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OPNAV 30-3M-A No. 5-45

15 July 1945

Mine Warfare

NOTES



NAVY DEPARTMENT
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON

MINE WARFARE NOTES

OpNav 30-3M-A, No. 5-45

LETTER OF PROMULGATION

1. For the purpose of keeping naval personnel charged with responsibility of mine warfare continuously informed of new developments and other pertinent information relating to their field, MINE WARFARE NOTES will be issued periodically.

2. The material in these NOTES is intended solely as information, and is not to be construed as a directive.

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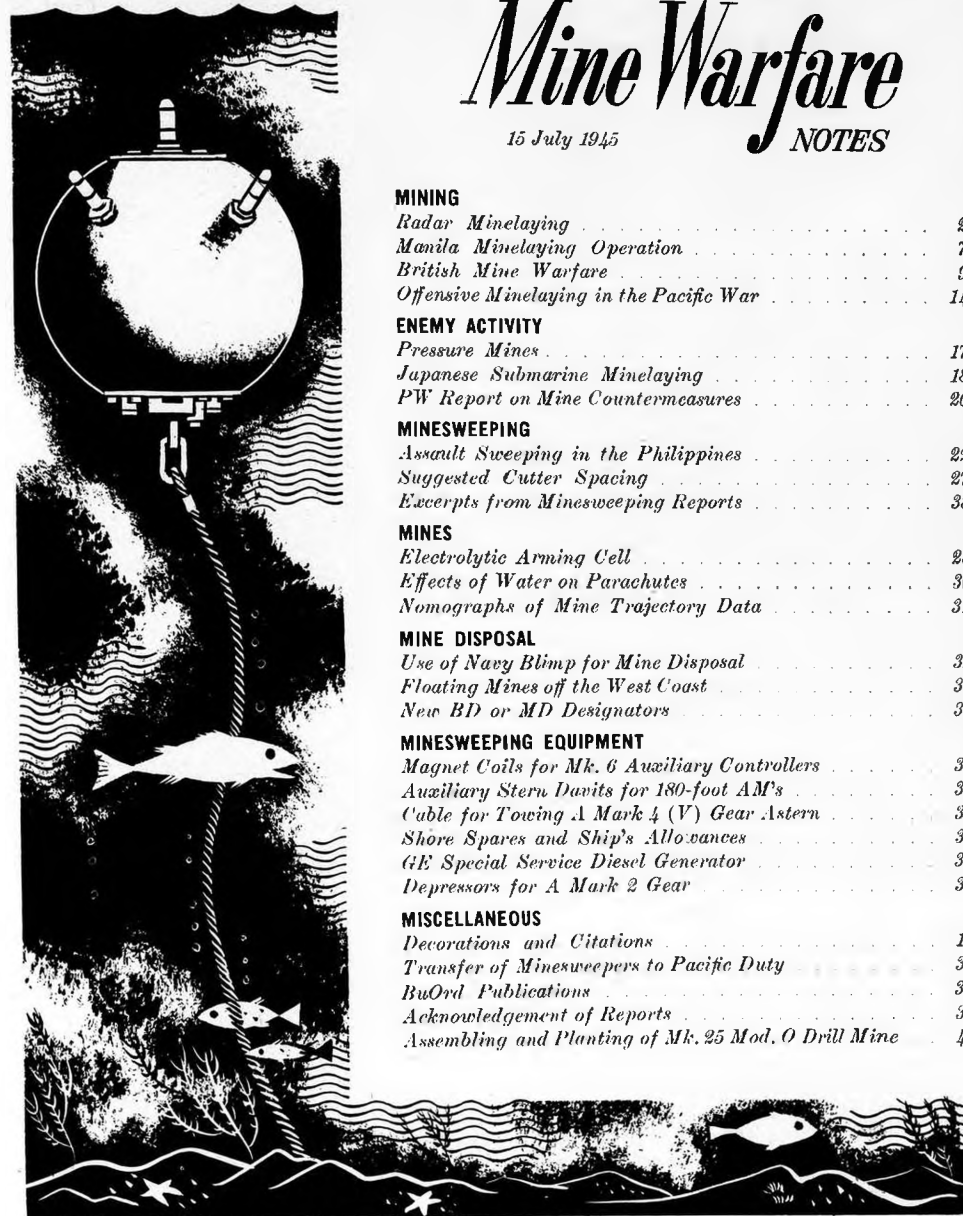
4. MINE WARFARE NOTES are to be handled in accordance with Art. 76, U. S. Navy Regulations and will be destroyed by burning when they have served their purpose. Neither quarterly reports, nor reports of burning are required.

(s) J. P. COMPTON,
By direction.

COVER PICTURE The photograph appearing on the cover of *Mine Warfare Notes* this month shows a B-29 dropping a mine in Japanese home waters. Suitable photographs of other phases of Mine Warfare are needed for use as cover pictures for future issues of *Mine Warfare Notes*. All hands are invited to submit such photographs to the Mine Warfare Section, Base Maintenance Division of CNO. Pictures must be 8" x 10" glossy prints (or smaller prints clear enough to be blown up) and whenever possible, negatives should accompany prints.



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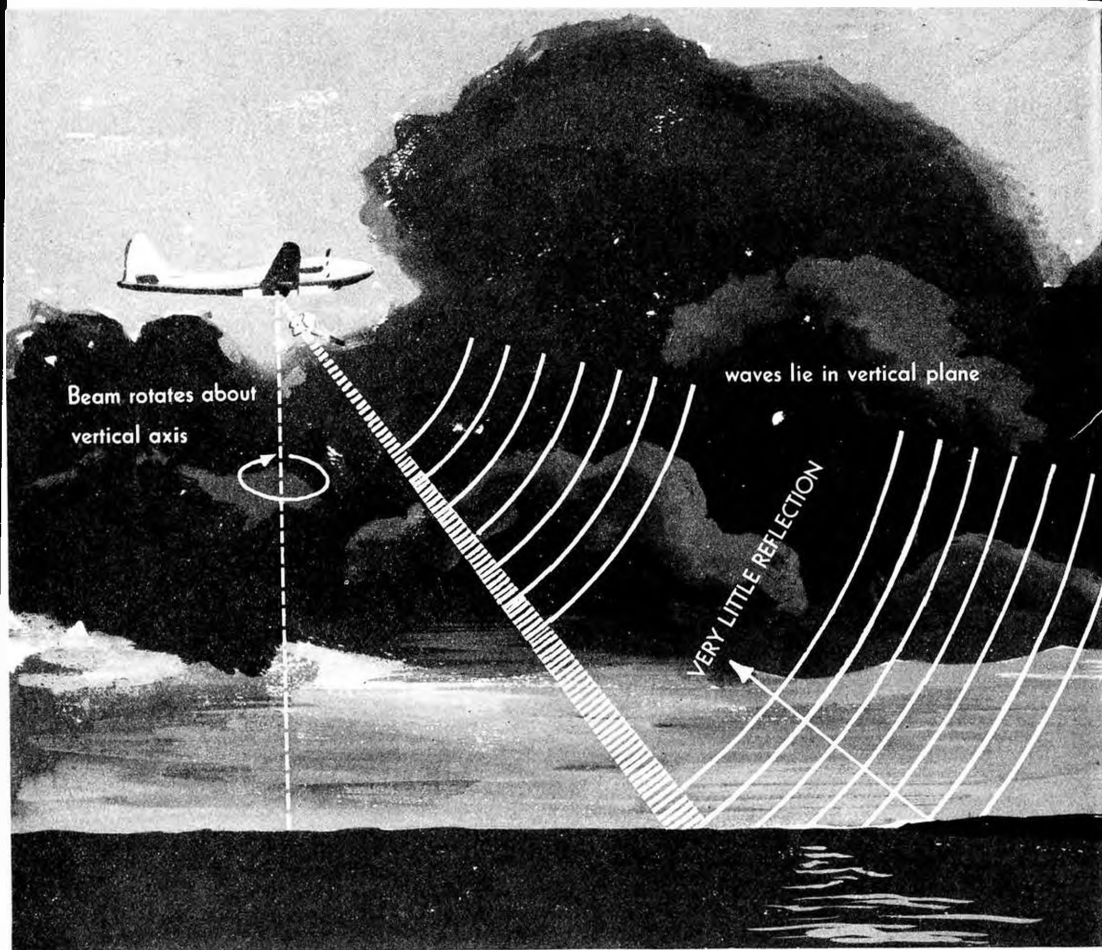
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RADAR has been characterized as the most important new development to appear in this war. This characterization can hardly be disputed when one considers the very great changes which radar has made possible in search and detection, bombing, gunnery, and navigation. It is not surprising, then, that radar should play an important role in mine warfare. The 21st Bomber Command has been using it exclusively to lay very large and important minefields in the Japanese home ports and Inland Sea.

The fundamental problem of aircraft minelaying is essentially one of navigation, i. e., of getting the plane into the correct position, and flying

the right course at the right speed and altitude, so that when the mines are released they will fall to the desired location. Experience has shown that radar permits this to be done even when the ground is totally obscured by darkness or clouds.

The best types of radar for this kind of work are those using PPI (Plan Position Indicator) scopes to give the locations of objects on all bearings from the aircraft. In these types of radar very brief pulses of short radio waves are projected downward and outward from the aircraft in a very narrow beam, so that the wave pulses lie very nearly in a plane. These pulses proceed through the air until they strike some object,

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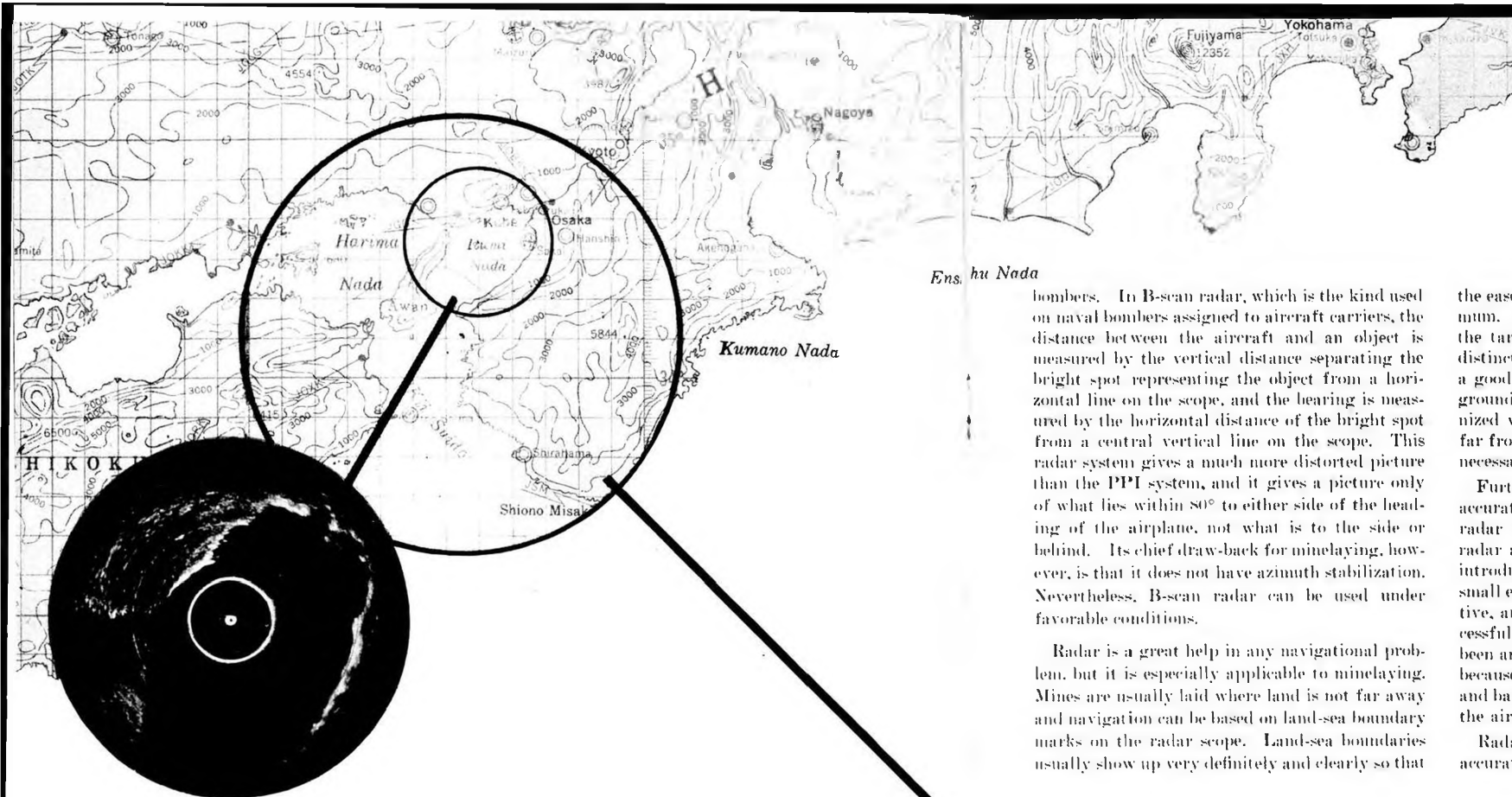
reflecting object; for example, a steep mountain slope which the aircraft is approaching will send back a much stronger signal than will a level surface at the same distance. The time taken for the pulse to travel from the aircraft to the reflecting object and back to the aircraft is a measure of the distance from the aircraft to the reflecting object.

The information given by the projected planar radio beam appears on the radar scope in a straight line reaching from the center of the scope to the edge, with distance from the center of the scope representing distance from the aircraft, and the brightness of the line at any point indicating the strength of the radio wave reflected by the object at that distance from the aircraft.

The plane of the projected beam is made to rotate about a vertical line through the aircraft, at a rate of one revolution every few seconds. The corresponding straight line on the radar scope is made to rotate around the center of the scope in synchronization with the projected beam. The bright spots formed on the scope fade slowly enough so that they remain visible until the line representing the beam rotates around to them again, but they fade enough so that they are not noticeable after the line has passed a second time; the slowly fading new bright spots formed by the latest passage of the line are all that can be seen. Thus, as the projected radio beam rotates and so strikes and is reflected from all points lying on successive bearings from the aircraft, a "picture" of the terrain below the aircraft is made on the scope. The direction and distance of a bright spot from the center of the scope correspond to the bearing and distance of the reflecting object from the aircraft, and the brightness of the spot corresponds to the strength of the reflected wave.

such as a sea surface, point of land, mountain, etc., which reflects them back toward the aircraft, where they are picked up by a suitable receiver. The intensity of the reflected waves varies according to the nature and aspect of the

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bombers. In B-scan radar, which is the kind used on naval bombers assigned to aircraft carriers, the distance between the aircraft and an object is measured by the vertical distance separating the bright spot representing the object from a horizontal line on the scope, and the bearing is measured by the horizontal distance of the bright spot from a central vertical line on the scope. This radar system gives a much more distorted picture than the PPI system, and it gives a picture only of what lies within 80° to either side of the heading of the airplane, not what is to the side or behind. Its chief draw-back for minelaying, however, is that it does not have azimuth stabilization. Nevertheless, B-scan radar can be used under favorable conditions.

Radar is a great help in any navigational problem, but it is especially applicable to minelaying. Mines are usually laid where land is not far away and navigation can be based on land-sea boundary marks on the radar scope. Land-sea boundaries usually show up very definitely and clearly so that

the ease and accuracy of navigation are at a maximum. In bombing it often happens that neither the target nor nearby landmarks give clear and distinct scope images, or else only the target gives a good image. In the latter case, because of the ground clutter, the bomb sight must be synchronized with the radar image while the aircraft is far from the target. Thus, a long run-out time is necessary and may result in large errors.

