dark the U-boat was steering to the northward at about 1½ knots, with "AFFLECK" holding contact 1,200 yards astern and "GOULD" keeping station at about the same range upon the

U-boat's starboard beam. "AFFLECK" had a foreboding - and in fact warned "GOULD" - that the U-boat, on surfacing, might endeavour to destroy one of the hunters, but, nevertheless, remained astern in such a position that she could at once carry out an attack.

"GARLIES" and "GORE" were back by 1930 - they had found nothing - and were ordered to carry out 'Observant' two miles away from the ships in contact on a datum course of 355°. This datum course was altered from time to time during the night as the enemy doubled round and got first under "GOULD" and then under "AFFLECK". It was easy to detect the start of the U-boat's manoeuvres but difficult to counter them owing to the contact disappearing at 700 yards range. Weather conditions continued to be perfect.

The moon was due to set 0157/1 and it was hoped that the enemy would then surface and endeavour to escape but he did not and between 0200 and 0300, "GORE" and "GARLIES" changed places with "AFFLECK" and "GOULD"; the former's Asdic operators had been holding contact for over twenty four hours. At dawn the attack was taken up again by "GOULD" and "AFFLECK" but the long hunt had not impaired the enemy's cunning and he avoided the danger. A mass creep attack was then organized, the four ships each firing a full 26-charge pattern, but though well synchronized, it had no result; the U-boat was keeping deep enough to be safe from even such a marine convulsion as this. It was then about 1000 and at this lack of success the ships, after twenty-nine hours of hunting, were tempted to despair. To add to their fatigue, the weather had deteriorated; there was a rising south-easterly wind with an accompanying sea. When, at 1606 "GORE" and "GARLIES" had to leave the scene and proceed to Gibraltar, Asdic conditions were extremely bad but, although contact was lost from time to time, either "AFFLECK" or "GOULD" always managed to regain it.

The end came at 1920. "GOULD" had just lost the contact on her port quarter and "AFFLECK" had picked it up on her port beam, when a sudden improvement in the echo was followed by "GOULD" being torpedoed in the after motor room on her port side. It was thought that, as the periscope broke surface, the U-boat fired at "GOULD", who was the last ship she knew to be in Asdic contact. "AFFLECK" sighted the conning-tower some 1,500 yards on her port beam and with depth-charges and gunfire brought the long contests to an end. Only one survivor was picked up, for "AFFLECK" had to rescue "GOULD's" crew. The U-boat was "U-358".

This hunt had lasted from 0507 on the 29th February until 1920 on the 1st March, a period of more than thirty-eight hours. The hunt of Group C.2 was not quite so long but it was

in progress for thirty hours. In both, Senior Officers overcame the temptation to disbelieve the evidence offered by the Asdic and were duly rewarded.

GROUP C.2's THIRTY-HOUR HUNT

At about 1000 on the 5th March, H.M.C.S. "GATINEAU", 8 miles on the port bow of Convoy H.X. 280, obtained an Asdic contact. H.M.C.S. "ST. CATHERINES" closed and the hunt began. Fifteen attacks were made with depth-charges and Hedgehog between 1028 and 2120, H.M.S. "ICARUS" and H.M.C. Ships "CHAUDIERE", "CHILLIWACK" and "FENNEL" taking part in them with "GATINEAU" and "ST. CATHERINES! H.M.S. "KENILWORTH CASTLE" also attacked, using Type 147B and Squid; she achieved no success but the result has not diminished her Commanding Officer's faith in the new gear and weapon. There was a lull between 2120/5 and 0015/6 and it was then decided that the hunt was becoming too quiet from the U-boat's point of view and three attacks were made in the next hour. The U-boat Captain - described by "GATINEAU'S" Commanding Officer as a man "who knew exactly what steps to take in order to confuse hunting vessels" - then seems to have thought that the hunt was becoming too easy from the point of view of the ships, for he spent the next three hours in taking violent evasive action.

After this he settled down somewhat and two Hedgehog attacks were made between 0745 and 0830 but he was keeping deep and they were without success. At 0910 when the hunt had entered on its twenty-fourth hour, the U-boat Captain detected "CHAUDIERE" increasing speed as she manoeuvred for a creeping attack and, altering course, compelled her to postpone it for an hour. Another creeping attack was made at 1100, but the U-boat, by doubling back to port again, avoided the pattern. Shortly after noon the U-boat settled down and the Group, being in firm contact, decided to let four hours go by before taking up the attack again; Asdic conditions were extraordinarily good. It was considered that the U-boat would try to remain submerged until about 2100 but at about 1530 she surfaced - she was "U-744" - and her crew abandoned her without any attempt to reply to the ship's gunfire. It was fortunate that the Captain of this U-boat had not quite the same determination as she displayed by "U-358's", for soon afterwards the wind and sea increased and the barometer fell fast.

2. M.A.D. BARRIER IN THE STRAITS OF GIBRALTAR

Since the middle of January, 1944 U-boats attempting to enter the Mediterranean Sea by the Straits of Gibraltar have had

to face a new and unknown hazard in the form of an M.A.D. (Magnetic Airborne Detector) barrier patrol. In the first two months of operation this patrol was instrumental in the sinking of two German submarines. Both of these U-boats were attempting to make the passage of the Straits submerged by daylight.

U-BOAT TACTICS

Early in the war nearly all passages were made by night on the surface. In November, 1942, however, the R.A.F. began patrolling the Straits with night-flying searchlight aircraft based at Gibraltar. This increased the hazard of the night surfaced passage to such an extent that the U-boats were forced to change their tactics.

The waters of the Mediterranean are more saline, and therefore denser than those of the Atlantic. As a result there is a constant flow of dense water from the Mediterranean to the Atlantic in the depths of the Straits, and a shallow counter-current of lighter water from the Atlantic into the Mediterranean.

The U-boats have taken advantage of these currents. They approach the Atlantic mouth of the Straits by night and submerge at daybreak. During the day they need only make enough speed to maintain trim, while the current carries them through the Straits. Tests indicate that at times as much as a two knot current flows towards the Mediterranean.

COUNTER-TACTICS DIFFICULT

The destroyer patrols in the Straits operate under a number of handicaps. Sound conditions, because of the variations of the density of the water, are bad, so that Asdics become unreliable, and serve to warn the enemy of the presence of the destroyer. Nor is listening for hydrophone effect of much use when the U-boats can proceed at slow speed.

Moreover, all land boundaries of the Straits, except for the Gibraltar Peninsula, are formed by neutral territory with the accompanying three-mile neutrality zone.

To prevent submerged passage an M.A.D. patrol has been set up. This patrol is flown simultaneously by two planes, which attempt to keep on opposite portions of the circuit at all times, so that they pass each other at the centre and go into simultaneous turns at the opposite ends. An altitude of 150-200 feet is maintained. At this altitude the aircraft flying the patrol can detect a submarine even at a depth of 200 feet, if the submarine lies within 300 feet of the track of the plane.

The Straits are so narrow that a plane passes any point on the patrol every one or two minutes, so that a U-boat cannot pass the barrier without having a plane pass within 300 feet of it.

When a plane makes a contact, the position is marked by a float-light automatically released, and by making successive passes over the U-boat, dropping float-lights on each contact, the plane determines the track of the U-boat.

FIRST SUCCESSFUL M.A.D. CONTACT AND ATTACK

Two PBY's were flying the Strait of Gibraltar M.A.D. Barrier Patrol at 100 feet altitude over a moderate sea, when plane No. 15 obtained a contact. Float lights were fired and the pilot immediately commenced the prescribed clover leaf tracking procedure.

After plane No. 15 had tracked the submarine with three lights, plane No. 14 joined the tracking and the planes flew the clover leaf procedure, simultaneously firing float lights on M.A.D. signals.

Shortly thereafter a destroyer, H.M.S. "ANTHONY" approached the area from a position two miles west of the point of contact. By the time six float lights were laid, the destroyer was within the clover leaf pattern and offered a serious hazard to the two aircraft which were flying at 100 feet attempting to continue the tracking. The destroyer was requested to remain in the area but to stay clear of the tracking.

About twenty minutes later, plane No. 15 regained magnetic contact about one mile to the southeast of the previous position. Both aircraft then commenced the regular tracking procedure. After dropping several float lights, they observed the destroyer again heading into the area.

