United States Fleet

ANTI-SUBMARINE

BULLETIN

April • 1945

COMMANDER-IN-CHIEF U.S. FLEET

SECRET

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C. M. Cooke Jr.

C. M. COOKE, JR.
Chief of Staff

This issue of the *United States Fleet Anti-Submarine Bulletin* reports operations as known through 4 April 1945.

United States Fleet ANTI-SUBMARINE BULLETIN

VOL. II NO. 11
APRIL 1945

REVIEW OF M/V LOSSES AND A/S OPERATIONS DURING MARCH

Submarines Sunk or Probably Sunk........*13*
Merchant Vessels Lost (Submarine Action)...*13— 56,679 Gross Tons*
Merchant Vessels Lost (All Causes)........*31—102,198 Gross Tons*

An enemy submarine sunk for every Allied merchant vessel lost by submarine action was the ratio maintained in March by Allied anti-submarine forces, although the month's convoy traffic in the North Atlantic was particularly heavy (see "Convoys—Review of the Month" on page 35).

Nine of the 13 Allied merchantmen sunk were sent to the bottom in the Biscay-Channel and North Sea areas. Seven of the nine vessels sunk were in convoy. The German undersea campaign in those waters was costly, however, inasmuch as six of their submarines were destroyed. Among merchant vessel losses due to other enemy action was one ship captured and towed away by the enemy.

Eleven German and two Japanese submarines were sunk or probably sunk during the month, all but one by surface craft action. This figure is lower than the February total when 17 enemy submarines were sunk.

Biscay-Channel and North Sea Areas

Submarines Sunk or Probably Sunk........ *6*
Merchant Vessels Lost (Submarine Action).... *9—36,447 Gross Tons*
Merchant Vessels Lost (All Causes).........*24—75,287 Gross Tons*

Most of the March activity was concentrated in the busy European sea-lanes, growing more important to the Allied cause as the pressure against Germany from the West became heavier throughout the month. On the 2nd a British and a Norwegian cargo vessel each went to the bottom of St. George's Channel as a result of torpedoing after their convoy was attacked while enroute to the U. K. from Halifax. All hands except three from the British vessel were saved.

Farther north, in the Irish Sea, a British escort group picked up radar and asdic contact on the night of the 7th. The escorts illuminated the target and discovered the Schnorchel and periscope of a U-Boat in the act of diving. The escorts attacked and sank the submarine, identified as U-1302 from objects recovered.

The next day, on the 8th, a midday attack on a convoy bound for Gibraltar from U. K. resulted in the torpedoing and sinking of a British cargo vessel in the English Channel. All hands were landed at Newhaven.

The second U-Boat sunk in these areas was U-681, which went down under the well executed bombing and strafing of a U. S. Navy Liberator bomber on the morning of the 11th off the Scilly Isles. Prisoners were picked up, but two of them died before the rescue ships made port. A detailed account of this attack appears on pages 26 and 27.

About two and one-half hours later, British escort ships were investigating an oil patch off Beachy Head in the Strait of Dover. They got an asdic contact, attacked several times and recovered debris including German first-aid kits, letters, locker keys, and books. It is thought the U-Boat destroyed in these attacks had been a previous victim of a mine explosion.

Although no attack against a U-Boat has been reported in this area, 48 survivors of U-260 landed at Galley Head, Ireland, on the 13th. The crew on being interned announced their craft was sent to the bottom as the result of a bombing attack.

Torpedoing and sinking of a small Swedish vessel three miles off Berwick, England, on the 14th led to the sinking of another U-Boat. The Swedish vessel was in a coastal convoy and was hit early in the afternoon. One of the British ships escorting the convoy gained asdic contact and attacked. A cylinder containing a rubber dinghy was picked up. Four days later, British escorts searching the scene gained asdic contact on a bottomed object and after attacking picked up quantities of wreckage with German markings. The U-Boat is considered destroyed.

On the 19th a British cargo vessel traveling independently was torpedoed and sunk off Zeebrugge. Thirty-one survivors were put ashore at Ostende. Two days later a U. S. cargo carrier in a channel convoy was torpedoed and sunk nine miles off Lizard's Head. There were no casualties.

Another British cargo vessel in a channel convoy was sunk by torpedo on the 22nd six miles off Land's End. Fifty-one survivors landed at Sennen.

A British escort continued the string of U-Boat kills when, on the 26th, 17 minutes after a small Dutch merchantman was torpedoed and sunk, she fired Hedgehogs on a contact about three and one-half miles from the torpedoing. The submarine sunk was identified by the sole survivor as U-399. This action occurred in the early morning just off Lizard's Head.

The final submarine action of the month occurred in the North Sea when a small British cargo vessel was torpedoed and sunk while traveling independently near Yarmouth. Twelve survivors were landed in that port. Eight of the crew are still unreported.

In other enemy action, German E-Boats destroyed three small British ships. Eight other merchant ships flying British, Belgian, French, Greek and U. S. flags were destroyed after hitting mines. Seven of these casualties occurred in the North Sea and one in the Biscay-Channel. The most unusual incident of the month took place on the night of the 8th, when a German raiding party boarded a small British merchantman in Granville on the Normandy Coast, made her fast to a German ship and towed her away.