Furthermore, bombing must often be extremely accurate to be of value, so that the inaccuracies of radar navigation sometimes make bombing by radar alone unprofitable. In contrast, the errors introduced by dropping mines by radar are usually small enough so that the mines are still fully effective, and minelaying can be carried on quite successfully by means of radar alone. Mining has been an especially useful adjunct to aerial warfare because it can so often be carried on when weather and bad visibility preclude pin-point bombing and the aircraft otherwise might have to remain idle.

Radar also permits mines to be dropped fairly accurately from high altitudes. However, in lay-

It should be noted that there is a great deal of distortion in the scope picture because the radial distance from the center of the scope represents distance from the aircraft, i. e., slant range, and not the horizontal distance from a ground point directly beneath the aircraft. However, this distortion is troublesome only for the area almost directly below the aircraft, since slant range and horizontal range are nearly the same for areas far distant from the aircraft. There are also distortions, such as that due to the width of the projected beam, inherent in the instrument itself. Details of the area just below the aircraft are usually lost in a large central bright spot, called ground clutter, caused by the strong vertical reflections from the horizontal surface below the plane.

One of the greatest advantages of recent types of PPI radar is that it has azimuth stabilization, i. e., it can be set so that North will always appear at the top of the scope, no matter what the heading of the aircraft is. The heading of the aircraft is indicated on the scope by a bright radial line. Without azimuth stabilization, the line from the center to the top of the scope always represents the heading of the aircraft and turns of the airplane cause confusing changes in the orientation of the scope picture. Azimuth stabilization permits the airplane to maneuver without producing such large changes in the scope picture as to make it unintelligible.

Unfortunately, PPI radar equipment weighs so much that it is usually carried only in heavy

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Illustrated are both a map and radar scope pictures of a part of Japan. A comparison of the two shows how the scope picture can be interpreted and how it is distorted.

ing from high altitudes it is necessary to know the wind, since mines with parachutes fall slowly and so drift large distances. The Naval Air Station, Patuxent, Md., has found that the wind averaged over all altitudes below the plane is given approximately by multiplying the wind at the altitude of the plane by a known factor which depends on the altitude. This average wind can then be used in computing and allowing for the mine drift. The wind at the altitude of the plane is found by comparing the air speed and heading of the plane, and ground speed and track as determined by the actual passage of the aircraft past a landmark as indicated on the radar scope.

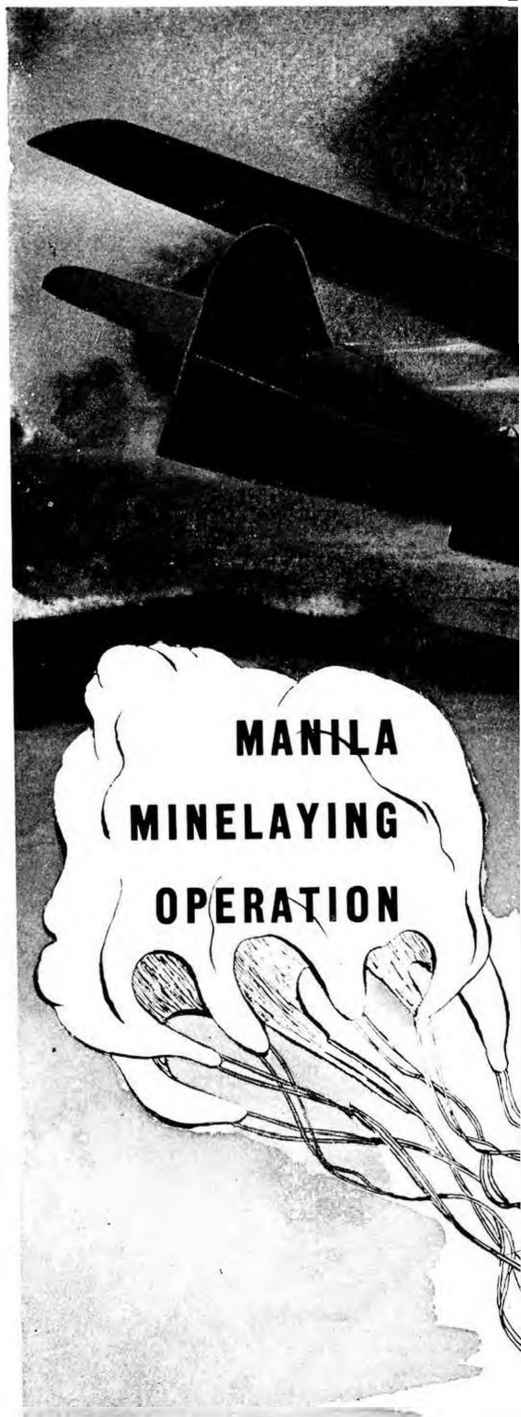
In spite of the many great advantages which radar can give, its use is not always possible nor even desirable. Where laying mines visually from low altitudes is practical and not too dangerous, it will usually give greater accuracy than laying by radar, especially in mining restricted, well-marked channels. Furthermore there are some locations where there are no contours which show up well on the scope or where there are so many channels, islands, and bays, that it is impossible to separate and identify the scope images in order to determine the position of the aircraft. In the first mission to mine Hong Kong using radar, the radar was relied on entirely, and the planes became lost among the many channels and islands in that area. Experience has shown that visual laying is necessary in such cases. However, radar may be very useful in flying to and from the general area of the lay.

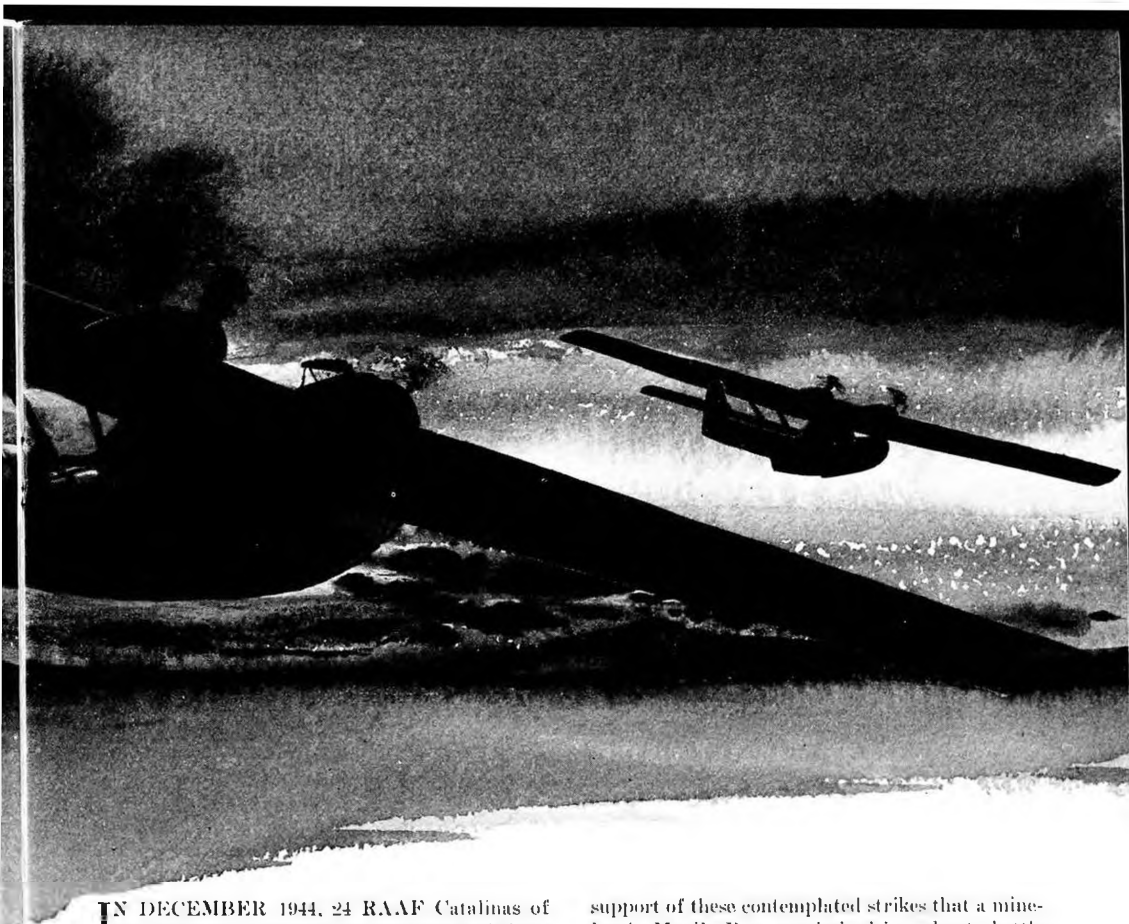
Mine Detail No. 14, working with the 14th USAAF, has done a great deal of pioneer work in actually laying mines by radar. The officer in charge of this detail summarized his opinions on the subject as follows:

"(a) Radar is always useful for navigation and the approach to the target . . .

"(b) Radar, if used blindly, can be dangerous. It is the writer's opinion that low-flying planes have been lost, for this reason, due to collision with mountains.

"(c) Like everything else, radar should be used as much as possible, even with good visibility. It is a valuable device whether it solves all problems or not. It must not be condemned for the limitations, nor used exclusively in spite of them. If accepted in this light, radar is one of the most useful and valuable devices applicable to minelaying problems."





IN DECEMBER 1944, 24 RAAF Catalinas of the Southwest Pacific area command carried out a minelaying mission in the Manila Bay area, laying 24 Mark 25 and 30 Mark 26 Mod. 1 mines under cover of darkness and under the nose of the enemy. This operation while routine in its final execution was remarkable for the complexities of planning and the obstacles that had to be overcome to get the planes, the personnel, and the mines in the right place at the right time.

In the latter part of 1944 neither the planes nor the minelaying equipment necessary for this mission were available in the Philippine sector. Leyte had just been retaken and its facilities were not yet sufficiently expanded to include a mine depot. The invasion forces were poised for other landings and their problems of supply and maintenance were enormous. Still, it was in direct

support of these contemplated strikes that a minelay in Manila Bay was desired in order to bottle up a portion of the enemy and hamper his efforts to bolster his dwindling empire. The mines were equipped with sterilizers so they would not become boomerangs for the Allied forces scheduled to attack a few weeks later.

The sturdy, slow-flying Catalinas, which have consistently carried out all mining operations in the Southwest Pacific area, were assigned to the task. As only 18 craft of this type were available at Darwin, an additional 6 were flown up from Rathmines, NSW, the entire group rendezvousing at Leyte for the mission. The aircraft from Rathmines probably set an all-time record by flying 9,000 miles to take part in a single sortie. As Leyte could not accommodate the whole squadron, 12 planes stopped over at Woendi Island for the night,

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proceeding to Leyte on the morning of the operation.

Not only did the planes have to fly several thousand miles to reach the scene of operations, but they had to carry their own mines, as the mine-ferrying Liberators usually employed for this could not be handled at Tacloban. Mines were loaded aboard the Catalinas at Darwin, 12 planes at a time. On 11 December the first group of 12 took off for Woendi. This group arrived in Leyte late on December 12 when the second group took off from Darwin. By the 14th of December all planes had arrived at Leyte.

As regards tactics, the task of mining a strongly defended harbor with the slow and vulnerable Catalinas had required extremely careful planning, as there were numerous problems involved, notably: (1) the best location for the field so as to close off the bay and at the same time keep the aircraft clear of such heavily gunned areas as Corregidor, Cavite, and Manila town; (2) the choice of a suitable track in and out of the bay; (3) secrecy of approach with a minimum of warning to the enemy; (4) the accomplishment of the mission in the shortest possible time over enemy territory.

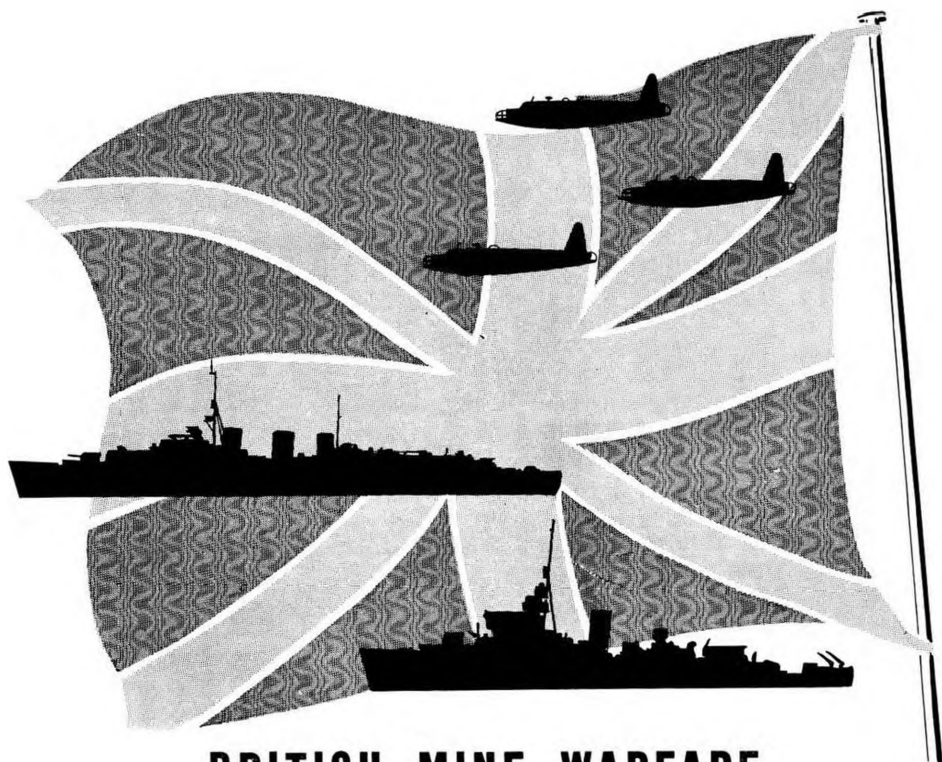
It was decided to plant the field in two separate rows simultaneously laid, the planes crossing the bay on non-intersecting courses. The first row, in the waters between Lukanin Point and San Nicolas light, would close off the north and south channels and be out of range of the heavy anti-aircraft fire from Corregidor. The second row, extending out 12 miles from Kalibuoy Point and the mouth of the Timalan River, would straddle the normal entrance to the Manila docks. The 24 planes would be divided into 2 groups: Group A, consisting of 15 planes would mine from the Bataan side of the bay; group B, consisting of 9 planes would mine from the opposite shore. All planes would fly at 90 knots, the 2 groups at different levels but all planes within each group at the same level. A USN "Ferret" Catalina equipped with a radar jamming machine would precede the formation to block the enemy stations along the way. An extra Catalina brought along from Darwin would drop liberal amounts of "window" and "rope".

All mining planes were loaded with either two Mark 25 or four Mark 26 Mod. 1 mines and 1,000 Imperial gallons of gasoline. As night landings on Leyte were discouraged the large fuel load was necessary to keep the squadron in sustained flight from sunset on the 14th to first light on 15th.