Plane No. 15 started a bombing run, informing the destroyer which turned slightly to port to clear the area. Twenty-three 65-pound VAB contact bombs were retro-fired (see Miscellaneous Section) on good magnetic indication from an altitude of 100 feet at a ground speed of 109 knots. Explosions from the bombs were reported, indicating that they found their target. Ten seconds after plane No. 15 had attacked, plane No. 14 fired another float light on an M.A.D. signal and then made a 360 degree turn and approached on a bombing run. The destroyer by this time was within 100 yards of the end of the line of float lights. Twenty-five 65-pound retro-bombs were fired on a good M.A.D. indication approximately two minutes after plane No. 15's attack.

About 20 seconds after plane No. 14 had completed

its run, "ANTHONY" dropped ten depth charges at the position of the explosions of the bombs dropped from plane No. 14.

About five minutes later, the conning tower and the bow of the U-boat broke the surface at the point of attack and directly in line with the float lights which had been dropped marking its submerged track. The submarine lost all forward way and the stern settled quickly until the bow was only partly visible at an angle of about 40 degrees, it disappeared stern first one minute later.

In the meantime another destroyer, H.M.S."WISHART" had arrived on the scene and now attacked with depth charges over the point where the submarine was seen to settle stern first. "ANTHONY" quickly followed this attack, dropping ten more depth charges almost immediately.

About five or six minutes later the submarine surfaced and personnel immediately commenced abandoning ship without manning the guns. Both destroyers opened fire on the submarine and one direct hit was scored on the conning tower.

The bow of the submarine then rose to an angle of about 40 degrees and sank. Twenty-five minutes had elapsed since the first retro-bombing attack by VP-63. The destroyer then began picking up the survivors, 48 of whom were rescued.

3. THREE KILLS BY FLEET AIR ARM DURING HOMEWARD-BOUND RUSSIAN CONVOY

The first kill was made on the 4th March by Swordfish B/816, from H.M.S. "CHASER", flying in dawn twilight, the weather being clear. It first sighted the U-boat's wake eight miles on the starboard beam when flying at a height of 3,500 feet. The U-boat was about 10 miles from the convoy. It closed and attacked with rocket projectiles from a height of 600 to 700 feet, the first pair being fired at a range of 600 yards. The U-boat turned to starboard during the attack and received the rockets abaft the starboard beam. At first it did not seem to have been affected by them, for it continued on its course at full speed but it was soon seen to be leaving a large and unbroken oil streak behind it.

The Swordfish, meanwhile, got in touch with H.M.S. "ONSLAUGHT" on the Convoy's outer screen and homed her on to the U-boat, reporting the fall of shot to her when she opened fire.

The U-boat made some reply but, after taking evasive action, lost way and then came to a stop. Firing ceased and the destroyer closed but, when she was within a few hundred yards the U-boat's bow reared up and she sank stern first. A number of survivors were picked up by "ONSLAUGHT" and also by H.M.S. "ORIBI".

On the next day, at about 0850, Swordfish aircraft F/816 sighted a U-boat about 12 miles from the outer screen of the convoy. The range of sighting - in weather which was hazy in patches - was 6 miles. The aircraft closed from up sun, climbing from 2,300 to 3,000 ft., beginning a gentle dive at two miles range after she had got the U-boat down wind. At one mile it dived to attack at 90° to the U-boat's course, opening fire with rockets at 1,200 feet. The U-boat was evidently caught unawares for it did not reply until about 30 seconds after the attack had been made and then missed well astern.

Three hits were observed abaft the conning tower and about two minutes afterwards the U-boat's bow emerged from the water until the deck forward was quite clear; then, a minute later, the bows rose suddenly to an angle of about 70° and the U-boat slid under the water stern first. Thirty survivors were seen in the water, but the crew had evidently been taken entirely by surprise for no rafts or dinghies were seen.

The third kill took place about the same time next day. It was achieved by Swordfish X/816, which made clever use of cloud cover after sighting the U-boat at a range of 12 miles. H/F D/F bearings had indicated that a U-boat was gaining bearing on the convoy and this boat, when sighted was about 15 miles from it. The aircraft climbed over a thin cloud layer and closed without using A.S.V. At the end of five minutes a convenient gap in the clouds showed that it was on the correct bearing and it therefore continued on for another two minutes before beginning its dive. As the Swordfish came out of the cloud the U-boat was about a mile away and almost in the leadsight. At a height of 800 ft. the aircraft fired the first ripple of three pairs of rocket projectiles. The first rocket of the second pair hit the U-boat just below the conning-tower, the others being over.

As in the earlier attacks, the U-boat at first showed no signs of being damaged, remaining fully surfaced and under way. The Swordfish could see, however, some white smoke puffs issuing from the place where the rocket projectile had hit. The U-boat was seen to turn first to starboard, then to port and then back to starboard again; as it made the last turn, its stern suddenly rose in the air at about 60° and it disappeared leaving oil and bubbles. The Swordfish dived over the position and, as it did so, saw about fifteen survivors. It directed H.M.S. "BOADICEA" to the position and the men were picked up.

It was fortunate that in two out of the three cases prisoners-of-war were obtained from the U-boats for they should be able to explain how the U-boat apparently seemed undamaged immediately after the attack, but succumbed about two minutes later.

4. CONTACT CLASSIFICATION BY PROXY

The Contributors' Section of a recent Admiralty Anti-Submarine Report yields an idea which could be developed into a morale-shattering weapon for use against all but the ace A.S. C.O's.

"During a recent operational trip as a Support Group, we found ourselves hurrying one day to join an S.C. convoy. I hoped to rendezvous with the close escort before dark, and had estimated that, if our navigational errors corresponded, it might be just possible. The Group at this time were spread two miles apart zigging independently and proceeding at a speed of advance of 15 knots. My "outside left" reported an A/S contact classified as doubtful, and then amplified it over the T.B.S. H/F R/T as possible. I had no alternative but to send the "inside left" to back him up. I gave him a quarter of an hour and then tearing up all my dusk rendezvous calculations "blue turned" the Group towards my pair of investigators. This sort of thing has of course happened to everyone before and will again, but at this moment we had a new idea on my bridge. The T.B.S. was working beautifully and as clearly as a bell. When the ship in contact pressed the button on the microphone to speak to us we could hear all the ship noises, etc. It was suggested, therefore, that if they held their microphone alongside their A/S loud-speakers we could, as it were, "lend an ear", although we were some eight miles apart. This was done and my A/S C.O. had no hesitation in saying "FISH". The time thus saved in not going right over to them was quite 30 minutes and we were all quickly on our course again.

"Shortly afterwards, to be correct 36 hours, we were in contact with a U-boat and by this little trick were able to confirm and also to know all about the contact that my various ships were holding on to.

"Two days later we got our "hooks" into an expert who fooled around with us in all for 38 hours. During most of this time he was so deep that to close the range inside 750 yards was to lose him completely. We decided, therefore, that I would

remain astern holding rather a shaky contact through his wake and that my Supporter should be on his quarter in firm contact. Every now and then just to cheer ourselves up, we had a listen to the beautifully clear echoes my other ship was getting as compared with the woollen things that were flopping out of my own A/S hut.

"It really works. Try it, all you lucky ones with T.B.S."

SECTION V

INTELLIGENCE

1. JAPANESE ANTI-SUBMARINE TACTICS

A Japanese Navy Mine School Secret Publication "Reference Book on Underwater Sound Gear" captured at Kwajalein gives an insight into Japanese methods of anti-submarine searches and attacks.

The Japanese place much more emphasis on hydrophone detection than the Allies do, and most A/S vessels appear to be fitted with both hydrophones and echo-ranging gear.

When using hydrophone gear, a 360° sweep is advocated but no speed of sweep is mentioned. "The speed of the target is judged by obtaining the number of revolutions of the propellers from their rhythm. Changes in the enemy course are known from rapid changes in sensitivity and changes in direction. It has been found experimentally that it is possible to measure quite accurately up to 300 turns a minute without the use of the instruments. The range of the sound source is judged in general by the degree of sensitivity and comes through practice. However, at times the sensitivity will produce irregular changes, making it impossible to rely on it completely. Therefore, as a general principle, judging the distance is based upon a plot drawn from the essential elements in the change of target speed and bearing, and upon references to the sensitivity."

When sweeping with the echo-ranging gear automatic rotation is favoured in 5° steps through an angle of 50° on each bow. If the speed of the A/S vessel is less than 12 knots, the angle may be increased to 60° and to 90° in other special circumstances. Apparently a transmission interval of 3,000 metres is normally used with either one or two transmissions during the eight seconds taken to negotiate the 5° step.

THE COUNTER ATTACK

The "immediate" attack corresponds to our counter attack. "It has the physical and spiritual effects of neutralizing the enemy submarine, keeping her down, disturbing the enemy's underwater search, upsetting his torpedo firing plans, etc., and at the

same time, if the bearing and range of the submarine can be ascertained without loss of time, plots and estimates of the situation will be made by echo-ranging several times and the target course and speed will be speedily estimated, and an immediate attack carried out with the object of trying to protect the friendly main force."

There is no evidence of any form of deterrent measure before the actual counter-attack such as the dropping of a depth charge immediately upon obtaining contact. The emphasis appears to be the other way "although speed is necessary, the attack is not to be made on a basis of echo-ranging only once or twice, but it is to be executed as a general rule only after the presence of an enemy submarine has been ascertained by as much echo ranging and plotting as the situation permits. For this reason the ship will take such measures as slowing down to make echo-ranging easier and more accurate."

THE DELIBERATE ATTACK

In a deliberate attack as much as possible is made by the hydrophone gear to supplement information obtained from echo-ranging. The general principle is to reduce speed as necessary to make detection easier and then gradually to work the ship's head round to the bearing of the submarine "pinging being done insofar as possible always from the same side of the bow." This is apparent-ly a very gradual process and in both examples shown the attack is eventually made from the quarter of the submarine, and the publicat-ion states "it is most often the case that attacks ultimately develop from the rear."

In both examples the final turn in to attack is not made until a range of 500-600 metres despite the fact that the echo-ranger cannot range under 300 metres. However "although the minimum distance at which it is possible to range with the present Type 93 echo-ranger is 300 metres, it is possible to pick up the sound of a submarine's propellers from a distance of 500 metres; therefore, within 500 metres, do not neglect the echo-ranging projector's ability to listen, and even within 300 metres, continue to listen until you are directly above, or in other words right up to the time of firing."

The length of the depth charging run is 400 metres - 200 metres on either side of the submarine's presumed track. Unfortunately no information is given as to the recommended pattern of depth charges or the method of finding the time to fire. The development of a plot during the attack seems to be of primary importance and, as no mention at all is made of Doppler effect or automatic visual ranging for each echo, it may well be that the

plot yields the primary method of finding the time to fire.

In the explanatory notes under the two diagrams of model attacks, the "number of echo-rangings" is shown as "15 times" and "10 times". As continuous pinging is advocated during the greater part of an attack, it seems that the actual ranging is a problem of its own, and is not registered automatically. This might explain both the inability of the Type 93 echo-ranger to range under 300 metres and the enthusiasm for the use of Hydrophones for very accurate measurement of changes of bearing.

Both of the model attacks show a submarine going to its destruction along a steady course, but it would appear from this publication that a submarine taking a violent turn away when the A/S vessel is at about 300-500 metres range (and still plugging away at a maximum speed of 12 knots) would stand a good chance of escape.

SCREENING THE FLEET

In dangerous waters it is recommended that the main units of the fleet should proceed at least 18 knots and that the screen should be divided into two groups which proceed alternately at 11 knots while sweeping and 26 knots while proceeding to the next lane to be swept. When the fleet has nearly caught up one group, this group increases to 26 knots and leap frogs the other group which is then sweeping well ahead at 11 knots.

2. INFORMATION ON JAPANESE DEPTH CHARGES

The following information is extracted from a translation of some pencilled notes found in a captured Japanese notebook:-

Type of Depth Charges:

Type 91 Depth Charge Mark I Improved I (100 kg).
Type 95 Depth Charge
Marks I, II and III (100 kg improvised Type 1 explosive is used)
Horizontal type depth charge (shallow navigating).

Effective Radius of Depth Charge:

By deduction from experiments with the Type 88 Depth Charge against submarines and from the records of various experiments with depth charges in the past, the damaging effect of depth

charges used at present (Types 88, 91 and 95) is as follows:-

Extent of Damage	Radius (Metres)	
Small leaks on a calm sea surface will probably disclose the presence of the submarine.	45	
Submerging will be difficult for a short time due to breakdown of various gauges of the secondary battery.	25	Though only a short time is required for repairs there will be many occasions where it will reveal itself.
The concealment of the vessel is greatly affected and it will be impossible to submerge for a time.	20	Even though it temporarily comes to the surface repairs are impossible.
It will be flooded with a great quantity of water and will gradually sink.	15	

Important Points in Launching Depth Charges:

	Type 91	Type 95
The hull of the submarine will be damaged and flooded due to the explosion of the depth charge at distance (radius of damaging effect.	20 m.	20 m.
Sinking speed of Depth Charge-Parachute Attached.	1.7 m.(5.6 ft.) per sec.	1 m. (3.3 ft.) per sec.

Important Points in Launching Depth Charges: (Contd.)

	Type 91	Type 95
Sinking speed of Depth Charge - Without Parachute	3.5 m.(11.5 ft.) per sec.	1.9 (6.2 ft.) per sec.
Safe distance for launching	100 m.	100 m.

(Note: The maximum speed used by the Japanese in an anti-submarine attack using the echo-ranger is 12 knots and, for certain depth-settings, the sinking speed of the depth charge is reduced by attaching a parachute giving the attacking ship time to get clear of the danger area).

3. JAPANESE SUBMARINE AT BREST

A Japanese submarine seen in Brest by prisoners from "U-732" was described as having a displacement of 2,400 tons. She was said to have been fitted with "an enormous of guns" including twin 140 mm. (5.5") A.A. guns.

There are eight torpedo tubes forward in two rows of four, and four tubes aft in two rows of two. Two catapult aircraft were carried on the upper deck each in its own hangar. The hangars and the crane for hoisting the aircraft aboard are aft. There was a large searchlight on the bridge and one W/T office in the conning-tower. Two other W/T offices were situated amidships on each of the two lower decks. The submarine had two decks within the pressure hull.

The submarine which was said to carry a cargo of various metals and machine parts arrived in Brest on the 1st September, 1943.

The German prisoners said that the Japanese submarine carried three complete crews each of 90 officers and men, but it is considered unlikely that more than one additional crew could be accommodated. The German said however that two crews disembarked, one going to Mimizan for anti-aircraft training, and

the other proceeding to Hamburg to stand by a U-boat under construction. This boat was eventually handed over to the Japanese. The same prisoner said that 40 men from each of two crews were able to man two further U-boats. While in Brest, the Japanese submarine was fitted with a German 20 mm. quadruple mounted and one or two single 20 mm. guns. She sailed from Brest with her original crew of 90 on 10th October, 1943.

4. JAPANESE SHIPPING POSITION

A recent O.N.I. Weekly publishes the following comment:-

"The enemy's shipping position is critical, and he is experiencing difficulty in maintaining present lines of communication. This condition may well become a factor in softening Japanese strategy and forcing a decision to shorten supply lines to a point where serviceable tonnage can meet transport demands. The current estimate of Japanese merchant shipping, serviceable as at April 1, 1944 is 3,972,000 tons in full powered vessels of 100 tons or more."

This estimate is based on the figures shown in the following table.

	Vessels 100 tons and upwards	
	Number	Gross Tons ('000)
Estimated December 7, 1941	2,760	6,397
Captured or acquired	160	611
Construction 1942	186	356
Construction 1943	200	600
First Quarter - 1944	300	210
Naval Oilers Afloat	12	90
	3,618	8,264
War Losses	968	3,768
Rebuilt as Aircraft Carriers	5	82
Total Available	2,645	4,414
Total Serviceable *	2,380	3,972

* Estimated at 90% of Total Available.

5. CONCERN IN JAPAN ABOUT SHORTAGE OF SHIPPING

A Japanese signal captured in the Marshalls probably did not inspire many of the ever-dwindling outposts of the Empire with much confidence in their future.

From: Vice Minister of the Navy
Vice Chief of Naval General Staff

To: Commanders-in-Chief of All Fleets
Commandants of All Naval Stations
Commanding Officers of All Guard Districts

"In view of the serious nature of the shipping situation, all naval units are actively encouraged to co-operate in submitting recommendations for the solution of problems discussed in the following.

"The United States and Great Britain are now taking the initiative in the war, and will soon concentrate their entire strength for a determined offensive thrust intended to bring the war to a decisive stage by the middle of next year. The welfare of the Empire clearly depends on the ability of our forces to check this offensive and to mount counter-attacks at an opportune moment. Accordingly the Imperial Headquarters and Government have agreed to adopt resolute measures, as a matter of national policy, designed to increase production of all types of weapons and to reinforce strategic points, regardless of the sacrifices entailed in other spheres.

"As one glance at the geography of our defence system will show, the problems of surface transportation and shipping space must first be met in order that the desired rate of production and reinforcement may be achieved.