Final briefing took place during the morning hours of 14 December. No alternate target was assigned as in this case the primary target was considered to be a *must*. At 1630 the first heavily laden Catalina proceeded down the bay for the take-off. When all were airborne, the planes flew singly to the target. The effectiveness of the radar jamming tactics became apparent when every one of the 17 enemy stations along the route ceased transmitting. The group A planes flew at 400 feet, the Captains feeling that there was more danger from AA at 1,200 feet than there was from parachute failure and possible impact explosion of the Mark 25 mines at this low altitude. As it turned out no S L or organized AA fire was encountered over the objective. The Catalinas made their runs according to plan with only minor difficulties. The principal defect was the failure in two instances of the electric release gear causing two planes to drop four mines in pairs rather than singly. A small amount of inaccurate rifle and machine-gun fire was encountered on the east coast of Bataan Peninsula. Heavy AA was seen at Manila and Corregidor but it was not directed at the mining planes. At the commencement of the mining runs two B-24's staged a raid on the airfields in the vicinity.

One plane failed to take off due to unserviceable radar and one plane did not return from the mission. The circumstances of its loss were unknown, but as two of the aircraft narrowly missed crashing into the mountains on the way to the target, it appeared likely that the unfortunate Catalina had suffered disaster in this manner. Two aircraft jettisoned their mines west of Bataan. With these exceptions, the results of the mission were highly satisfactory, comprising 20 successful sorties in which 54 mines were laid according to plan. Returning planes were assigned definite areas east of Samar in which to circle until daylight, although a few were forced to make emergency night landings. When the others came into Leyte at dawn, some had less than 20 gallons remaining in their fuel tanks.

The subsequent clearance of the mined areas by U. S. sweepers after the fall of Manila provides an interesting footnote to this minelaying mission. It will be recalled that all of the mines were equipped with sterilizers. The performance of these devices was such that no live mine was encountered during the sweeping operations.



BRITISH MINE WARFARE

The following quotations from British broadcasts give some indication of the extent of the tremendous British mining effort. The first, a summary of the campaign, was presented on 7 February 1945, by Capt. J. S. Cowie, R. N., Deputy Director, Operations Division (Mining), Admiralty; the second is the story of one of the British Fast Minelayers as told by Rear Admiral R. K. Dickson, D. S. O., Chief of Naval Information, on 28 February 1945.

BRITISH MINING CAMPAIGN

"The first British mine to be laid in this war was dropped into the water exactly 6 hours after Mr. Chamberlain announced the start of hostilities against Germany. Since then, British Naval Minelayers have carried out, on the average, one operation every 2½ days.

"In April 1940, the first British aircraft mine was laid, and since then over 20,000 minelaying sorties have been flown by R. A. F. and naval aircraft, the majority of them carrying multiple loads of mines.

"In addition to Minelayers of the Royal Navy, ships of the Royal Australian Navy, the Free French Navy, the Royal Norwegian Navy, and the Royal Netherlands Navy have played a conspicuous part in these operations. And at the same time, the magnificent efforts of the aircraft of the Royal Air Force, and in particular of Bomber Command, have been emulated with success by aircraft of the Royal Navy, of the Royal Australian Air Force, of the Royal Canadian Air Force, and of the Royal Netherlands Air Force.

"It has been my privilege to be associated in

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the planning of some of these operations, and I want to tell you what it is we have been trying to do, and how we have been trying to do it.

"In order to do this, I must first of all explain just how minelaying differs from all other methods of annoying the enemy. All other weapons, such as the arrow, the bullet, the bomb, the shell, the torpedo, and the depth charge, to mention but a few, are what the handbooks call aimed missiles. In plain English, they are things you throw at the other chap, and if you miss him you can frequently correct mistakes and have another shot. They are all things which hit, or miss, as the case may be, very soon after they have been released from human control, and their effective use is entirely a matter for those in the ship or aircraft from which they are released. In modern war, these people are aided by a variety of crystal-gazing devices designed to make the best possible use of the particular missile they carry.

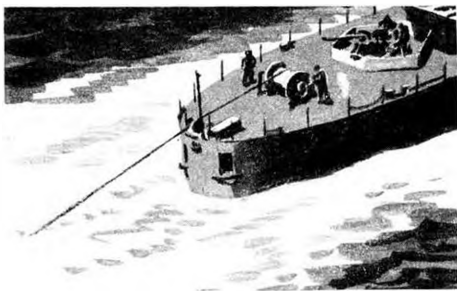
"Not so the mine, which is a long-term weapon, and which may not achieve its effect until months after it has been laid. Except in very rare cases, and apart from the difficult and dangerous task of ensuring that the mines are laid in the correct place, the people who lay them can thereafter exercise no personal skill in the matter whatever, and they can seldom if ever be identified with any particular success. In short, the mine, or rather the minefield, is what is called a strategic weapon, and it must be laid in accordance with a pre-conceived policy. From the planner's point of view, the difficulty is that some considerable time must elapse before it is possible to tell whether the policy being followed is the correct one. In addition to this time-lag, one is constantly aware of the fact that even the most highly civilized mine is quite incapable of distinguishing between friend and enemy.

"Finally, mines do not grow on trees and fall into the water when ripe. Thus between the inception of a strategic plan, and what may be called the delivery of the ironmongery into the water, there is a tremendous process of design, trial, production, assembly, storage, supply, and preparation, all of it calling at every stage for the highest degree of technical efficiency if the plan is to be successful.

"That is the essential framework of the matter, and within that framework we have been trying to do two things. First, to assist in the protection of our own shipping, and secondly to cause the maximum dislocation to the enemy's communications as a whole. The first object—the protection of our own shipping—represents the purely unspectacular and slogging part of the business, in the conduct of which minelayers of all types have laid many thousands of mines in the great barrages around the British Isles.

"Here, the results are not measured in terms of enemy ships sunk, but the degree of protection afforded to our own shipping. Nonetheless, in spite of their unspectacular nature, these operations have not been without hazard.

"The other side of the picture—the laying of mines in enemy waters—although unspectacular in the broad sense, contains certain elements of drama. It involves a battle of three kinds, all closely related. First, there is the technical battle between the people who design our mines and the Germans and others who have to cope with them; and personally I should say that, in my opinion, our scientists and technicians have done an even better job in devising new tricks on the enemy than they have done in dealing with the tricks played by the enemy on us—and the whole world knows what they have achieved. We have advanced far beyond the stage of the magnetic and the acoustic



mine, and there is an infinite variety of these and other devilish contraptions. Actually, the Germans themselves have complained bitterly that it is impossible to equip a minesweeper to cope with the dozen odd different types of mines she may encounter in any one area.

"The second battle is that between the opposing planners, and is compounded of a knowledge of enemy psychology, third-degree bluff, and a warped sense of moral values.

"The third battle, and not the least important one, is that fought by the Minelayer in getting to the appointed place *unseen* by the enemy, laying her mines, and getting away, *again unseen*.

"The results achieved have been referred to from time to time in Admiralty and Air Ministry statements. In terms of enemy ships sunk and damaged the victory undoubtedly lies with the Allies.

"This, however, is only half the story. Our aim is to dislocate the enemy's war machine, and the indirect effects of minelaying have made a remarkable contribution to this end. Enemy ships, frequently carrying valuable cargoes, have been held up in different theatres of war for days on end—vast numbers of men and ships, and quantities of special material, have had to be provided for minesweeping—insurance rates have gone up—crews have refused to sail—U-boat training has been affected, and in general, alarm and despondency have reigned supreme.

"Lastly, the sinking of specialized craft such as train ferries, dredgers, tugs, and so on has a far greater effect than the actual size or value of the ships themselves would at first sight suggest.

"You will, I hope, realize from all this that minelaying is a peculiar trade, and that success depends on the coordinated efforts of a very large team of people, few of whom ever see the results of their labors.



"The official communique which announced that over 100 enemy ships had been sunk or damaged as a result of minelaying by the Royal Navy and the Royal Air Force in connection with the landing in Normandy concluded with the words that 'these operations made a direct and valuable contribution to the success of the enterprise as a whole'.

"I think it fair to say that these words apply with equal force to the war as a whole, and to the work of the minelaying team in whatever part of the world it may be pursuing its secret purpose."

THE BRITISH FAST MINELAYERS

"More than 1,000 enemy ships, great and small, have been sunk or damaged by British mines since the outbreak of war. A thousand ships! Minelaying is a sea affair, and the whole campaign is broadly planned by the Admiralty. But of these thousand ships it is certain that well over 60 per cent are due to naval mines laid by the R. A. F., and chiefly by aircraft of Bomber Command. Minelaying is a terribly destructive form of warfare; more so in this war than ever before because minelaying aircraft can work in places where ships

cannot reach—the Baltic for instance. But may I tell you about the work of one class only of mine-laying ships?

"Early in the war, the British Admiralty built a class of ship which was entirely new in any navy. They were called the Fast Minelayers, and there were originally four of them—*Abdiel*, *Latona*, *Welshman*, and *Manxman*. There are others now. If I speak only of the *Manxman* and of 2 years ago, it is because I had the honour to command her in the middle part of the war, but all these ships did the same work. The first three were sunk; but the *Manxman* survives, although we were torpedoed in the early days of the landing in North Africa.

"The Fast Minelayers were the size of light cruisers and their outstanding feature was their speed. They were the fastest ships in the world and so they were often diverted from their proper job for every kind of service. Rushing urgently needed troops or munitions about the world, running the gauntlet to Malta with compressed food and so on. But they were designed for one purpose only—offensive minelaying right on the enemy's doorstep, in the swept channels along his coasts and at the entrance to his ports. This could be done by aircraft, but of course a ship, if she succeeds, can carry in one trip a far heavier load of mines than many squadrons of aircraft. Hence the great speed of the Fast Minelayers—so they could get anywhere on the enemy's coast and back all in one night.

"To succeed on those offensive mining operations two things were necessary. Firstly, the minefield had to be laid in exactly the predetermined place, and this required a very high standard of navigation. If we were disturbed on the job we couldn't just nip along the coast and plant our stuff somewhere else. If we did that, and then if we ourselves didn't get back, no one would ever know where we had laid the minefield, and so our own fleet might be endangered months later, for remember that minelaying is the only kind of warfare where *the target has to throw itself at the weapon*.

"Secondly, we had to get there and back unseen and unheard. When we were with Force H in the Western Mediterranean, Admiral Somerville used to call us his 'Little Rat'—and if ever we'd allowed the enemy to suspect that the 'Little Rat' had been about the place, he could just have told

his ships to avoid that neighborhood until he had searched for the minefield and swept it up.

"One more thing. Rule 1, line 1, in the Fast Minelayers was 'The mines *must* be laid,' and so a good time was had by all.

"The one thing we prayed for in those ships was a dark night—a really dark night. The moon was the devil. Sometimes we had to work in moonlight if there was urgent need for it—for instance, when the *Scharenhorst* and *Gueissau* were getting restive in Brest, but we always hated the moon. It used to make us feel so naked.

"When the moon was in the last quarter, and the dark night period of the month had come, we used to leave our lair on the northwest coast of Scotland and join the Commander-in-Chief at one of the southern ports. There we loaded with mines, and the technical drill of testing and setting them would be gone through on board. There was no room for mistakes, for if the torpedo officer and his men failed in that part of their job there might be an accident—an accident of a kind that would leave no trace of the ship or anything on board her to show what their mistake had been. Then we'd meet the local naval and R. A. F. staffs and we'd plan a series of operations to make the best use of the few dark nights before the moon came back.

"On the afternoon of the show we'd sail at dusk, and as soon as we were clear of the harbor we'd stream the taut wire gear. That was a device which was meant to help very accurate navigation by peeling miles and miles of piano wire off a drum and paying it out over the stern to measure the distance run. It was worth a guinea a minute when it worked, but when it didn't it was a curse and an abomination. Sometimes the wire would part half way across the Channel and then we just had to back our luck and our dead reckoning. The Channel tides are strong and the enemy do not often oblige with lighthouses. We needed luck, because as likely as not we'd be bound for some spot a mile or two miles off the coast of Brittany—and whatever else might be waiting for us over there, nothing is quite so unpleasant as to be uncertain of your position at night off a rock-bound coast on a dead lee shore.

"We generally used to run over at moderate speed—about 28 knots—and the first thing was to get settled down steadily to that speed and pass close to a fixed point like the Wolf Rock or the

Eddystone with the taut wire running nicely. That would give us a good departure.

"By then it would be quite dark, and we'd nothing to do but concentrate on the navigation and wonder what the weather was going to be like for the run back. We did many of these operations, but we never lost the thrill of rushing toward the enemy's blacked-out coast in a fast ship crammed with high explosive. Half way across we'd go to mining stations. Down below on the mining deck lit by faint blue lights, the torpedo men would stand by the mines parked on their rails, each of them taller than a man and weighing about a ton; the engineers would tend the machinery which, when the lay began, would pass the mines out through the stern doors. On deck the rest of the ship's company manned the guns; and right aft on the quarter deck the chief boatswain's mate was stationed alone at the taut wire gear with a shaded torch in one hand and the bridge telephone in the other, watching the dynamometer which controlled the tension of the wire and measured the distance run. The dynamometer had an electric repeater on the bridge, where we kept absolute silence, and I remember the thing used to make a very sinister ticking noise.

"When we got near the place, we'd reduce to a comfortable speed for laying and the stern doors would be opened. Then the navigator would say 'Er're there, Sir' and the order 'Lay Mines' would be given. The next half hour was the really exciting time, because as soon as the first mine splashed

into water we knew we were committed to the job. Whatever surprises might come in that half hour—and we often had surprises—there were only two alternatives open to us, either to finish the lay exactly as planned or else cut and run for it. And if anything *lamed* us—an unlucky splinter in the engine room, or even collision with submerged wreckage—we should not have the speed to cut and run. There was a faintly illuminated dial on the bridge, like the speedometer of a car, which showed how many mines had been laid at any moment. I remember how we used to hold our breaths as the finger of the dial got near the last figure. Then came the report 'All mines gone, Sir,' and at that a lot of things had to happen. The executive order for them all to happen at once was 'Home, John.' The great mining doors in the stern would be closed, the engine room telegraphs put to full speed, and then you could just feel the acceleration as she worked up to it. After that it was a matter of so laying the ship to the wind and sea that she would maintain full speed for the rest of the night, and of hoping that at dawn we should be at least more or less where our own fighters expected to find us. And when it got light, if we were in luck, there would be Land's End on the right bearing at the right distance, and there would be our own fighters overhead. I have known Land's End from the sea all my life, and in peace time I used to think it looked a pretty grim sort of hole. I've got a more friendly feeling for it now."



MINING

OFFENSIVE MINELAYING IN THE PACIFIC WAR





◀ B-29 being loaded for an attack on Japan.

The following is the fourth article of a series outlining U. S. mining activities in the Pacific. Previous articles appeared in Mine Warfare Notes 2-45, 3-45, and 4-45. It is the purpose of the series to make available to mine detail, mine disposal, and minesweeping officers a general picture of the offensive mine warfare effort.

Part IV—The Opening of the Large Scale Attack—January Through March 1945.

THE start of the new year—1945—found the Japanese shipping situation in a critical condition. The continued attrition of ships had weakened the transportation system, and air patrols from the Philippines were threatening to cut off the southern half of the Greater Asia Sphere. In keeping with the increased pace of the attack upon the enemy merchant marine, the B-29 aircraft of the Twentieth Army Air Force, on the night of 25-26 January, engaged in their first full scale mining effort, and planted several hundred magnetic mines in the approaches to Singapore and Saigon.