"Efforts are now being made to alleviate the problem of civilian supply and transportation, which is largely a matter of insufficient cargo space. Efforts are also being made to offset the serious inadequacy of military production and transportation. Despite these efforts, however, improvement to any large degree cannot be counted on. Although a large percentage of the ships in the Empire has been diverted to Army and Navy purposes, the number of requisitioned vessels is no longer sufficient to meet new demands.

"These conditions make it necessary to reduce the flow of supplies to all units, with a consequent need for increases

in local self-supply and greater simplicity in living standards. Up till now the Navy's ability to maintain its supply lines has naturally been a reason for its strength. A marked difference between the living standards of the Army and Navy forces in defence outposts has consequently arisen. A deliberate reduction of supplies is of course inadvisable; and thus the inequality of standards is causing ill-feeling on the part of Army forces - a factor which is likely to injure inter-Service co-operation. Moreover, the enemy has recently sensed this Army-Navy rift and has exploited it for propaganda purposes. An immediate and thorough investigation is therefore felt to be imperative.

"Even the luxury-loving American forces live frugally in forward areas, and it is reported that the ration per man differs only slightly from ours.

"It is of course hoped that supplies will become more abundant in the future, and our fighting efficiency correspondingly increased.

"In the light of current transportation difficulties however, all forces are urged to be additionally patient. It is felt that perseverance on the part of all personnel will soon lead to increases in production and reinforcement. Accordingly leadership should be exercised so that shortages may be better endured.

"Both the Ministry and other agencies concerned have deliberated at length in an effort to arrive at a basic solution of logistic problems. The navy has always taken the lead in matters of surface transportation and thus bears the major responsibility for meeting the problem. The need for curtailing the flow of supplies has been mentioned, but a negative approach of this sort is not enough. All units and branches must exert themselves to devise improvements - no matter how slight - in transportation facilities. It is especially urgent that cargo ships be routed more efficiently, shipping losses reduced, amount of cargo restricted, local production increased and means devised whereby ships other than freighters may be employed for transporting supplies.

"Lastly recommendations which are of possible interest to the Ministry or other departments should be submitted without delay and steps taken for the dissemination and practical application of them."

6. JAPANESE USE OF RADAR

A report from a Japanese radar station in Northern

Chishima shows that the Japanese have complete faith in their eagle-eyed radar operators.

Poised in the direction of the sea, our radio detector was shooting interceptor rays in search of enemy planes. Suddenly one operator shouted, "they have come, they are enemy planes!" Sure enough rays reflected back by the fuselage of enemy planes began to dance wildly in the lens. An eagle-eyed operator without wasting a moment grabbed a telephone and shouted out the position of enemy planes. Enemy aircraft were speeding toward us in the darkness but our men had already determined their precise position before the engines could be heard. As the approaching planes began to produce clearer waves in the detector my heart would not cease pounding until our first plane took to the air.

In an ordinary battle of radio waves, shortwave detectors assume first position. This remarkable equipment is capable of emitting rays which strike approaching planes or warcraft and bounce back at the rate of 30 kilometers per second. To a region like Northern Chishima, constantly wrapped in a thick mass of clouds, the detector is a godsend. Use of detectors is nullifying U.S. strategy of attacking under a screen of clouds. Expert operators of detectors, with vision and sense at the highest pitch, have enjoyed amazing success in the keeping track of enemy raiders. At one base, a radio detector operator was the recipient of hugs of joy of officers and men for it was his accuracy in detecting which was responsible for brilliant results attain-ed later by our airforces in intercepting the enemy.

According to a recent statement by American war prisoners, Japanese operators are far more accurate than American veteran operators. Long training without seriousness of effort or true fighting spirit is giving no advantage to American detector operators. In July last year two American cruisers fired at each other in Aleutians waters, which topic was ridiculed by military quarters everywhere. It was later proved that it was caused by mis-information by erratic American operators of detectors. Another related equipment to the detector is the radio locator. This precision instrument calculates distance, direction and speed of enemy raiders which have penetrated the detectors line of defence.

This information is then transmitted to A/A searchlight units. Success of our anti-aircrafters is also due to accuracy of our operators of radio locators and efficient co-ordination of the two branches of radio wave units. As reports continued to stream into our detector station, enemy formation made an appearance and started to light the area brilliantly with multi-colored flare incendiary bombs. Simultaneously our A/A

guns barked aloud and our planes rose to engage the enemy in aerial combat. I kept my eyes glued to the lens of the detector whose rays kept fluttering. Suddenly it stopped abruptly. I found myself gazing into the skies above. The enemy planes had been cleared out.

7. JAPANESE "WINDOW" FOUND AT BIAK ISLAND

Three bundles of Japanese 'Window' radar decoy material were found at Biak Island, near a crashed BETTY. Two of the bundles were torn and damaged but the third was still complete.

The complete bundle contained 94 strips with the following characteristics:-

Mean length of strips	77 cm
Shortest length of strips	75 cm
Longest length of strips	78 cm
Width of strips	3 cm

Material - thin foil (probably aluminium backed by medium weight white paper).

The foil was glued to the paper along two lines ½ cm from the outside edges of the strips.

To form the bundle, the pack of strips was folded once and secured by two bindings of 'Window' material. The bindings were not suitable for automatic release; they would have to be removed by hand before the 'Window' could be thrown from the plane.

The damaged bundles were of similar construction but the mean length was about 67 cm.

Section 22 G.H.Q., S.W.P.A. comments:- "The width of these strips is sufficient to make them effective over the following frequency ranges:-

Length	Frequency Band
75 cm	170 - 205 mc
78 cm	165 - 200 mc
67 cm	190 - 225 mc

"It can be seen that the frequency band covered by alternative use of 77 cm and 67 cm 'Window', will overlap. The frequency estimates are conservative, and it is probable that Radars on frequencies 10 cm outside these limits will be affected noticeably."

8. THE GERMAN SUBMARINE BUBBLE TARGET

The charges used in this device consist of a wire mesh container holding about 0.8 lbs. of a substance, which, being principally compounded of calcium and zinc, gives off bubbles of hydrogen on coming into contact with water. This container is fitted into an iron or aluminium cup, and its top is connected by a spiral spring with the inside of the lid of the cup, in which is a hydrostatic valve.

While the hydrogen is being generated, the valve is kept open and the charge remains buoyant between depths of about 80 and 100 ft.; the valve closes when the pressure inside exceeds that outside and closes completely at an excess pressure of about 45 lbs. to the square inch. This corresponds to a depth in sea water of 100 ft.

The effective life of a charge is about 15 minutes. Probably six would be fired at one time.

The bubble created by it gives an extent of target of 10° to 15° and an echo sufficiently sharp and strong at 900 yards to be mistaken for the true "submarine" echo.

There are, of course, varieties of the device and one prisoner-of-war mentioned a miniature noise-making torpedo about 18 inches long and 6 or 7 inches in diameter. This runs in circles until the battery is exhausted, when it sinks; it is much more effective in rough weather than calm.

A trial of S.B.T. charges was carried out in good asdic conditions off Malta, H.M.S. "WHEATLAND" and H.M. Submarine "UNISON" taking part. "WHEATLAND" was stopped with the bubble bearing Green 100°, 900 yards and the submarine moving at slow speed at periscope depth between Green 80° and Green 50° at ranges varying between 800 and 1,100 yards. The H.S.D., an experienced operator with two U-boats to his credit, knew the nature of the exercise but was not, of course, told when the bubble was fired.

The narrative of events was as follows:-

Time in Minutes

0	Bubble discharged
2	Submarine dived
4	Operator still believed bubble to be submarine. Very good echo, extent of target 15°.
5	Bubble (extent of target 12° - 15°), had faded slightly but was still stronger than submarine (a target 17° in extent), and gave all characteristics of submarine stopped.
7	Both echoes approximately same strength. Bubble (extent of target 11°), still strong and sharp enough to be thought submarine.
9	Submarine now a target 5° in extent only; both echoes sharp, submarine slightly the stronger but harder to pick up. Consider an average operator would still prefer bubble.
10	Bubble fading and decreasing in extent.
11 -12	Bubble very faint but still sharp, not like a wake. Submarine echo also faint at this time (bubble range 900 yards, submarine range 1,100 yards).
13	No echoes from bubble.
14	"Lost contact".

The first use of this device was reported in July, 1942 but, although there has been quite a close liaison between German and Japanese submarines since then, no reports have yet been received of the use of S.B.T. in the Pacific or Indian Oceans. However A/S vessels in these areas should always be ready to deal with this device as the Japanese can be expected to use it at any time.