The only previous mining by the Superforts was the August mission against the Moesi River near Palembang, discussed in the third article of this series. Their attack on the Malay and Indo-China ports was on a much larger scale and offered a blow to the major port and repair facilities left to the enemy in Southeast Asia. Since the R. A. A. F. planes had extended their mining as far west as Borneo and as far north as the Philippines, and since the Fourteenth Air Force had planted mines all along the China and Formosa coasts from the Yangtze to Indo-China, the January Twentieth Bomber Command mission served notice on the Japanese that no mineable waters, with the possi-

ble exception of those of North China, Korea, and the Empire proper, could be considered secure.

The effectiveness of the Singapore and Saigon raids was augmented by coordinated mining attacks carried out by R. A. F. Strategic Air Force planes operating from India. Within a period of a week, just before and coincident with the B-29 attack, these aircraft mined nearly every usable port along the Malay Peninsula.

The use of delayed arming and ship counting devices on the mines laid in January assured that the enemy would experience continued difficulty if he attempted a hurried reopening of the channels. These devices were counted upon for a month, after which the Singapore field was strongly reinforced by a second B-29 mission. After a further mining attack by Liberators, which will be discussed below, the B-29 planes again mined both major ports heavily in late March.

In addition to carrying out the missions which supplemented the Twentieth Air Force mining, the R. A. F. Strategic Air Force, operating from bases both in India and in Ceylon, kept up a continued campaign against all targets within reach, using Mark 13, Mark 13 Mod. 5, Mark 26 Mod. 1, Mark 36 Mod. 1, and British magnetic mines. The scale of this effort and the difficulty which it caused the enemy may be judged from the facts that over a dozen major targets were mined more or less con-



Stringing crane fitted to standard bomb service truck facilitates mine handling at an Indian air base.

tinuously and that more than 1,000 mines were laid by these Liberator aircraft during the first quarter of the year. Of particular interest is the fact that the third mining of Singapore was carried out by these airplanes in March, when they flew a round trip of nearly 3,000 nautical miles to plant their mines successfully.

During this period the only other mine laying aircraft in Asia, those of the Fourteenth Air Force, had been forced by the loss of some of their bases to limit their efforts to the upper Yangtze. This important supply line to the Japanese forces in China was continually harassed, however, with more than 300 mines being laid during the quarter. These included over 100 Mark 19 mines which were drifted down the river against ship and barge traffic. To complete the blocking of the Yangtze, Twentieth Air Force B-29 planes carried out a heavy mining of the region near the Hwangpoo mouth, in early March.

The other portion of the mining previously conducted by the Fourteenth Air Force, that of the China coast ports, was taken over by the RAAF Catalina squadrons operating under Commander Seventh Fleet. As soon as bases in the Philippines became available, these squadrons were able to add the effort on the China coast to a continuation of their mining of the Netherlands East Indies. Thus the denial of Fourteenth Air Force bases accomplished little for the enemy as far as freedom from mining was concerned.

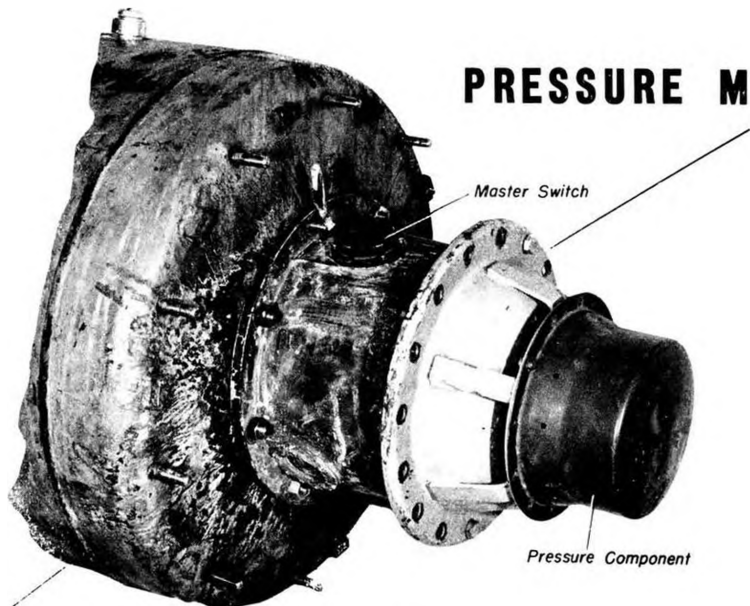
Up to nearly the end of March, the only mining done in the Central Pacific was a continuation of the attack on Futami Ko in the Bonin Islands. However, at the very end of that month, just before the start of the Okinawa invasion, B-29 aircraft expanded their mining activities and removed Japanese home waters from the list of safe areas for enemy ships. On the opening night of their mining campaign the Superforts of the Twenty-first Bomber Command carried nearly 1,000 magnetic and acoustic mines from the Marianas to the most important channels of the Inland Sea. For the first time, the Japanese home waters were subjected to an overwhelming concentration of mines, which forced the enemy to delay and re-route ships and to accept casualties on his very doorstep. At the time when the enemy needed free sea lanes both to counter this attack and to rush stock piles of food and raw materials to the homeland, these lanes were denied him. This was mining comparable with that which the Germans had used against Britain in 1939-40, when Hitler counted upon his secret weapon to cut the life lines of England.

The initial attack was followed within a few days by a second set of missions on a comparable scale. These flights both reinforced the original fields and established new ones. That they have already met with success is evidenced by the reconnaissance photograph below.



A 7,000-ton Japanese ship which was mined in Shimomaki Strait.

PRESSURE MINES



Oyster unit on a GG case.

THE pressure mine, a new type mine actuated by the reduction in hydrostatic pressure at the sea bottom which accompanies the passage of a ship, was introduced by the Germans at the time of the Allied invasion of Europe.

The German pressure units (designated Oyster units) require for actuation a reduction of pressure of approximately 2 inches of water, lasting 7 to 10 seconds. There are three known German pressure mine types, all combinations:

1. An acoustic-pressure combination (AP) in a modification of the bomb-mine case, type G.
2. A magnetic-pressure combination (MP) in a modification of the parachute-mine case, type C.
3. A magnetic-pressure combination in a modification of the submarine torpedo-type mine case, type S.

The acoustic pressure combination fires if there is a pressure actuation within about 30 seconds of (but prior to) acoustic actuation. The pressure unit is susceptible to actuation by swells. Hence, under favorable sea conditions this mine can be swept by acoustic gear alone.

The magnetic pressure combinations fire if a pressure actuation follows within 25 seconds of a magnetic actuation. The pressure units of these mines are unlikely to be actuated by swell.

The principle of these new German mines was no surprise to Allied mine experts, but pressure sweeping is difficult at best. A pressure mine unit is designed to be actuated by the pressure effect near the sea bottom due to the moving of a large volume of water by a moving ship. Thus a great deal of energy is involved in normal pressure actuation, and it appears that any sweeping method will also involve great expenditures of energy in some form.

Full details of pressure countermeasures cannot be given in a confidential publication, but one simple countermeasure can be described. A slowly moving ship has a weak pressure signature. Hence, it is possible to specify safe ship speed limits which will insure ship safety in a field of pressure mines of known characteristics. These safe speeds depend on water depth and ship displacement.

CONFIDENTIAL

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JAPANESE SUBMARINE MINELAYING



JA mine case. For picture of JA adrift see Mine Warfare Notes 1-45, page 15.

POSITIVE indication of offensive mining on the part of the Japanese has been obtained from a series of captured charts which show that the enemy carried out a rather widespread submarine minelaying program in the Southwest Pacific area at the time of, and directly following, the attack on Pearl Harbor.

MINEFIELDS

The fields were laid in seven different locations ranging from the Malay Peninsula to Northeast Australia. The information on the captured charts was by no means complete in all cases. However, the following general information is of interest:

(a) All fields were laid by I-121 class submarines during the period 7 December 1941 to 25 February 1942.

(b) In most of these fields, the cases were set at a depth of 3 to 4 meters and it can be assumed that this is standard Japanese doctrine for the case setting of submarine-laid mines.

(c) The use of the Type 88 mine is indicated in only one location, but it is assumed to have been employed in the other fields.

(d) The length of the mine lines, as indicated on the charts, varies from 0.5 to 6.5 miles. The number of mines is not given in each case but those numbers that are given vary from 6 to 39.

NOTE.—The field of 6.5 miles and the field with 39 mines are not the same. The number of mines is not shown in the first case and the length of the field is not given in the second.

(e) Apparently there is no consistency in the spacing of the mines. For example, in one area four lines of mines were laid of 0.5, 1.1, 0.5, and 0.5 mile in length in which the numbers of mines were 6, 12, 12, and 7, respectively.

MINELAYERS

The class of submarines (I-121) employed in the laying of the above fields is one of three believed to be employed by the Japanese for minelaying. These craft were built expressly for this purpose and they carry a normal load of 42 mines which are laid through two stern chutes. Six mines are carried in the chutes, the balance being stowed within the pressure hull. Each mine chute can be loaded in 8 minutes and a field of 42 mines can

Decorations and Citations

LEGION OF MERIT

REDDEN, Clarence Randolph, Lt., USNR.

"For exceptionally meritorious conduct in the performance of outstanding service to the Government of the United States as Officer in Charge of Mobile Explosives Investigation Unit No. 2 during extensive bomb and mine disposal operations in the enemy infested waters of the Central and Western Mediterranean from April to December 1944."

NAVY AND MARINE CORPS MEDAL

BRANTLY, Neil Duncan, Capt., USN.

"For heroic conduct while serving as Commander of the Boat Control and Minesweeping Group in action against enemy Japanese forces during landings at Cape Gloucester, New Britain, on December 26, 1943."

ARIN, William F., Lt., USNR.

"For outstanding courage as Officer in Charge of a mine disposal unit, naval operation base, in neutralizing an enemy mine found beached on one of the Grenadine Islands, October 22, 1943."

ALEXANDER, Ronald M., Y 1/c USNR.

"For distinguishing himself while serving in a United States minesweeper when that vessel was sunk during operations off the coast of France."

BALCOM, Charles Everett, S 1/c, USNR (posthumously).

"For heroic conduct as a member of the crew of the U. S. S. *Tide* in attempting to rescue a shipmate from drowning when their ship was hit by an underwater explosion during the invasion of Normandy on June 7, 1944."

BRONZE STAR

BROWN, William Drane, Capt., USN.

"For meritorious service as Chief of Staff and Operations Officer of a task group during a mining operation and bombardment of Japanese shore positions on Kolombangara, Shortland, and Bougainville, British Solomon Islands on the night of June 29, 1943."

be laid in approximately 4 hours. Usually the mines are released at 11 fathoms at a submerged speed of 4.5 knots.

The other Japanese submarines used as mine-layers are the RO-29 class and three units of the I-15 class. The former, classified as coastal submarines, also carry 42 mines which are laid through stern chutes. The three I-15 class vessels are long range cruiser-type submarines. It is known that they have been adapted for minelaying but it is not known how many mines they can carry.

MINES

The Type 88 mine (U. S. designation JA) is the only submarine-laid mine known to be used by the Japanese. It has been recovered and analyzed by U. S. mine disposal personnel.

The JA is a moored, contact, chemical horn mine which is used offensively against surface craft. It can be laid in a maximum depth of water of approximately 1,500 feet and has a maximum case depth, when moored, of 66 feet.

The black steel JA case is made up of two hemispheres joined by a 12-inch cylindrical midsection. It measures 33.9 inches in diameter and 45.8 inches in length, and the main charge consists of 396 pounds of block-fitted Shimose (picric acid). Four horns are equally spaced around the upper hemisphere, 16 inches from the top center of the case. Other fittings on the upper hemisphere are two lifting lugs located near the midsection, and the cover plate, which is bolted to the top center of the mine.

An arming switch, 5 inches in diameter, is located on the midsection.

Secured to two lugs on the lower hemisphere is a mooring bail which carries the mooring pulley and the come along. The detonator carrier mounting is secured to the center of the lower hemisphere by a keep ring.

The detonator is manually housed in the booster prior to laying. When the mine is laid, it moors on a bight of cable and takes depth by hydrostat. It is armed by a spring-operated arming switch 15 to 20 minutes after it has separated from the anchor, delay being caused by a dashpot on the arming switch. It is detonated by standard chemical horn firing.

CONFIDENTIAL

Various Japanese countermeasures and some of the results of our mining efforts at Makassar are indicated in the following excerpts from an interrogation report contained in ATIS, SWPA Bulletin No. 857 of 19 April 1945. The prisoner, a merchant seaman, appeared to be intelligent and observant and whose statements were considered by the interrogating officers to be reliable.

Minesweeping.—During October–November 1944, magnetic and acoustic mines were dropped at night at Makassar by unidentified four-engined airplanes. On four occasions the *Nikko Maru* was requisitioned by the Japanese Navy to engage in parallel minesweeping with another vessel. The other vessels on the four occasions were *Ryushin Maru*, *Yawata Maru*, *Seito Maru*, *Koyo Maru*. The ships were operated by their regular crews but were aided by two petty officers and six seamen in each vessel. Minesweeping was done under the direction of one officer.

TECHNIQUES FOR VARIOUS MINES

Magnetic mines.—The ships used were wooden. The equipment consisted of a large number of iron bar magnets secured along a cable, with floats attached. A grapnel was towed attached to a cable approximately 20 m. long over the stern.

Acoustic mines.—Single-engine seaplanes identified as PETE 11 flew back and forth across the water at 200–300 m. and exploded the mines, which were set to explode, only upon being disturbed four, seven, or nine times. Prisoner insisted he saw mines exploded by this method.

METHODS AT MAKASSAR

Marking mined areas.—The Japanese Navy had fixed observation posts with four observers each, at south corner of Juliana Quay, at Lae Lae Island and at the naval lookout post near the jetty and the swimming pool, just south of Wilhelmina Quay.

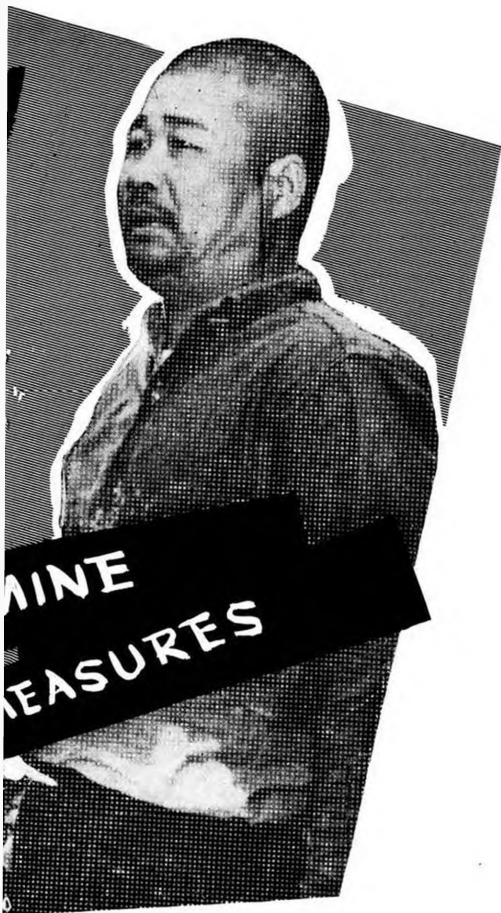
When mines were dropped during the night, military landing craft stationed in and outside the harbor put out marker flags the following morning as directed by the observers.

Sweeping mined area.—After the area was marked, two wooden vessels of approximately 180 tons swept the area aided by a PETE, flying at



about 50 m. Crew of the airplane consisted of a pilot, a signalman, and a minespotter. Spotter used a periscope-like telescope.

The airplane indicated courses for the vessels by its movements. Flying left-hand turns over the vessel on the port side of the sweep meant, to port. Flying right-hand circles over the starboard meant, to starboard. Repeated circles indicated more to port or starboard. Signals between the ships and ships to airplane were by flags. No wireless was used.



to the Navy. He was 1 of 15 Japanese civilian divers at Makassar, housed in 10 small wooden barracks at Makassar. During 1 week in October 1944, Yamamoto lifted 4. Prisoner did not know the types nor the color of the mines that were lifted by the diver. He saw only that he worked from a small boat and put a steel grapnel, insulated with rubber, around the mine. It was then floated to the dock where the Navy took delivery of it.

Un swept mines.—Mines located but not removed were marked by triangular red or square white flags. Prisoner did not know whether these different flags indicated types of mines or direction for navigation.

As a result of the daily attacks in October, the harbor and approaches at Makassar were never clear of mines. The entrance for large ships south of Lae Lae was not used but a swept channel was maintained from the wharves to the breakwaters. The entrance generally used by all vessels, leaving or entering, was between the two breakwaters, thence a swept channel marked by red buoys led eastward for about 2 miles. In the harbor a channel was marked by red buoys alongside the wharves for about 200 m. Vessels could also enter and leave the port to the north, hugging the coast. The southern entrance was used only occasionally and then by small vessels only, passing very close to the lighthouse on the reef of Lae Lae.

Mines dropped on land.—Prisoner had never heard of any. However, on four occasions during October 1944 mines were dropped on the reefs, and they were collected by the diver.

CNO COMMENT

The mines laid at Makassar were United States and British magnetic, acoustic, and magnetic-acoustic combination mines. The acoustic mine-sweeping described was probably an attempt to detonate the acoustic mines by means of explosive charges dropped from airplanes. Contrary to the statement in the text, these mines were set to fire on the first actuation. Since all the mines laid at Makassar are likely to be actuated when moved, diving on them was a very hazardous enterprise unless they were in water depths too shallow for arming.

During one week in October 1944, prisoner saw 1 or 2 mines exploded every day, and estimated the total for the week at about 10. Every time a mine was exploded the cable had to be spliced for the explosion came near the center of the bight.

No steel or rope mats were used at Makassar for sweeping nor did prisoner see any explosives attached to the grapnel. The grapnel never picked up nor exploded any mines.

Some mines were brought to the surface by Yamamoto Kazuo, a civilian pearl diver attached

Assault Sweeping in the Philippines

THE invasion of the Philippine Islands by U. S. Forces has involved not one or two, but a whole series of landings over a wide-spread area. This has meant that the minesweepers, in order to clear the way for each new assault, have steamed hundreds of miles through enemy waters where they have had to cope with many new and difficult problems. Navigational aids were inadequate and frequently nonexistent; constant and determined bombing and strafing attacks were encountered; and, on several occasions, the enemy employed desperate but well-coordinated "Kamikaze" tactics. It would be impossible to describe each of the assault sweeps in one article, but to give an idea of the kinds of action that took place, a few of the operations are briefly summarized below. Attention is invited to the accompanying chart whereon the principal areas of minesweeping activity are indicated.

MINDORO ISLAND (12-19 DECEMBER 1944)

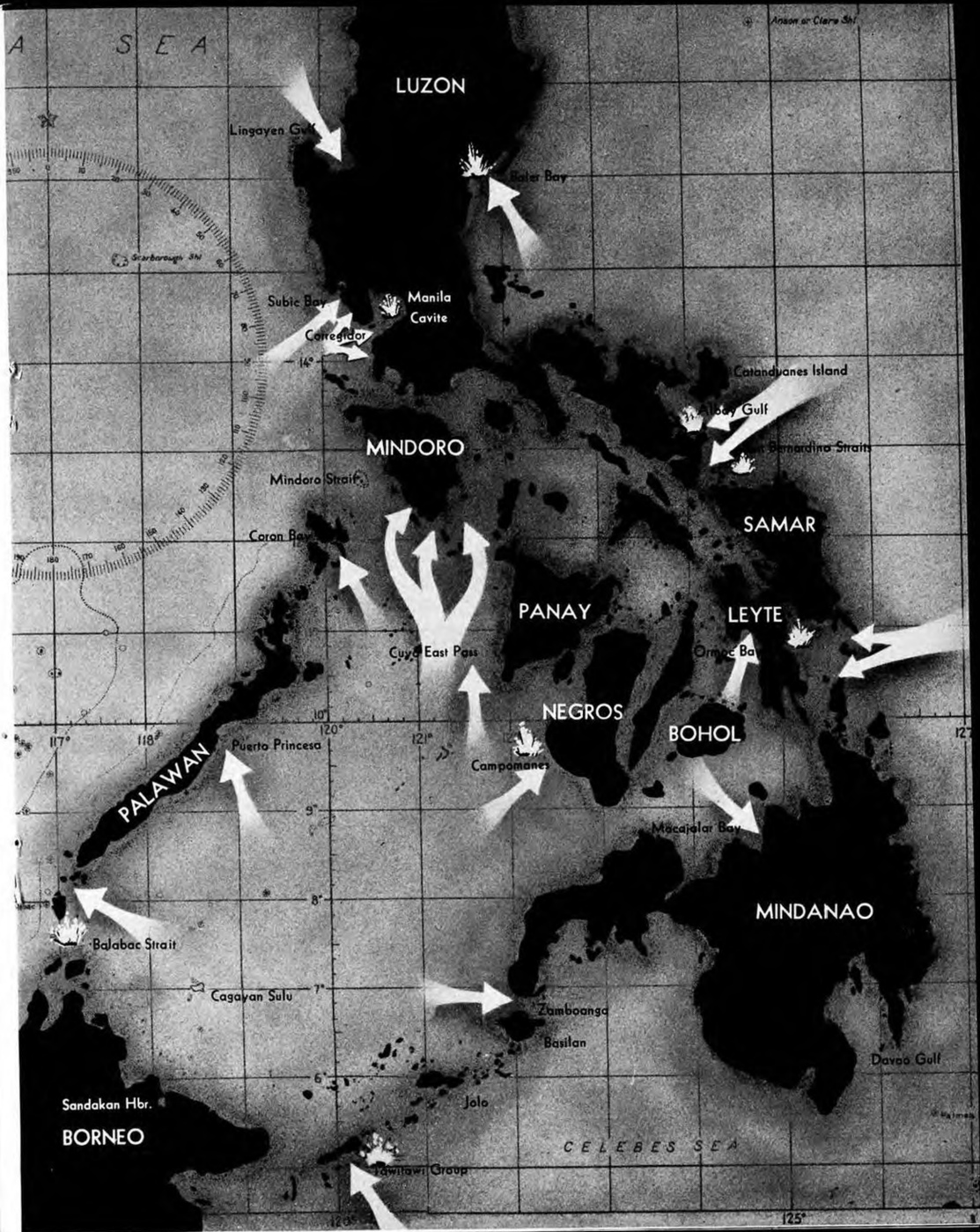
On 12 December 1944, a few weeks after the assault sweep into Leyte Gulf (Mine Warfare Notes 2-45), a minesweeping task unit got underway from San Pedro Bay and after making passage through Surigao Strait into the Mindanao Sea, set course for Mindoro Island in the west central portion of the Philippine Archipelago. This unit was composed of AM's (both 180 and 220 foot) YMS's, and one APD with four LCPR's aboard. Vessels took assigned anti-submarine screening stations in company with heavier fleet units.

Shortly after daylight on 14 December the AM's pulled ahead of the convoy to sweep Cuyo

East Pass. In midmorning, while these ships were streaming sweep gear, several Jap planes attacked and dropped bombs, but scored no hits. These planes did not press home their attacks, apparently becoming discouraged by the heavy volume of anti-aircraft fire. The sweeping of the passage was completed at sunset and the AM's proceeded at 12.5 knots for Mindoro Island to sweep ahead of landing operations scheduled for dawn of 15 December.

Upon arrival in the vicinity, the AM divisions deployed separately to assigned areas off the invasion beaches and about 0330 commenced night sweeping with "O" type gear. Lighted dan buoys were used to mark the swept water, and after the first pass had been completed, a Jap plane appeared suddenly and began busily strafing the lights. Apparently the pilot was unaware of the sweepers because he paid no attention to them, and disappeared a few minutes later. Damage amounted to one halyard severed by a ricocheting machine-gun bullet when the flagship turned momentarily into the Jap's line of fire. Sweeping of approaches to the invasion beaches was completed by 0700 with negative results and shore bombardment commenced a few minutes later.

With the coming of daylight another air attack developed in which two LST's were hit. Suicide planes were active; two of them attempted to hit a destroyer but missed. During the ensuing fracas an AM shot down one plane which was officially credited to her by the commander of the task group. Sweepers proceeded with various tasks, planting channel buoys and making preparations to sweep the surrounding areas. Two sweepers streamed "O" type gear, two others mag-



netic gear, and the four ships worked through Ilin Straits to Pandarochan Bay. No mines were encountered and late in the afternoon the sweepers returned through Ilin Straits to rejoin the convoy forming up for the return trip to Leyte.

It was after shutdown when one of the AM's, maneuvering in formation, grounded on an underwater pinnacle off Dongon Reef. Another sweeper was ordered to stand by and managed to pull the first one clear. As the latter's propellers were bent and she could not exceed $8\frac{1}{2}$ knots without excessive vibration, both vessels remained behind, patrolling off Mindoro during the balance of the night. Suicide planes attacked again the next morning while the two sweepers were off shore waiting for an LST to finish unloading on the beach. The damaged AM maneuvered clear and later shot down one of the planes with her 3-inch gun. As a result of this and a previous action she was officially credited with two Jap planes shot down during the Mindoro operation, while the ship which helped her out was officially credited with one. Meanwhile, the LST had not fared so fortunately, suffering material damage and personnel casualties as a result of these suicide attacks. However, the business of unloading was satisfactorily completed, the two AM's standing by to render all possible assistance.

On 17 December the two sweepers formed in convoy with the LST for the return trip to Leyte which proved to be uneventful. Although no mines were swept during the Mindoro operation, minesweepers overcame numerous obstacles to accomplish a difficult and arduous mission.

LINGAYEN GULF (2-19 JANUARY 1945)

Perhaps the most notable fact about the Lingayen Gulf assault sweep was the persistence, and at times, the effectiveness of the enemy air attacks. Although the Japs lost a good many planes in trying to impede the progress of the task group, they succeeded in sinking three DMS's, seriously damaging an LCI, and causing a fire and personnel casualties aboard one of the large oilers in the convoy. These attacks occurred around the clock, in bright sunshine, in moonlight, and often in pitch darkness. Planes attacked singly and in groups, sometimes with apparent coordination, but frequently in a haphazard manner that seemed to indicate both indecision and reluctance on the part of the pilots to follow through after they



had commenced their runs. These suicide attacks even when they failed in their primary objective, imposed a severe strain on personnel, especially those aboard small craft not equipped with fire director and air search radar.

The task group assigned to this mission included about 40 YMS's, 10 AM's, 10 DMS's, 1 DM, 1 APD, 8 LCT's, 2 Australian corvettes, and several destroyers and DE's. Accompanying the task group were Liberty ships, oilers, and 1 CM. Battleships and cruisers were in the vicinity to carry out fire-support and shore-bombardment duties. Sortie was made from San Pedro Bay, Leyte Island, on the morning of 2 January 1945, the task group passing through Surigao Strait into Mindanao Sea. The first of an almost continuous series of air attacks occurred about 1 hour after sunset on the same day. Two Jap dive bombers appeared, one dropping his bombs on the screen, the other attacking the forward units of the column. Both missed. Radar picked up numerous bogies during the night.

The task group entered the Sulu Sea on 3 January, and shortly after sunrise was again attacked, this time by seven Jap planes all carrying bombs. The attack was poorly coordinated and proved very disastrous for the enemy, most of the planes being destroyed either by anti-aircraft fire from the ships or by planes of the Cover Air Patrol. These air attacks occurred several times daily as the task group cleared the Sulu Sea and entered the China Sea, steaming north for Lingayen Gulf. Three Liberty ships and one gasoline tanker were detached from the convoy at Mindoro, putting in to San Jose.

The objective was reached on the morning of 6 January, at which time the sweepers formed into separate units and proceeded to their assigned areas. The large number of YMS's present made it possible for some to sweep "O" type while others streamed magnetic and acoustic gear. Sweeping progressed methodically, and no mines were encountered. About noon Jap planes appeared, flying low just over the land. One of them, a "Zeke", headed directly for a DMS. In spite of heavy fire from all guns that could be brought to bear, the "Zeke" came on about 25 feet above the water and

crashed into the port side of the DMS just above the water line. Violent fires broke out immediately, and it was seen that the ship was in a sinking condition. She was anchored and abandoned a few minutes later. A few hours afterward another plane hit her again, causing a large explosion. While retiring for the night, YMS vessels were harassed by more Jap planes which scored no hits. However, several of the ships suffered considerable damage from near misses.

Sweeping continued on 7 January, again with negative results. It was, however, a grim day for the mine-sweeping forces. Early that morning the battered DMS capsized and sank. Before sunrise another DMS took a torpedo hit and sank. About 1830 a Jap plane scored a direct bomb hit on a third DMS which sank 5 minutes later. This plane was shot down by other vessels in the DMS formation. Having accomplished the major portion of the sweeping, the task group again formed up for night retirement out of Lingayen Gulf.

During the period 8-13 January, YMS vessels fueled from AM's anchored in Lingayen Gulf and completed their sweeping assignments. Jap planes continued their attacks but caused no further

A YMS under attack from Jap shore batteries on Corregidor



casualties of a serious nature. Jap PT boats were reported in the vicinity and small boat patrols were established at night inside the Gulf to intercept them. S-day was 9 January and by that time the assault sweeping mission had been successfully completed. All sweepers reported satisfactory performance of gear, but as no mines of any kind were encountered during the operation, this fact cannot be considered significant. On 13 and 14 January, minesweepers departed from the Lingayen area, taking screening stations in the convoy which returned safely to Leyte.

MANILA BAY (13-19 FEBRUARY 1945)

The spotlight of invasion focused next on Manila Bay. From the beginning, it was expected that minesweepers would encounter heavy opposition from the shore batteries located at Manila and on nearby Corregidor and Caballo Islands. Sweep plans called for the usual off-shore clearances followed by deep penetrations into Mariveles Harbor and the restricted waters between Manila and Corregidor. These tasks were to be accomplished by D-day when paratroopers were scheduled to jump on Corregidor in conjunction with the main amphibious assault. Cruisers and destroyers were assigned to this force to provide fire support for the sweepers and to conduct shore bombardment of enemy positions when and where they might be disclosed.

This powerful task group left Subic Bay on 13 February. Sweep operations commenced on the approach to Manila and continued on into the waters to seaward of Corregidor. Here the task group split up into separate units, each having its own protecting cruisers and destroyers which took up fire support stations when the sweepers commenced operations. On D-2 day, 28 United States controlled mines were swept between La Monja and Corregidor Islands.