9. JAPANESE LONG-RANGE ESCORT VESSELS

The following is a condensation of a report issued by Intelligence Division. C.N.O. Washington:-

Japan has embarked upon a large scale expansion of its long-range escort vessels. Faced with a severe submarine threat which has already made deep inroads into the merchant marine the Japanese are attempting to improve the protection of their convoys.

The Japanese Navy has come to rely basically on two types of vessels for long-range off shore convoy escort work - old destroyers and a new frigate-type group called "KAIBOKAN" (literally "Sea Defence Vessels").

OLD DESTROYERS

Three classes of destroyers - "KURI" (1920-22, 770 tons) "WAKATAKE" (1922-23, 820 tons) and "MINEKAZE" (1920-22, 1215 tons) have apparently been converted from fleet work to escort duty by the removal of much of their L.A. armament and torpedo tubes in favour of 25 mm.machine guns, depth charges and minelaying equipment.

The conversion of the older Fleet destroyers into escort vessels cannot progress much beyond the "MINEKAZE" Class, because the subtraction of this class leaves Japan with under 60 Fleet destroyers and a destroyer production of only 15 in both 1942 and 1943 and a maximum of 20 in 1944.

"KAIBOKAN"

Production in this class has risen from 1 in 1940, 2 in 1941 and 3 in 1942 to 12 in 1943 and a projected figure of about 75 in 1944.

Information is available on two classes of this type of vessel - the earlier "SHIMUSHU" class and the newer and larger "MIKURA" class.

The "SHIMUSHU" Class have a displacement of about 1200 tons, a length of between 250 and 260 feet, a beam of 30 feet and a draft of 11 feet. Their speed is estimated at 20 knots. The armament is 3-4.7" dual purpose single guns in shield mounts with twin 25 mm A.A. guns on either side of the bridge. They have depth charge packs on the stern and are presumably equipped with Radar and Asdic equipment.

The "MIKURA" Class is 275 feet overall with a beam of 34 feet and a displacement of about 1500 tons. The armament consists of 4-4.7" dual purpose guns in twin mounts, 6 A.A. machine guns forward of the bridge and a twin 40 mm. A.A. gun abaft the tripod mainmast. Mine and depth charge equipment are carried and it is assumed that the ships are fitted with Asdic, Radar and Anti-Radar equipment.

10. EXCHANGE OF MATERIAL AND INFORMATION BETWEEN GERMANY AND JAPAN

Since the failure of two seasons of surface blockade-

running between Europe and the Far East, there has been a mutually advantageous exchange between Germany and Japan of naval material, especially U-boats, technical information and raw materials.

The following reports relating to this exchange have been received:-

During 1943 a 740-ton U-boat was transferred to Japan at Nagasaki as a gift from Hitler (Graded B.2), and U-boats began to operate from Penang (Graded B.1).

During April and May, 1943, up to seven ex-Italian submarines were reported as being converted into cargo-carriers at Bordeaux to transport machine parts, aluminium and mercury to Japan (B.2).

At the time the 740-ton U-boat was transferred to Japan, the Japanese were reported to have been handing over to Germany Italian submarines interned by them for use as cargo-carriers (C.2).

During the latter half of 1943 the arrival was reported of Japanese submarines in French bases with cargoes of rubber, and carrying extra men for training in Germany to man German U-boats destined for Japan (B.3). The latest Japanese arrival was reported in Lorient on 11th March, 1944 (B.2).

Between October, 1943, and March, 1944, Japanese naval men were reported under training in German technical courses, especially in the use of U-boat detection and anti-detection devices and standing by the construction of German U-boats in Hamburg and Bremen (B.3). By the end of 1943 several hundred Japanese naval men were reported in North German ports (B.2).

U-boats manned by Japanese have been reported in the Elbe in February, 1944; at Sassnitz, apparently working up, in mid-March; and near Kiel, doing trials in April. (B.3).

A Japanese naval technical mission arrived in Germany at the end of 1943 and remained till early 1944 to gain information on new types of U-boats, and to study German U-boat tactics. The commission visited several U-boat training centres, including Danzig (B.2). The German press in February published a photograph of the Japanese Admiral Abe inspecting German naval installations.

Three Japanese submarines (two southbound and one northbound) were fixed in the Atlantic during June, presumably engaged in blockade running.

Conclusion - Germany and Japan require a mutual exchange of raw material, and it suits Germany to extend and intensify operations against Allied shipping in the Far East and Indian Ocean. For this reason Germany has transferred material and valuable technical information to Japan for use in the eastern theatre. It is highly likely that the Allies will encounter Japanese submarine equipped with many of Germany's most recent U-boat devices and weapons, such as Acoustic Torpedoes, Mines and Radar equipment.

11. GERMAN NAVAL C IN C'S STAFF

Since Admiral Lutzens went down in "BISMARK" on May 27, 1941, and was succeeded as Commander-in-Chief of the Fleet by Admiral Otto Schniewind, the German Naval Staff has been kept "on the move".

When "BISMARK" was sunk 70 members including 11 Senior Officers of the Commander-in-Chief's Staff were lost. It was necessary to form a new staff and the members mustered in Paris and proceeded to Brest to embark in "SCHARNHORST". "SCHARNHORST" sailed from Brest for the Atlantic where she was to raid shipping, but was ordered into La Pallice where she was hit by bombs during an attack on the port. She shipped 8,000 tons of water and was ordered to proceed to Brest for repairs.

The Admiral transferred his flag to "GNEISENAU", but returned to "SCHARNHORST" before the two ships in company with "PRINZ EUGEN" made their channel dash in February, 1942. It was stated that both "SCHARNHORST" and "GNEISENAU" were mined twice during this operation. "SCHARNHORST" docked at Wilhelmshaven and "GNEISENAU" at Kiel. Admiral Schniewind with his staff landed at Wilhelmshaven and proceeded by car to Kiel, embarking again in "GNEISENAU".

But his stay here was cut short for "GNEISENAU" was hit during an air raid on Kiel, and badly burnt out forward. She proceeded to Gdynia for repairs and the C.-in-C. Staff proceeded to "PRINZ EUGEN". The cruiser in company with "ADMIRAL SCHEER" and an escort of four destroyers sailed shortly afterwards for Norway, but in bad weather on passage she lost contact with the other ships and was torpedoed about five miles from Trondhein by a British submarine. Thirty feet of the stern of the ship was blown off. ("PRINZ EUGEN" was torpedoed by H.M. Submarine "TRIDENT" on February 23. 1942).

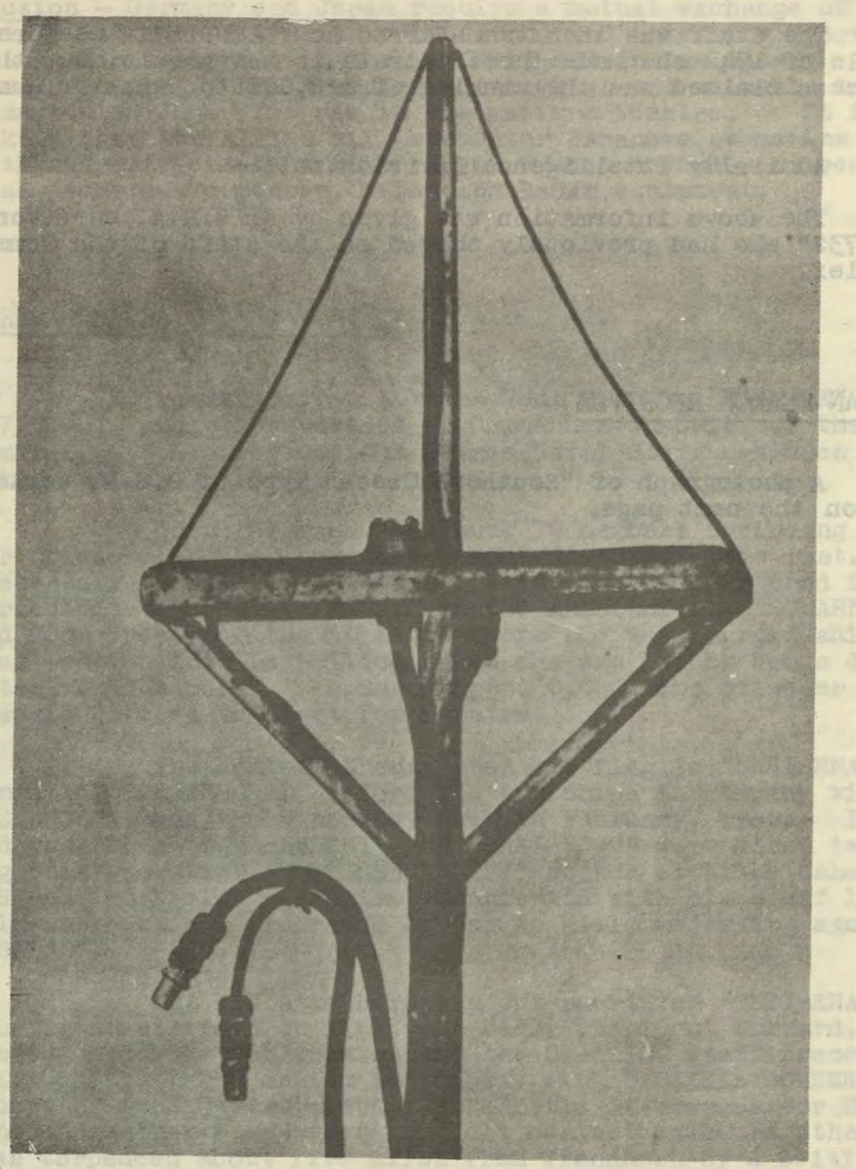
The staff was then transferred to "TIRPITZ". Before the middle of 1942 she made three patrols in the Arctic, but the only success claimed was the sinking of a 2,000 ton Russian Guard ship.