Shortly after noon on the following day (D-1), shore batteries on Corregidor opened up on a YMS formation as it approached with "O" type gear streamed in port echelon. Five hits were scored almost immediately on the guide sweeper (a YMS) which caught fire and had to be abandoned as she lay dead in the water without steering or engine control. A destroyer moving in to rescue personnel took a direct hit on the forecandle. All sweepers were ordered to clear the area and a second destroyer went to the assistance of the

stricken YMS. Meanwhile, fleet units lying off shore poured a tremendous volume of fire into Corregidor. Planes were ordered up to lay a protective smoke screen under cover of which the destroyer rescued survivors from the YMS. As this vessel was drifting toward the enemy beach the destroyer was ordered to sink her, which she proceeded to do, at the same time taking the enemy guns on Corregidor under fire. The remaining sweepers managed to retire in order although one YMS was the target of several Jap salvos. Shortly after this, enemy guns on Corregidor were silenced.

Meanwhile, AM's working in another area located a field south of Caballo Island. On the first pass 51 chemical horn mines were cut; 9 more were swept on the second pass and 25 on the third. The sweeper unit also came under the fire of shore batteries on Corregidor and Caballo Islands and returned fire effectively although actual hits could not be observed. Support destroyers also blasted enemy positions. Due to the importance of the time element, sweeping continued in spite of the fact that there were more mines on the surface than the LCS(L)'s assigned to mine disposal could handle. Altogether, 110 chemical horn mines were cut in this area during the day.

In the afternoon, moored, magnetic and acoustic sweeps were made in Mariveles Harbor by YMS vessels. These efforts netted an additional 11 mines of the chemical horn type and cost the sweepers some gear which apparently fouled on obstructions in the channel entrance. It was during this part of the operation that two destroyers were mined while following close astern of the sweeper formation to assist with mine disposal. This incident came as a complete surprise as the destroyers were proceeding very slowly in swept water at the time. It is believed that the mines must have been Japanese controlled mines. Other vessels were immediately dispatched to render assistance, but both destroyers were able to retire from the area under their own power. Darkness intervened before additional checks could be made in the harbor and further sweeping was planned for the following morning.

At dawn on 15 February (D-day) sweepers returned to Mariveles Harbor and set to work. The attack group commander delayed H-hour 60 minutes in order to permit maximum clearance. Two magnetic and two "O" type sweeps were com-

pleted by the time the landing craft appeared on the horizon and a third sweep was completed 50 minutes later just before the assault forces hit the beaches. Meanwhile, an AM unit swept 154 chemical horn mines in the waters north of El Fraile. YMS's worked into Caballo Bay and swept one mine at the entrance. Shore batteries inside the bay opened up and a YMS took a hit in the generator room from a 3-inch armor-piercing shell. Thus far, over 200 enemy mines had been swept up to and including D-day.

During the next 4 days, with the assault forces successfully ashore, minesweepers persistently re-swept all of the waters around Manila Bay, adding over 100 mines to the total previously swept. This total was again increased to nearly 600 mines when, during the following weeks, another task unit (Manila Bay Minesweeping Unit) recombated the harbors and channels until negative results were obtained.

SUMMARY

Only a few of the many sweep operations recently conducted in the Philippine area have been considered here. To understand in some measure the full scope and complexity of the entire sweeping picture, it is only necessary to study the chart with an eye to the distances involved and the miles of water actually cleared. As an example of this, in the Balabac Strait sweep operation, four AM's cleared 600 square miles in 8 days of operation. The names of the places where sweepers have streamed their gear make an impressive list—Leyte, Mindoro, Lingayen, Manila, Balabac, Palawan, Coron Bay, Albay Gulf, San Bernardino Strait, Ormoc Bay, Tawitawi, Zamboanga, and others. Although a relatively large fleet of sweepers was available, the majority of the vessels took part in several of these operations, sometimes concluding one and setting off for the next without pausing any longer than was necessary to fuel and provision. Severe strain and fatigue were experienced by all personnel involved, and the tension was heightened by prolonged and determined air attacks in some areas and the raking fire of strongly entrenched shore batteries in others. Nevertheless, missions were completed on time and as planned, sweep gear functioned in most cases in a highly satisfactory manner, and the minesweeping forces acquitted themselves with distinction under most difficult and hazardous conditions.

SUGGESTED CUTTER SPACING

MANY Japanese mines after being swept detonate upon reaching the surface. Consequently, when intermediate cutter spacings given in FTP 204A are used, care should be taken that the inboard cutter is approximately 100 yards from the stern of the vessel. In order that this condition may be satisfied, the following modifications are suggested in lieu of corresponding items contained in FTP 204A:

(a) In table 6603 (b), items 3 and 4:

"3. For 200 fathoms of sweep wire, use 8 intermediate cutters. (Omit cutter Nos. 9, 10, and 11.)

"4. For 150 fathoms of sweep wire, use 7 intermediate cutters. (Omit cutter Nos. 8, 9, 10, and 11.)"

(b) In table 6603 (c), items 2, 3, and 4:

"2. For 250 fathoms of sweep wire, use 13 intermediate cutters. (Omit cutter Nos. 14 and 15.)

"3. For 200 fathoms of sweep wire, use 11 intermediate cutters. (Omit cutter Nos. 12, 13, 14, and 15.)

"4. For 150 fathoms of sweep wire, use 9 intermediate cutters. (Omit cutter Nos. 10, 11, 12, 13, 14, and 15.)"

(c) In table 6607 (c), items 3 and 4:

"3. For 200 fathoms of sweep wire, use 11 intermediate cutters. (Omit cutter Nos. 12, 13, and 14.)

"4. For 150 fathoms of sweep wire, use 9 intermediate cutters. (Omit cutter Nos. 10, 11, 12, 13, and 14.)"

ELECTROLYTIC ARMING CELL



THE arming cell Mark 2 Mod. 0 is an electrolytic arming-delay device for use on clock starter mechanisms Mark 1 Mods. 3 and 4 in place of a soluble washer. Electrolytic action between a zinc disk and a cup of silver chloride in the presence of sea water causes the disk to deteriorate until the piston of the clock starter is released and the clock starter is free to arm.

At present the arming cell Mark 2 Mod. 0 (see illustrations) is the only electrolytic arming cell available. It has a nominal delay period of 4 days, but the conditions of temperature, pressure, and salinity normally encountered may cause the time to vary between approximately 2 and 6 days. If the temperature and depth of water are known, the operating time may be estimated to within ± 1 day.

The cell consists of a zinc disk 0.016 inch thick and a small tray of silver chloride mounted on a bakelite washer $\frac{9}{16}$ -inch thick and $2\frac{1}{4}$ inches in diameter. The zinc disk is secured by a thin cover of bakelite placed on top of the assembly and held by three brass screws. The tray of silver chloride rests in a curved recess in the bakelite

washer between the edge of the zinc disk and the edge of the bakelite. One end of the tray is connected electrically to the disk by a 200-ohm resistor which is buried in wax in another recess. A slot in the bakelite cover exposes the tray of silver chloride to the water. The zinc disk has six small holes to allow water to circulate under the cell. A threaded bakelite boss or nut is secured in the center of the disk for holding the arming cell on the threaded piston rod of the clock starter.

When the delay-arming cell is immersed in sea water, a primary electric cell generating an E. M. F. of about 1 volt is formed; the sea water is the electrolyte, the zinc disk is the anode, and the silver chloride is the cathode. The resistor completes the circuit and limits the current through the cell. The time required for the zinc plate to deteriorate and release the piston rod depends basically on the cell current and thickness of the zinc disk.

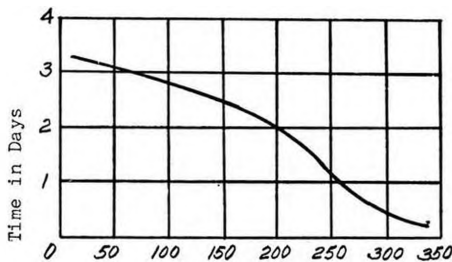
The delay time of the cell is affected by the pressure, salinity, and temperature of the water around the cell. Water pressure, acting on the diaphragm of the clock starter, exerts a thrust on the zinc disk. The effect of pressure for a temperature of 75° F. and a salinity of 30 parts in 1,000 is shown in the graph. A pressure of about 240 pounds per square inch (540 feet of sea water) on the diaphragm of a clock starter will break the zinc disk at once. The effect of salinity variations between 15 parts per 1,000 and 30 parts per 1,000 is very small, but below 15 parts per 1,000 the delay time of the cell increases rapidly, and the cell cannot be used in water of lower salinity than 10 parts per 1,000, or in fresh water. The salinity of sea water is commonly 30 parts per 1,000. A change of water temperature of 10° F. changes the delay time inversely by approximately 15 percent.

To estimate the delay time of the cell in a practical case, consult the graph for the time delay at 75° F. for the depth in question. If the temperature is not 75° F., increase the time by 15 percent of this value for each 10° below 75° and decrease it by the same amount for each 10° above 75°. The delay time should then be accurate to ± 1 day.

Countermine shock and the impact of planting are not expected to affect the arming cell Mark 2 Mod 0. Severe vibration and shocks producing accelerations up to 1,000 g. have not damaged it.

Tests which simulate actual field conditions have been made to determine the effects of mud and sand on the operating time of the cell. In each test a clock starter equipped with an arming cell was completely covered with mud or sand and subjected to a pressure comparable to a depth of 50 feet. In these tests, the effect of the mud and sand upon the delay time was negligible, indicating that, in this respect, the arming cell is superior to a soluble washer.

The cell is not suited for use on extenders because the larger diaphragm area of extenders increases the total thrust on the cell and breaks the cell at lower pressures. In the case of extenders Mark 12 Mods. 3 and 4 the situation is particularly unfavorable because pressures not sufficient to break the cell may cause deformation of the disk sufficient to permit arming. It may be used on extenders Mark 14 Mods. 1, 2, 5, and 6 in place of a short-time soluble washer to prevent operation of the extender by impact when the mine strikes the water as it is planted. Since the effective area of the extender diaphragm is 4 square inches, and that of the clock starter diaphragm is 1.2 square inches, the delay period for the cell used on these extenders may be estimated by multiplying the actual depth by $\frac{3}{2}$ and proceeding as though the device were a clock starter at this calculated depth. Until further tests have been made, however, it is recommended that delayed operation not be relied upon when the cell is used on a Mark 14-type extender.



DEPTH OF WATER IN FEET
EFFECT OF DEPTH UPON TIME

Temperature, 75° F. Salinity, 30. Zinc disk, 0.016 inch thick. Resistor, 200 ohms.

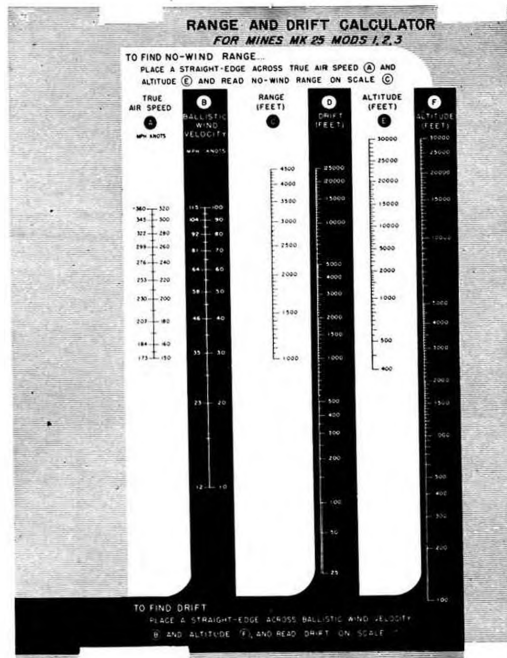
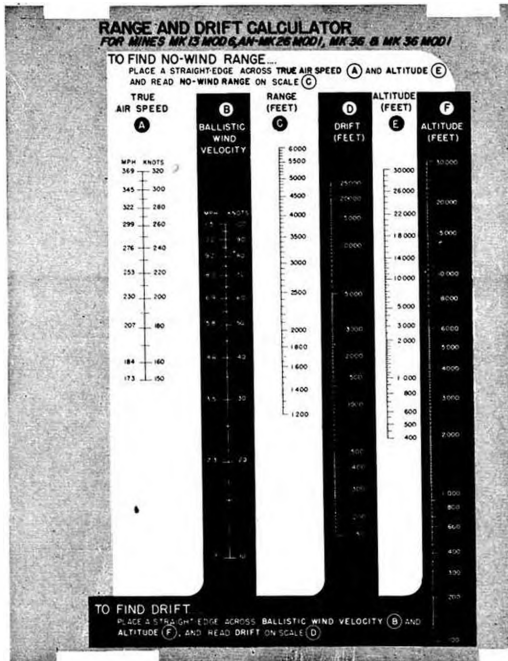
EFFECTS OF WATER ON PARACHUTES

QUESTIONS frequently arise as to the effects of water on the operating reliability of the parachutes used on United States Navy mines, and tests have been made to determine these effects in terms of launching conditions.

These tests indicate that water has two effects which cause failure of the parachute material. First, the strength of the material of the parachute is reduced to 40-45 percent. Secondly, the air permeability or porosity of the material (200 to 300 cubic feet of air per square foot of cloth per minute for a dry parachute) is reduced to practically zero. This latter effect can be illustrated by throwing water on a window screen; the small holes in the screen are closed by a film of water and flow of air through the screen is restricted.

The failure of a wet parachute, when the mine is launched at standard speeds of 200 or 210 knots, is due principally to the abnormally high forces on the fabric caused by the zero air permeability. Failure is also partially due to the loss in strength of the material, but tests indicate that this alone is not sufficient to cause a high percentage of failures at standard laying speeds.

Tests made on completely wet parachutes, installed on Mark 25 mines, to determine the maximum launching speeds have shown that the parachute Mark 2 (6-foot) will operate satisfactorily at 130 knots or less. Parachutes Mark 3 Mods. 2, 3, and 4 (9-foot) can be launched at 120 knots or less. These launching speeds are the maximum recommended speeds for wet parachutes, and occasional failures may still occur. It is noted that at these slower launching speeds the opening time of the parachutes is variable, and may amount to approximately twice as long as the opening time at higher speeds. The result is a greater dispersion of mines.



The above tests were concerned only with completely wet parachutes. However, other tests were made with parachutes which had been exposed to high relative humidities. The results of these tests show that no appreciable reduction in air permeability of the parachutes occurs, but there is a 35- to 40-percent loss in strength of the material. As mentioned above, this loss in strength usually does not result in parachute failure when the mines are launched under standard conditions.

Current assembly instructions indicate that parachutes should not be removed from their waterproof containers prior to use, as they are susceptible to fungus growth and the material is often destroyed by rotting. Field activities should not attempt to dry out parachutes, because temperatures of more than 150° F. will injure the sheer rayon fabric and lower temperatures accelerate the formation of mold and fungus growth in packed parachutes. Parachutes which have become damp should be discarded.



The effect of exposure to humidity and dampness on the Mark 1 parachute, which is made of the same material as the Mark 2 and the Mark 3, Mods. 2, 3, and 4

RANGE AND DRIFT CALCULATOR FOR MINES MK 25 MOD 0

TO FIND NO-WIND RANGE:

PLACE A STRAIGHT-EDGE ACROSS TRUE AIR SPEED (A) AND ALTITUDE (E) AND READ NO WIND RANGE ON SCALE (C)

TRUE AIR-SPEED (A)
MPH - KNOTS

349	320
345	300
342	280
339	260
239	240
235	220
230	200
207	180
184	160
173	150

BALLISTIC WIND VELOCITY (B)
MPH - KNOTS

18	100
24	90
32	80
41	70
51	60
62	50
74	40
87	30
101	20

RANGE (FEET) (C)

7000
6000
5000
4500
4000
3500
3000
2500
2000
1800
1600
1400
1200

DRIFT (FEET) (D)

14000
12000
10000
8000
6000
4000
2000
500
100
50
20
10
5
2
1

ALTITUDE (FEET) (E)

30000
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
1000
500
200
100
50
20
10

ALTITUDE (FEET) (F)

30000
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
1000
500
200
100
50
20
10

TO FIND DRIFT:

PLACE A STRAIGHT-EDGE ACROSS BALLISTIC WIND VELOCITY (B) AND ALTITUDE (F) AND READ DRIFT ON SCALE (D)

NOMOGRAPHS OF MINE TRAJECTORY DATA

Illustrated at left are nomographs of no-wind range and drift which have been constructed from experimental data obtained from actual mine drops. These nomographs will be of use in making quick estimates of mine flight characteristics.

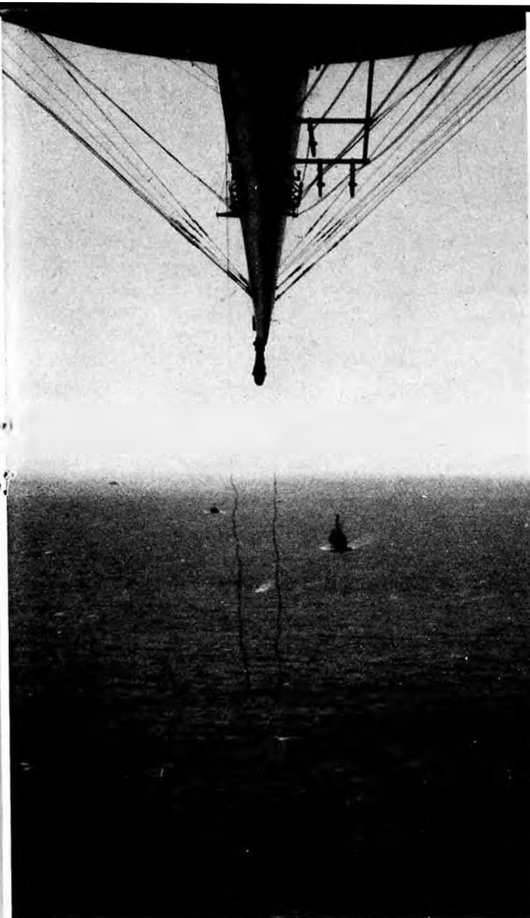
USE OF NAVY BLIMP FOR MINE DISPOSAL

FOR a short period last November a Navy blimp operated with minesweepers engaged in clearing the Key West minefield (Mine Warfare Notes 4-15). Although LTA craft have previously been employed in connection with minesweeping operations, notably in the Mediterranean, their duties were limited for the most part to the spotting of enemy minefields and the charting of drifting mines that were a menace to navigation. Blimps were also used in the European theater to guide sweepers on their first pass through the minefield and to prevent shipping from straying into danger areas. At Key West, however, it is believed that for the first time a blimp performed mine disposal duties while functioning as an integral part of a surface task unit. The blimp's success in this unusual mission is attested by the fact that in one 7-day operating period 22 mines were destroyed by the air-ship's 50-caliber machine gun with an average of 31 rounds per mine.

It was originally intended to employ the blimp only for spotting and photographic purposes. However, during an operational conference with LTA officers, the question arose as to whether or



not a blimp could effectively destroy mines on the surface with machine gun fire. There were no existing records of this having been attempted before in conjunction with mine disposal craft. It appeared that the blimp would have several distinct advantages over the surface craft: (1) a steady platform with good visibility regardless of rough seas; (2) maneuverability and wide range of speeds; (3) ability to cover large areas quickly; (4) ability to destroy mines which, due to wind, current, and heavy seas, might otherwise drift beyond the visual range of small craft. On the basis of these advantages and the enthusiasm of the LTA officers the blimp undertook the experiment.



For several days prior to the blimp's appearance at the scene of operations, the pilot accompanied the Task Unit Commander into the minefield to study existing methods of mine disposal and familiarize himself with the communication procedure. The Mine Disposal officer discussed the Mark 6 mine in detail, with special emphasis on the safety factors affecting the blimp's altitude and approach. As several swept mines had detonated on the surface while under fire, it was decided that a distance of 500 yards and an altitude of 300 feet would provide an adequate margin of safety and at the same time permit a sufficiently close approach for accurate fire.

As soon as the sweepers entered the field, the

blimp took station as nearly as possible over the center of the echelon. The mine disposal craft were deployed along the flanks. When a mine was cut, the sweeper reported it to the OTC who in turn assigned the blimp or one of the small craft to the task of disposal. The blimp maneuvered into position with engines idling, usually firing down wind. The machine gun was located in the top of the gondola just above the pilot, affording the gunner an unobstructed view. One or two short bursts were generally sufficient, especially in rough weather when the lapping waves would quickly fill the case. On calm days it was necessary to pierce the mine very close to the water line. The blimp would linger until certain that the mine was sinking and then move on to her next assignment.

The blimp functioned very effectively as a mine disposal craft. The Task Unit commander also believed that it would serve a useful purpose as an observation point from which to direct the mine-disposal operations, since it afforded such a good view of the area. However, no attempts was made to put this idea to a test as the blimp was unable to remain with the Task Unit for a long enough time.

Since no mines detonated as a result of the blimp's fire, it was impossible to determine whether or not the safety margins of altitude and approach would have been sufficient to provide adequate protection from the blast impact of a mine explosion. For that reason the facts pertaining to the blimp's suitability for this type of duty are somewhat inconclusive. However, as observed under the conditions existing during the Key West operation, the blimp was as successful as the surface craft at mine disposal, and, in rough weather, much faster and more efficient.

FLOATING MINES OFF THE WEST COAST

In recent weeks, there have been numerous reports of floating mines off the West coast of the United States. In one area, as many as seven were reported within a period of 10 days. The most likely explanation for their presence in United States waters is that they broke loose from Japanese defensive minefields and were carried by currents across the Pacific. Most of the mines sighted or recovered were covered with sea growth,

indicating that they had been in the water for a considerable period of time.

Positive identification of these mines as to nationality and type has been impossible in many cases, but it is considered probable that nearly all of them are Japanese. This supposition is borne out by the following facts: (a) The Mine Disposal Officer, Thirteenth Naval District, recently rendered safe several mines found on West coast beaches and definitely identified them as JB's (Mine Warfare Notes 4-45, p. 26); (b) several of the mines sighted off the coast answered the JB description and also detonated when fired upon, indicating that, like the JB, they contained a charge which was very sensitive to gunfire.

NEW BD OR MD DESIGNATORS

In order that the records of enlisted personnel who are trained in bomb or mine disposal may show more readily their special qualifications, two new designators have been established by BuPers Circ. Ltr. 81-45 (NDB, 31 March, 45-314). Graduates of the Bomb Disposal School, Washington, D. C., will have the designator (BD) added to their rating, while graduates of the Mine Disposal School, Washington, D. C., will be identified by (MD).

TRANSFER OF MINESWEEPERS TO PACIFIC DUTY

During the past 6 months, several divisions of AM's attached to the Atlantic Fleet have been transferred to duty in the Pacific. Before shoving off from the East coast, each division is ordered to report to Commander Service Squadron 5 in Norfolk for general overhaul of vessels and refresher training of personnel.

Prior to reporting to Norfolk, the division unloads depth charges and projector charges at the Mine Depot in Yorktown, where an advance representative of Commander Service Squadron 5 meets the ships at the dock and gives the commanding officers general instructions and information. The ships then proceed to Norfolk to unload gun ammunition and fuel and to begin the actual overhaul within the navy yard. Additional enlisted personnel are put on board so that

all hands can get leave during the 4 to 6 weeks yard availability.

While the ships are in the yard, Pacific charts, publications, and effective letters are obtained, teams attend CIC and ASW school, and individual men get ashore training in anti-aircraft firing, fire fighting, and any other specialties desired. A conference is held between the commanding officers of the sweepers and the operations and minesweeping officers of Service Squadron 5 to outline and coordinate the details of the 10-day underway refresher training. This training is usually set up as follows:

1 day:

A. M.—Magnetic compass compensation.

P. M.—RDF calibration (if equipped).

2 days: Degaussing calibration at Wolf Trap magnetic range off Cape Charles City. Measured mile calibration of pitometer log and speed curves, with and without gear streamed, at Kent Island off Annapolis.

1 day: Underway adjustment of moored minesweeping gear.

2 days: Overnight sweep formation exercises as a division with the division commander as OTC and the Service Squadron 5 minesweeping officer as observer. These exercises consist of maneuvers and tactics in formation (by visual signals and by voice radio), simulated (and sometimes actual) casualties to gear necessitating dropping out of formation and regrouping, and a simulated assault sweep. These operations are conducted outside of Cape Charles.

1 day: Gunnery exercises (surface, sleeve and drone).

1 day:

A. M.—Exercises at towing and being towed.

P. M.—Fueling at sea exercises, both from a tanker and to a YMS.

2 days: Alongside for departure inspection by Commander Service Squadron 5 and readiness for departure.

Before leaving Norfolk, the commanding officers are briefed on what to expect during the passage. Then upon actually reaching the Pacific they report to Commander in Chief, Pacific Fleet and Commander Minecraft, Pacific Fleet for further assignment.

MAGNET COILS FOR MK. 6 AUXILIARY CONTROLLERS

The Bureau of Ships is cognizant of the inadequacy of the square wave holding magnet coils originally installed in Mark 6 auxiliary controllers supplied 180-foot AM's and YMS's. These coils were designed by the manufacturer to operate on a 50 percent duty cycle. Therefore, if a coil is energized more than half the total time of operation of the Mark 6 auxiliary controller, overheating may result and insulation failure occur. In order to obviate this difficulty, the manufacturer was requested to provide a magnet capable of operating on a 100 percent duty cycle. Consequently, a new unit has been designed which consists of a new core and two of the original coils connected in series. These new magnets are now in production and have been installed in controllers recently shipped. Coils for all 250-volt Mark 6 auxiliary controllers are being distributed to the vessels by the Bureau of Ships. Additional stocks are being shipped to the Spare Parts Distribution Centers.

AUXILIARY STERN DAVITS FOR 180-FOOT AM'S

Vessels of the 180-foot AM class are fitted with two removable auxiliary stern davits to facilitate streaming and recovery of O-type minesweeping gear. These davits permit placing the otters in a ready position at the stern some time prior to the actual command to stream gear and also serve as a hanging position for the otters during temporary recovery of the gear.

When the otter is to be placed in a ready position at the stern for streaming, it is picked up by the crane from its stowage rack on the fantail and swung outboard to an auxiliary davit. The davit whip hook is connected to an eye on the otter strongback, or to the strongback itself, and the otter is shifted from the crane to the davit by taking a strain on the davit whip and easing off on the crane whip. The otter is two-blocked at the davit head well clear of the water. The crane is then trained to a position over the float stowage preparatory to streaming.

When it is desired to recover the gear temporarily, without stowing the otters on deck, the

sweep wires are recovered until the otters are in a position near the stern fairleader blocks. The davit whip hooks are connected to the *otter strongbacks* as described above and the otters are two-blocked well clear of the water. The otters may have to be lashed into the ship's hull to prevent damage from violent pounding but they will be high enough out of the water to permit the vessel to maneuver at high speeds.

CABLE FOR TOWING A MARK 4 (v) GEAR ASTERN

The Bureau of Ships is supplying 4-conductor cable in 1,600-foot lengths for towing A Mark 4 (v) gear astern. Stocks of this cable are being shipped to the Navy Yard, Mare Island, and to the Spare Parts Distribution Centers at Guam, Manus, and Pearl for issue to minesweepers. This cable is for specialized application against acoustic mines of certain sensitivities, and is to be employed operationally only in accordance with sweeping instructions to be issued when use of the gear is specifically directed by cognizant commands.

SHORE SPARES AND SHIPS' ALLOWANCES

Requisitions from ships and shore activities requesting shore spares for magnetic minesweeping generators and control equipment to fill ships' allowances are frequently received in the Bureau. Data on shore spares as contained in the pertinent machinery allowance lists are included only for information and should not be construed as authority to carry the items on board ship. When an item designated as a shore spare is required for immediate installation in a ship in an advance area, it should be requisitioned from the nearest Spare Parts Distribution Center or local spare parts activity. For ships operating in continental waters, the material should be requested from the Bureau of Ships. All shore spares which may now be aboard ships should be forwarded to the nearest Spare Parts Distribution Center or local spare parts activity. When a shore spare is used for immediate replacement, the defective item removed from the ship should be forwarded to the nearest Spare Parts Distribution Center or local spare parts activity for repair if repair is feasible.

GE SPECIAL SERVICE DIESEL GENERATOR

The majority of General Motors-General Electric Special Service Diesel-generators on Contract NObs-410 (used with Mark 6 auxiliary controllers) installed in YMS's and 180-foot AM's were originally shipped without covers on the end bells of the exciters. Subsequently, covers were distributed to some vessels, but a quantity still remains to be distributed. These are being shipped to the Naval Supply Depot, Mechanicsburg, for further distribution. All YMS's and 180-foot AM's requiring the covers should request a set from Mechanicsburg, referring to Contract NObs-410 and BuShips letter S81-1-(3) (660m) of 4 May 1945. A copy of each request should be furnished the Bureau of Ships (Code 660m).

DEPRESSORS FOR A MARK 2 GEAR

A recent Bureau of Ships letter (C-581 9 (920)-C-FN128 A2-1 of 11 May 45), promulgates instructions for the streaming arrangement



As long as we're short a paravane and Henderson, here, is willing—why not?

and use of special depressors with A Mark 2 (a), A Mark 2 (c), and A Mark 2 (f) (high speed) gear, when the gear is streamed from a special boom forward on AM and DMS vessels. The depressors are used in place of the streamlined weights previously supplied. Use of the special boom and depressor permits the gear to be towed at an adequate depth when streamed abeam.

Depressors are being shipped in sets of two (i. e., a ship's allowance) to the Navy Yards at Norfolk and Mare Island and the Spare Parts Distribution Centers at Pearl, Manus, and Guam. Depressors are not being provided for YMS vessels because the normal method of streaming A Mark 2 gear on such vessels is from the hammer box or the fantail. When A Mark 2 gear is towed astern, the standard streamlined weights submerge the gear to a suitable depth at speeds of which YMS vessels are capable.