Admiralty Intelligence Division note:-

The above information was given by an E.R.A. survivor from "U-732" who had previously served on the staff of the Commander-in-Chief.

12. GERMAN SEARCH RECEIVER

A photograph of "Southern Cross" Type of G.S.R. aerial appears on the next page.



"Southern Cross" Type of G.S.R. Aerial

SECTION VI

MISCELLANEOUS

1. GERMAN AND JAPANESE SUBMARINE LOSSES

Preliminary reports indicate that during the month of May, 26 submarines (19 German and seven Japanese) were sunk or probably sunk. The monthly total was the highest since October, 1943 and the ratio of submarines sunk or probably sunk to merchant vessels lost by submarine action was the best of any month of the war. During the month 8.7 submarines were sunk or probably sunk for each merchant vessel lost by submarine action.

For the year 1942, one submarine was sunk or probably sunk for every 9.2 merchant vessels lost by submarine action. For the year 1943, the ratio was one submarine for every 1.8 merchant vessels, whereas for the first five months of 1944, 1.6 times more submarines were sunk or probably sunk than merchant vessels lost by submarine action.

The interval in days for the sinking or probable sink-ing of each submarine is as follows:

1939	one every 13. 3 days
1940	one every 7. 5 days
1941	one every 6. 3 days
1942	one every 2. 9 days
1943	one every 1. 5 days
1944 (to May 31) . . .	one every 1.6 days

Of the 26 submarines sunk or probably sunk during the month, surface vessels were responsible for nine, aircraft for eight, co-ordinated action of aircraft and surface craft eight, and a submarine for one.

Of all Axis submarines sunk or probably sunk since September 3, 1939, surface vessels were responsible for 41.2%, aircraft 36.4%, submarine 9.9%, co-ordinated aircraft and surface craft

action 7.5% and mines, marine casualties or circumstances unknown 5%.

During the month of June preliminary reports show that 24 submarines were sunk or probably sunk, 14 by shore based aircraft, eight by warships and two by carrier based aircraft.

2. GERMAN WAR CASUALTIES

German survivors from "U-340", which was sunk on November 2, 1943 (as described in A.C.B. 0233/44 (6)), said that the official figure of 543,000 German was dead is completely disbelieved in Germany, and that the lowest figure generally expected is 2,000,000.

3. TWO NEW ANTI-SUBMARINE WEAPONS USED BY AIRCRAFT

RADAR SONIC BUOYS

The E.R.S.B. (Expendible Radio Sono Buoy) is a method of providing aircraft with a means of listening to underwater sounds. The two principal parts of the quipment consist of

(i) the E.R.S.B. and
(ii) a receiver in the aircraft.

The E.R.S.B., which is launched by the aircraft, weighs 14 lbs. and is about 45 inches long by 6 inches in diameter. It consists essentially of -

(a) a hydrophone which is released from the base of the buoy when this strikes the water and is suspended some 24 ft. below the surface; and

(b) a transmitting set contained within the buoy and a short antenna by means of which sounds picked up by the hydrophone are transmitted by radio to the listening aircraft.

The buoy has an operational life of 4 to 8 hours, after which it will sink. Those in use at present have a non-directional hydrophone, but a directional model is being developed.

In order that the aircraft may know which buoy is

transmitting sounds they are made in six frequencies, each buoy being painted a distinctive colour corresponding to its frequency.

Range of detection of submerged U-boat sounds depends upon the speed of the U-boat and upon sea conditions and are approximately as follows:-

U-boat speed 2 knots. Range of detection 300-1,000 yards.

U-boat speed 4 knots. Range of detection 1,000-6,500 yards.

U-boat speed 6 knots. Range of detection 3,000-10,000 yards.

The range of the radio transmitter is 35 miles when aircraft is flying at 5,000 feet altitude and 30 miles at 3,000 feet.

RETRO-BOMBS

To increase the effectiveness of the Magnetic Airborne Detector it has been necessary to develop a weapon which can be released at the moment a strong signal is received, and in order to ensure that the weapon will hit the water above the target a rocket-propelled bomb is projected backwards with a speed equal to the forward speed of the aircraft so that the backward motion of the missile will neutralize the forward speed of the aircraft. There are two variations of this -

(i) by giving the bomb excess backward velocity, or
(ii) by giving it a downward component of velocity so as to reduce the time of fall.

This weapon is known as the Retro-Bomb which is similar to the Hedgehog projectiles in size and weight, but has a rocket motor attached. The bombs have contact fuses.

4. NIGHT FLYING IN THE FLEET AIR ARM

H.M.S. "VINDEX", after a successful patrol in the North Atlantic during which her planes completed 237 hours of night flying, reported "any ship, whatever her motion, has brief periods in which the deck remains quite steady. Provided the pilots and

D.L.C.O. have sufficient patience to wait until the approach of an aircraft coincides with one of these periods, there seems to be no reason why perfect landings should not be made in any but the most exceptional condition.

"In visibility under a quarter of a mile and cloud base under 200 feet, it is considered that night landings are extremely hazardous if the rise and fall of the round-down is more than 20 feet over-all".

It is interesting to learn that there are apparently some conditions in which night landings are not considered extremely hazardous.

5. UNUSUAL RADAR ECHOES

The following extract from a ship's report illustrates one of the problems introduced by the extension of normal look-out facilities provided by Radar:-

"On another occasion Action Stations were closed up on a contact (by A286P) made at 3 miles.

"The sky was heavily clouded at the time and it was thought that an aircraft might be lurking behind the clouds preparatory to a surprise attack.

"Several minutes later three birds appeared flying in close formation.

"Subsequently birds have been detected on several occasions."

6. MOBILE A/S TRAINING UNIT NO. 40

M.A/S.T.U. 40, recently completed, is the prototype of a new design M.A/S.T.U. specially equipped for service overseas.

It consists of four vehicles, two four-wheel drive Crossley tractors, each towing an eight-wheel caravan type trailer. (Figure 1.)

MOBILE A/S TRAINING UNIT NO. 40

Figure 1

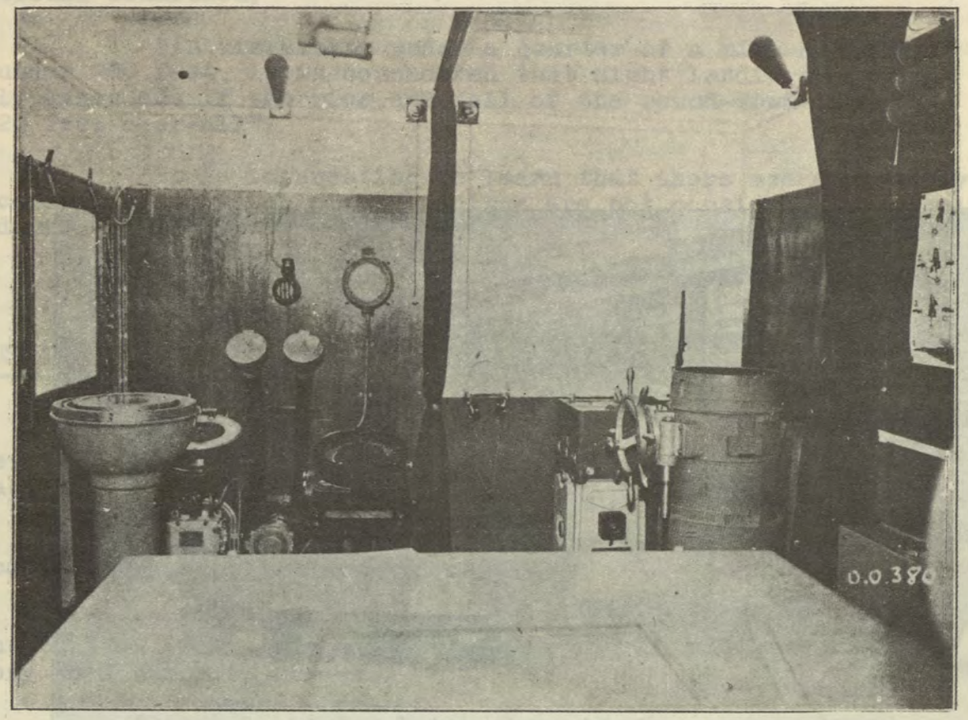


Figure 2.

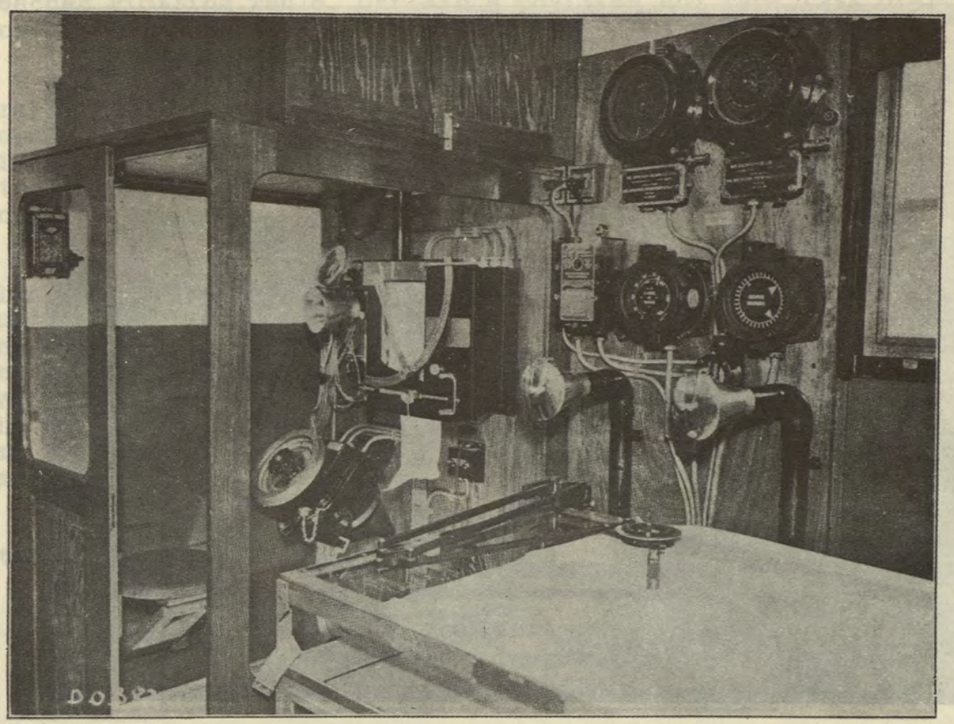


Figure 3.

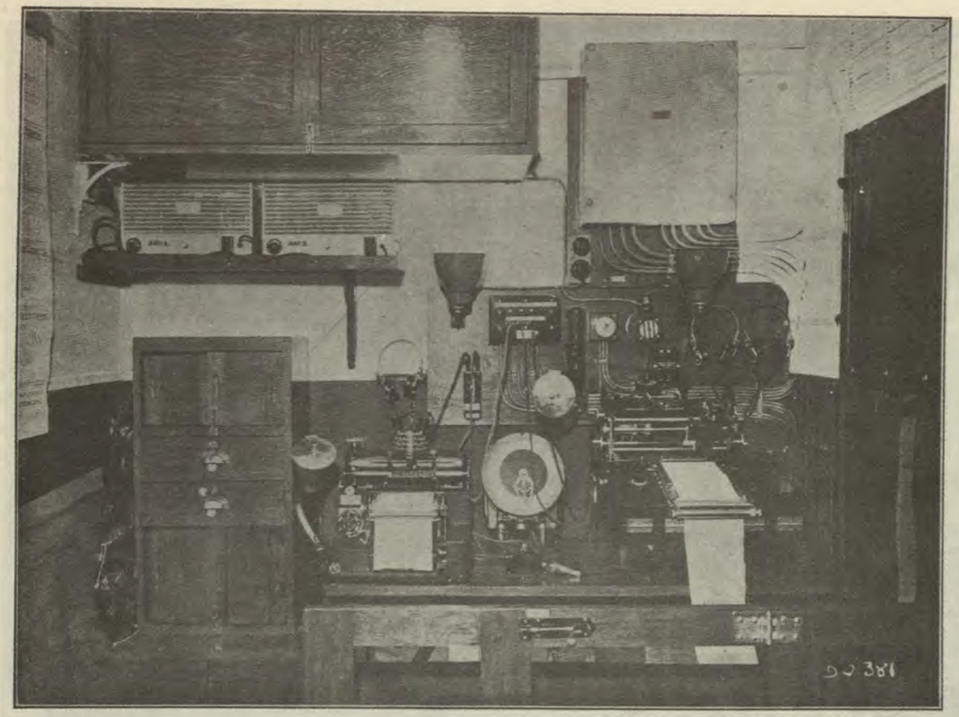


Figure 4.

Tractor "A" houses a 15 kw. diesel electric power plant and tows trailer "C" which contains a cabin for the Officer-in-Charge and a working compartment in which is sited the Attack Teacher Plotting Table, Captain's position and Type 123A operating positions. (Figure 2).

Tractor "B" is fitted with galley and w.c., and tows trailer "D" containing a mess deck for the crew of three, and a working compartment fitted with Type 144/5, 127/8 and A.R.L. plot with latest type instrumental bearing and range repeaters. Instruc-tions in 134 series boat sets can also be given. The necessary instruments are in the mess deck. (Figures 3 & 4).

Both trailers are fitted with air conditioning plants and forced ventilation; windows have mosquito screens. The unit is completely self-contained and should be able to operate in any temperature. Its total weight is 28 tons; when parked for instruction, which requires a space 50 ft. by 30 ft., the two trail-ers are connected by a covered gangway. Intercommunication betweer the working compartments is by microphone and loud speaker; a 16 mm. projector, A/S instructional films, gramophone and records, are carried.

The maximum road speed is about 30 m.p.h. and the steepest gradients can be tackled.

7. WHEEL ORDERS IN A.M.S. VESSELS DURING AIR ATTACK

The Commanding Officer H.M.A.S. "KALGOORLIE" reports details of a device constructed in his ship to obviate difficulties in handling an A.M.S. when subject to air attack:-

"It appears that the handling of an A.M.S. vessel whilst under air attack would be considerably difficult owing to (a) an enclosed bridge completely restricting the Captain's over-head view when standing near the wheel (b) the positions of two oerlikons on the bridge which, when firing, completely preclude the use of speech as a medium of passing wheel orders.

"In order to combat these disadvantages and to give the Captain more complete control of his ship the following arrange-ments have been made in "KALGOORLIE":-

"A three way switch situated in the Search Light platform is connected to three lamps coloured red, white and green

positioned in front of the wheel. These lamps convey the orders "Starboard thirty", "Midships" or "Port thirty". To inform the Captain that his order has been received this arrangement has been duplicated in reverse."

This apparatus was constructed in "KALGOORLIE" by Leading Seaman J.P. Lynam who has also submitted drawings of an arrange-ment of the portable type which could not be constructed on board because of lack of materials.

In this case one three way switch and one group of three lamps are contained in a portable panel which is connected by a wandering eight-core cable to a socket at some convenient position on the bridge or searchlight platform. The Captain can carry this panel to the best vantage point and the quartermaster repeats all orders on his own three way switch.

SECTION VII

MATERIEL

1. RADAR MAINTENANCE

Radar sets depend very largely for their efficiency and reliability on correct maintenance, conscientiously carried out.

Although a Radio Mechanic is borne in every vessel fitted with Radar, it is possible only in the larger ships to provide a technically qualified Officer to supervise the work of maintenance.

It is possible for an Officer not technically qualified in Radar to supervise the work of maintenance to a large extent if attention is paid to the following points:-

MAINTENANCE ROUTINES AND LOGGING

The Handbooks to the various sets contain Maintenance Routines, which should be carefully carried out by the Mechanic as stated.

A complete record of maintenance tests with results should be kept by the mechanic in the maintenance log for each set. These logs should be inspected weekly by the Officer in charge of Radar, and monthly by the Commanding Officer.