ACKNOWLEDGMENT OF REPORTS

Acknowledgment of Mine Assembly Depot and Mine Detail Reports Received by the Chief of Naval Operations for the Period 10 May to 10 June 1945

Activity	Submitted by	Date written	Date received
<i>Mine assembly depot</i>			
No. 1	Lt. Comdr. E. C. Jones	4-20-45	6-10-45
do	do	5-22-45	6-1-45
No. 2	Lt. O. L. Osteen	5-22-45	5-28-45
No. 4	Lt. E. L. Atkins	5-20-45	5-20-45
No. 6	Lt. E. G. Anger	4-24-45	5-10-45
<i>Mine detail</i>			
No. 5	Lt. (jg) R. M. Gaze	5-21-45	6-6-45
No. 10	Lt. L. T. Seward (3)	5-7-45	5-23-45
	Lt. L. T. Seward	5-8-45	5-23-45
	Lt. L. T. Seward (15)	5-10-45	5-23-45
	Lt. L. T. Seward (3)	5-11-45	6-8-45
	Lt. L. T. Seward (6)	5-23-45	6-4-45
	Lt. L. T. Seward	5-28-45	6-4-45
	Lt. L. T. Seward (4)	5-30-45	6-8-45
	Lt. L. T. Seward	6-2-45	6-12-45
	Lt. L. T. Seward (7)	6-3-45	6-12-45
No. 13	Lt. (jg) N. M. Levinson	5-20-45	5-28-45
No. 14	Lt. N. H. Prade	4-19-45	5-14-45
do	do	4-27-45	5-25-45
do	do	4-22-45	5-25-45
do	do	4-27-45	5-11-45
do	do	5-3-45	5-26-45
No. 21	Lt. R. B. Kosok	4-20-45	5-30-45
No. 25	Lt. F. W. Brown	4-20-45	5-30-45
No. 28	Lt. (jg) N. D. Blair (7)	5-11-45	5-25-45
	Lt. (jg) N. D. Blair (5)	5-12-45	5-25-45
	Lt. (jg) N. D. Blair (2)	5-13-45	6-1-45
	Lt. (jg) N. D. Blair	5-14-45	6-1-45
	Lt. (jg) N. D. Blair (3)	5-15-45	6-1-45
	Lt. (jg) N. D. Blair	5-16-45	6-1-45
	do	5-16-45	6-10-45
Navy #28	Capt. E. R. Swinburne	5-20-45	5-26-45
Navy #37	Lt. M. J. Ehrlich	4-12-45	5-30-45
		4-25-45	5-21-45

BUREAU OF ORDNANCE PUBLICATION ON MINES AND MINING

The following are additions and corrections to the list of Bureau of Ordnance Publications contained in Mine Warfare Notes 4-45:

OP'S AND ORD'S

OP 1118—*Add to title:* (Change 4—12 April 1945.)

Add to list:

No.	Title	Cover date and date of last revision	Classification
OP 1394	Bombing Table for 2,000-pound Aircraft-Laid Mine Mark 25 Mod. 0.	1 Feb. 45	Restricted.
OP 1395	Bombing Table for 1,000-pound Aircraft-Laid Mines AS Mark 26 Mod. 1 and Mark 36 Mods. 0 and 1.	12 Feb. 45	Restricted.
OP-1459	Bombing Table for 2,000-pound Aircraft-Laid Mines Mark 25 Mods. 1, 2, and 3.	22 Mar. 45	Restricted.

OCL'S

Add to list:

No.	Title	Cover date and date of last revision	Classification
M6-45	Mines—Clock Starters Mark 1 Mods. 1 and 2.	1 May 45	Restricted.

NOLR'S

The following list supersedes the list of NOER's printed in Mine Warfare Notes 4-47:

No.	Title	Cover date and date of last revision	Classification
774	Mine Mark 18—Operational Characteristics.	Nov. 43	Confidential.
782 (1st rev.)	Mine Mark 25—Description and Instructions for Assembly, Handling and Planting.	1 July 44	Restricted.
841	Mine Mark 13 Mod. 5 (A-3 Mod. 1 Conversion Kit) Description and Instructions for Use.	{ 1 Jan 44 15 Aug. 44 }	Confidential.
859 (1st rev.)	Mine Mark 25—Operational Characteristics.	{ May 44 15 Oct 44 }	Confidential.
878	Field Mine Test Sets—Instructions for Using.	May 45	Confidential.
902, Part I and Part II	Mine Accessories, Description and Instructions for Testing.	15 Feb 45	Restricted.
915	Instructions for Installing British 44-Day Clock in U. S. Naval Mines.	Oct 44	Restricted.
938	C'D-14 Delayed Arming and Sterilizing Clocks for Mines—Forwarding of Instructions Pertaining to.	1 May 45	Confidential.
948	Mine (Practice) Mark 40 Mod. 0—Description and Instructions for Use of.	15 Nov 44	Restricted.
956	Conversion Kits Mark 9 Mod. 0 and Mark 10 Mod. 0—Description and Instructions for Use.	{ 15 Dec 44 28 Apr 45 }	Confidential.
860	Mines Mark 12 Mods. 3 and 4—Descriptions and Instructions for assembly.	15 Dec 44	Confidential.
940	Mine Mark 25 Mod. 1—Descriptions and Instructions for Assembly and Testing.	1 Apr 45	Confidential.

CONFIDENTIAL

No.	Title	Cover date and date of last revision	Classification
942	Mine Firing Mechanisms A-5 Mod. 0 and A-5 Mod. 1 Description and Instructions for Testing.	15 May 45	Secret.
943	Mine Mark 25 Mod. 2—Descriptions and Instructions for Assembly and Testing. 1	{ 1 Feb 45 15 Apr 45 }	Confidential.
944	Mine Mark 25 Mod. 2, Operational Characteristics.	1 Apr 45	Secret.
945	Mine Firing Mechanism A-6 Mod. 0—Description and Instructions for Testing.	5 May 45	Secret.
949	Mines (Practice) Mark 41 Mods. 0, 1, and 2—Description and Instructions for Use.	15 May 45	Confidential

BUORD MULTIADDEE LETTERS

Add to list:

No.	Title	Cover date and date of last revision	Classification
S 7 6 - 1 (Rev.)	Mines—Instructions for Modifying Mark 1 Type Clock Starters and Mark 12 and 14 Type Extenders of, to Reduce Galvanic Corrosion.	30 Apr. 45	Restricted.

DISTRIBUTION LIST MINE WARFARE NOTES 5-45

List 1.—a (3 copies to CinCPac, CinCLant) ; b, c (2 copies to ComFleetAirs) ; d, e, f, g, h, i, j, k, l.

List 2.—a (8) (Fleet AirWings only) ; f, g, h, u (all copies via air mail) ; q, u.

List 3.—a, d, h, i, j, w, w-1, x, y, y-1, z, z-1, aa, bb, ii, jj, kk, mm, pp.

List E-3.—(2 copies) (all copies via air-mail).

List 4.—a, d, i, j, w, x, y, z, aa, bb, ii, jj, kk, mm, pp.

List 6.—a.

List 7.—a (1), b, f, g, h, s, x, z.

List 8.—f, j, ce, ee.

List 10.—12 copies each, except Commander Northern Group—4 copies; Commander Patrol Forces, Inshore Patrol, Eighth Naval District—10 copies; and Commander Naval Local Defense Forces Twelfth Naval District—8 copies; ; jj, mm, (2 copies) ; u.

List 14.—a (25 copies).

Senior Member, Minesweeping Trial Boards, c/o Comdts., Naval Districts 1, 3, 4, 5, 6, 7, 8, 11, 12, 13.

Op-30-3M Special Distribution List No. 1 (District Minecraft).

Op-30-3M Special Distribution List No. 2 (Mine Disposal Units).

Op-30-3M Special Distribution List No. 3 (Special Degaussing activities).

Op-30-3M Special Distribution List No. 4 (Special Activities).

Excerpts from Minesweeping Reports

The following excerpts have been selected from various recent minesweeping reports because of their general interest, or to illustrate the practical application of established sweeping methods.



Mines visible from AM vessels in conducting sweep appeared to be moored at depths of 6 to 9 feet in water 15 to 20 fathoms deep with possibility of shallower plants in shallower water. It is also recommended that area be dragged before use as an anchorage to remove any plants deeper than the 60-foot sweep. Sweeping operations were limited to 60-foot depth in area because of limiting depth of water in northwest and southwest courses of field.

It is considered that this minefield as planted was extremely effective against surface vessels of all types. The extent of the field and disposition of mines in rows was not readily apparent until entire field was covered. Mines were planted in short rows staggered across field at irregular intervals . . .

CNO Comment: Where complete coverage with "O" type minesweeping gear cannot be obtained due to restricted maneuvering room, varying depths, or other causes, a bottom drag is recommended.

This command is of the opinion that a minefield is best swept in laps perpendicular to the axis of the line of mines. An attack parallel to the line can only result in sweepers frequently and simultaneously encountering a large number of mines and if obstructors and snag-lines are present, in the resultant confusion some sweeper is bound to find himself not only in unswept water but still heading into the minefield. Even if the mines are cut clearly and without undue drag on the gear, then a profusion of "Floaters" will ensue to menace the formation . . .

CNO Comment: See FTP 204A, paragraph 2552. In several operations sweeping has been slowed and sweepers endangered by the great number of floaters cut in a single pass. As many as 79 mines have been cut in 1 pass by a single sweeper formation.



Better doctrine is needed for employment of markers and dan buoys. Their use should be reduced to a minimum and they should be sunk or recovered by mincraft when swept or of no further value. Buoys adrift almost always result in alarm in the belief they are mines. While care should be exercised not to destroy markers serving a useful purpose, any vessel sighting a real mine on the surface should invariably make every effort consistent with its mission to sink it. There is a tendency for ships sighting suspicious objects in the water to report the location and depart the area, leaving mincraft the difficult task of relocating and disposing of the item, whatever it might be. Single aimed 40-mm. shots are effective in disposing of mines . . .



It is recommended that organized aerial mine spotting be made a part of future minesweeping operations in the Pacific, the sole mission of aircraft assigned for this purpose to be the search for and location of enemy minefields. It is believed that the organized operational use of aircraft for mine spotting in conjunction with minesweeping operations will be of great value in bypassing or sweeping of enemy minefields during amphibious operations. This has been proved in the Mediter-

anean where aerial mine spotting was successfully used to assist minesweepers off the coast of Italy and the southern coast of France. The search for mines should be the sole mission of slow-flying aircraft equipped to provide photographs of areas where smoke markers are dropped . . .



The following excerpts are from British sources:

THE "TAIL" OF THE DOG THAT BIT HIM!

An echo of the spirited action of three BYM's without asdic or depth charges, on the 26th of December last, in sinking two Midget submarines is now revealed in an official report. When the three ships were sweeping LL/SA in Q formation, a submarine was reported by BYMS (A) to port and at the same time BYMS (B) reported a periscope to starboard. BYMS (C) and (A) immediately gave chase to the Midget on their port side and BYMS (B) turned to starboard in attempt to ram his bird. The port side Midget started to zig-zag and an attempt to ram by the BYMS (C) glanced off. BYMS (A) rammed but the submarine continued on its way. BYMS (C) then turned to ram again and opened fire with Oerlikon and small arms with repeated hits. The submarine then stopped and remained on the surface. To make sure of his prize, BYMS (C) then proceeded to take a turn round the submarine with his LL cable, which caught the conning tower in the bight. BYMS (C) was then able to bring the Midget under his stern by hauling in his LL tail. Wires were made fast to the submarine in an attempt to take her in tow but the towing wires parted as the submarine foundered. The starboard Midget began to zig-zag at 5 knots, but when BYMS (B) was one cable off, the conning tower hatch opened and a German was seen frantically waving his arms. The BYMS struck the Midget just forward of the conning tower and she passed under the bow of the minesweeper and reappeared on the other side to finally sink. The one survivor clung to the LL tail and was taken prisoner . . .

SUCCESS OF AERIAL MINESPOTTING

Preceding the operations of the 12th MSF in clearing a channel Piombino to Leghorn, the Flo-

tilla's navigating officer made an air reconnaissance in a Walrus of the area to be searched before the operations commenced. Numerous conical floats were observed; some on the surface. The position of the watching floats was then fixed by an M/L. The Walrus further cooperated by dropping smoke floats indicating the extremity of the mine lines. The assistance of this air spotting was so valuable that the area Fighter Wing was approached and further air spotting assistance was arranged for all subsequent operations . . .



Aircraft on patrol reported seeing a large number of mines 5 miles North of Cherbourg on the 28th in the vicinity of a declared dangerous area. Next day another air patrol reported 20 mines 5 miles NNW of Le Treport. So far this area has been unexplored by minesweepers and is likely to be heavily mined. At the request of A. C. Dover, a dangerous area (QZX 1536) was then declared within a circle of 2½ mile radius. This is another example of the value of aircraft cooperation in spotting mines although, in this particular case, there is some suspicion that the reported mines may turn out to be boom-defense buoys . . .



The minesweeping forces in the Firth of Forth were provided with a cheer this week in detonating a groundmine on the 3d, 3½ miles East of the Bass Rock Light during routine sweeping. The mine is thought to be of an old lay *probably of November 1940 vintage* . . .

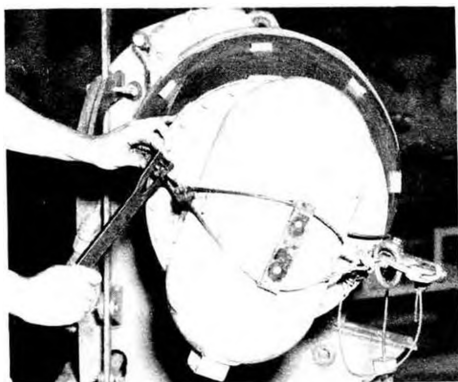


ASSEMBLY AND PLANTING OF MK. 25 MOD. 0 DRILL MINE

At the completion of the course in Mine Assembly and Test at the Naval Mine Warfare School, several drill plants are conducted by the students. The purpose of these drills is to test the student's ability to prepare mines for planting and to give him visual evidence of his accomplishment under somewhat realistic conditions.

The photographs illustrate certain phases of the procedure followed in the drill plants of magnetic mines. One mine is assigned to a group of about four students who completely assemble and test it in the laboratory and install the firing indicator float with its release pistol. The mines are then

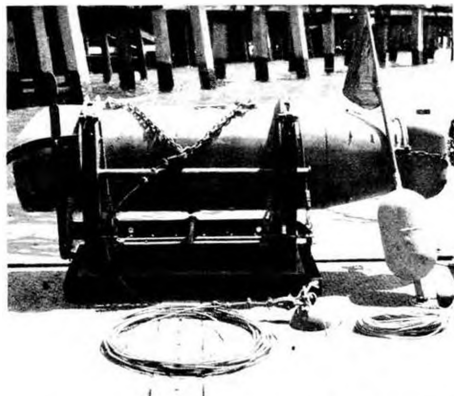
loaded on a laying barge, equipped with a recovery line and a marker buoy, and launched. After the arming time has elapsed, the laying barge is used to sweep the mines which are located by the marker buoys. Firing of the mine is indicated by the surfacing of the indicator float which is released from the mine when the operation of the mine mechanism fires the primer in the release pistol. Following firing (or failure to fire) the mine is recovered by means of the recovery line attached to the marker buoy, washed down with fresh water, and disassembled in preparation for the following plant.



1. Installing firing indicator float.



2. Hoisting mine aboard minelayer.




3. Recovery lines ready; mine ready for launching.



4. Launching recovery buoy.

Mines reported swept by U. S. Forces



	GROUND	MOORED	TOTAL
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As of 15 May 1945	435	7,618	8,053
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Since 15 May 1945:

North France	2		
Italy		41	
Corsica		13	
Philippines		211	
Okinawa		75	
Palau		58	
Tarakan, Borneo	9		29

Total as of 15 June 1945	446	8,045	8,491
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Including: 1 United States controlled mine, 11 Jap controlled mines.

2 United States and British influence mines.

These NOTES can be of maximum service only if operating personnel freely contribute items of interest. Accordingly, contributions are invited, and may be addressed directly to the Director, Base Maintenance Division, Mine Warfare Section, Naval Operations, Navy Department, Washington, D. C., with a copy to immediate Commanding Officer.

Contributions of all types are welcome, including comments on articles which have appeared in the past. Suggestions for the improvement of equipment or techniques and personnel accounts of operations. Clear photographs or negatives to accompany these articles are especially desired.