The fact that the results of the tests are entered in the log ensures that the maintenance routines are carried out.

To assist small ships, a series of maintenance test schedules on which these records can be kept, are being prepared for all ships fitted with A286 and A272. These sheets can be incorporated in the maintenance logs.

All work done on the set by the mechanic and Radar Base Staff other than that included in Maintenance Routines should also be recorded in detail in the maintenance log. Not only does this provide evidence of the work done by the ship's mechanics but a valuable record of experience with and efficiency of the particular set.

STORES

The mechanic should be required to keep an accurate record of all stores and spares carried, and should enter in the Maintenance Log when a particular component is replaced in the set. The replacement of valves is particularly important and a record should be kept of the life in hours of each valve.

He should be required to furnish the O.I.C. Radar with a statement of the stores position before arrival at each port, in order that the stocks may be kept up to Establishment.

SPECIAL POINTS TO BE NOTED.

Vibration, dampness, and overheating are the three main causes of breakdown in Radar sets. Periodical inspections of the complete Radar installation should be made to ensure that no parts are working loose due to vibration.

These should include a careful examination of the joints in the lengths of hollow "wave guides" as looseness in these joints can give rise to serious losses which will result in a marked falling off in performance of the set.

A complete inspection of all installations should be made if possible after gunfire.

The connectors on the cables joining various units of a Radar set are also liable to work loose, and are either secured by a locking nut or a spring clip. These should be regularly inspected and kept tightened up.

The motor alternators for providing power for the set should be kept in efficient running condition by the Radio Mechanic. Some cases of interference to the W/T and A/S receivers have been traced to sparking in the Radar motor alternators due to neglect of regular maintenance of these machines while in other cases, this machine and others in ships have caused interference to the Radar receiver and indicator for the same reason.

Dampness is a frequent cause of trouble in sets operating in northern areas, where a high degree of humidity is usual and sets are not operating for a long period.

A simple method of reducing ill-effects from dampness is to switch sets on for two hours in the forenoon and two hours in the evening when in harbour. All the valve filaments can be switched on, but not the High Tension current to the transmitter.

The extra wear to the valves is negligible, and slight as it is, it is preferable to breakdown of transformers through dampness.

2. C.A.F.O's ON A/S SUBJECTS

C.A.F.O. 1944	Reference	Brief Description
34	Type 119 Series, 124V, 127, 128 and 133 Series 141, 144 and 145 Series	Lining up of range recorders - Introduction of data, plates, Pattern A.2425.
35	Type 132 and 132/V.	Fitting of spare recorders
36	Asdic recorders	Introduction of brush, carbon Pattern 3254 B
37	Range recorders A/S 393X	Lock for cursor handwheel, Pattern A.2377
71	Hedgehog	Installation of Type "B" roll unit
80	Types 127D/DV 128D/DV, 144 Series and 145 Series	Special office lighting
82	Depth Charges Mark VII and VII * - T.N.T. Amatol and Minol	Minimum speeds for firing depth charge patterns.
129	Hedgehog mountings	Securing of ready-use lockers and protection plates
133	Indicator strips	Instructions for fitting to D/C setting order instruments
137	Type 144 and 145 Series with "Q" attachment	Oscillator connections to H.T. plug.
191	Depth Charge Drill	Motor Launches

C.A.F.O. 1944	Reference	Brief Description
194	Hedgehog	Firing or projectiles which have remained on the mounting for extended period.
203	Type 134/A	Introduction of chain block, Pattern A.2075, chain lifting, Pattern A.2184, and cap lifting, Pattern A.2500
204	Type 144 and 145 Series	Failure of automatic training if gyro fails-Remedy.
205	Type 145XB and later sets of this Series	Automatic training. Occasional failure of 5 degree step-back.
206	Asdic Bridge huts	Improvement of atmospheric conditions in hot climates
207	Asdic installations incorporating A.V.C. receiver equipment.	Introduction of loudspeaker, Pattern A.2475
208	Asdic loudspeakers	Corrosion of switch spindle in Pattern A.1825 base and dual horn and A.2475 loudspeaker.
209	Recorders A/S 14 and A/S 58	Vertical time scale and relative speed scale.
210	H.F. motor alternators	Introduction of brush spring, Pattern A.2427, for machines manufactured by small electric motors
265	Asdic installation with housing domes	Examination of directing gear in docking.
376	Type 127D/DV, 128D/DV, 144 and 145	Special office lighting - Introduction

C.A.F.O. 1944	Reference	Brief Description
377	Type 127D/DV, 145 interim sets and Type 128D/DV and 144 interim sets	Conversion to Type 145 and 144 respectively
378	Type 132 V	Fitting of domes, Pattern 7024B, with reflecting plate for E/S purposes.
379	Asdic installations	Fairing of plating, etc.
382	Bearing recorders, Patterns A.2097 and A.2247	Breakage of stylus band, Pattern A.2182
383	Bearing recorders, Patterns A.2097 and A.2247	Operation of cursor
442	Type 134 A	Increase in allowance of struts, Pattern A.2015
444	"Q" Attachment	Board synchronising, Pattern A. 181 - Check of wiring
504	Depth-Charges	Depth-Charge Shock Damage Trials
512	Type 132/V	Introduction of Additional Bridge Instruments
514	A/S Directing Gears, Patterns A.810, 880	Introduction of Roller Guide Assemblies for.
515	Ship, Asdic Procedure Teacher	Use when A.V.C. Receiver is Fitted.
567	Rubber Cover Oscillators	Care in Handling
593	Asdic Oscillators	Return for survey and repair
607	Type 124/V	Improved Method of Mounting H.T. Connector

C.A.F.O. 1944	Reference	Brief Description
609	Type 144 with Q attachment	Guide for H.T. Connectors
610	Asdic Bearing Repeater, Pattern A.2281	Faulty Operation
611	Bearing Recorders, Patterns A.2097 and A.2247	Introduction of Spare Springs, Pattern A.2411
612	Echo-sounding Equipment	I. Sonic Sets. II. All Sets
613	Types 758N, P, Q and S.761, and P.762, 763, 763A, and Type 135/B	Introduction of Valve Retaining Device.
622	Night A/S Marker, Pattern 16213	Introduction. Description, Supply and Method of Use in Night attack on Submerged U-boats - Reports.
623	Fairmile "B" Type M.Ls.	Provision of A/S Cranes
668	Types 123, 127 and 145 Series	Importance of Fitting Locking Pins to Dome Screw Locking Plates and Precautions Concerning Housing or Removal of Oscillator
669	Asdic Equipment	Clutch Magnets - Shortage
722	Depth-Charge	Outfits and Equipment
736	Types 123, 127 and 145 Series	Amendment to C.A.F.O. 668/44
737	Type 134/A	Oscillators Patterns A.2166 and A.2167 - H.T. Connector joint.
738	Type 147B	Alteration to Power Supply to Captain's Depth Indicator, Pattern A. 2304, and Method of Lining up.
739	Asdic Apparatus in Motor Craft.	Radio Interference of

Attention is also drawn to the following C.A.F.O's.

19, 20, 21, 52, 351, 380, 381, 452, 505, 509, 513, 564, 565, 594, 615, 620, 740.

C.A.F.O. 1944		
609	Type 144 with Q attachment	Guide for H.T. Connectors
610	Asdic Bearing Repeater, Pattern A.2281	Faulty Operation
611	Bearing Recorders, Patterns A.2097 and A.2247	Introduction of Spare Springs, Pattern A.2411
612	Echo-sounding Equipment	I. Sonic Sets. II. All Sets
613	Types 758N, P, Q and S.761, and P.762, 763, 763A. and Type 135/B	Introduction of Valve Retaining Device.
622	Night A/S Marker, Pattern 16213	Introduction. Description, Supply and Method of Use in Night attack on Submerged U-boats - Reports.
623	Fairmile "B" Type M.Ls.	Provision of A/S Cranes
666	Types 123, 127 and 145 Series	Importance of Fitting Locking Pins to Dome Screw Locking Plates and Precautions Concerning Housing or Removal of Oscillator
669	Asdic Equipment	Clutch Magnets - Shortage
722	Depth-Charge	Outfits and Equipment
736	Types 123, 127 and 145 Series	Amendment to C.A.F.O. 668/44
737	Type 134/A	Oscillators Patterns A.2166 and A.2167 - H.F. Connector joint.
738	Type 147B	Alteration to Power Supply to Captain's Depth Indicator, Pattern A. 2304, and Method of Lining up.
739	Asdic Apparatus in Motor Craft.	Radio Interference of