A German midget submarine torpedoed and sank a British cargo vessel traveling in a channel convoy off Ramsgate on the 26th. There were 21 survivors. Two additional Allied vessels, both small, were lost, one presumably by enemy action and the other by marine casualty.

A Norwegian armed trawler was torpedoed by a German submarine and sunk in the North Sea on the 10th, while on the 17th a Canadian minesweeper was lost in a similar action in the Southwest Approaches. The Commanding Officer and 35 others survived. A U-Boat rammed and sank a small Swedish craft on the 8th, off the Swedish coast. Six of the crew were rescued.

Throughout these two areas seven vessels including a Canadian frigate were damaged by submarine, E-Boat and mine action. All arrived in port.

Atlantic Area (Other Than Biscay-Channel and North Sea Areas)

Submarines Sunk or Probably Sunk............5
Merchant Vessels Lost (Submarine Action)......2—5,846 Gross Tons
Merchant Vessels Lost (All Causes)............4—9,873 Gross Tons

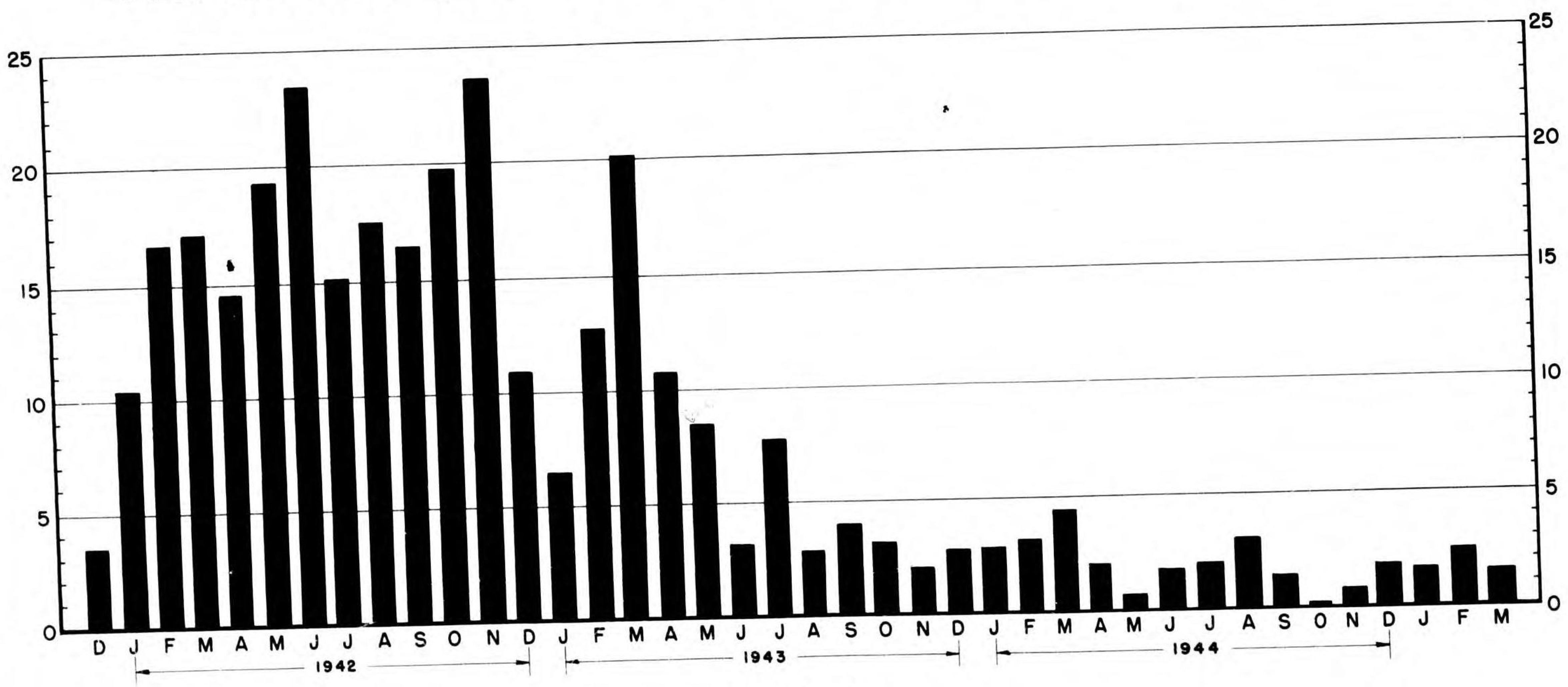
In other Atlantic areas sinkings of German submarines outweighed merchant vessel losses. On the 10th a British cargo vessel was torpedoed and sunk approximately 600 miles east of Recife, Brazil. She was enroute to Durban from New York and was sailing independently. The sinking, which occurred at night, was the first in the Brazilian Area since last July. Thirty-three survivors were landed at Cabedello, Brazil, on the 22nd and the remaining 25 of the crew were picked up by a British merchant ship on the 16th and landed at Montevideo on the 26th.

The only other U-Boat casualty in the Atlantic occurred on the 16th when a small convoyed British cargo ship enroute to U. K. from Iceland was torpedoed and sunk. She went down three miles west of the Isle of Skye. All her crew were rescued. Two other merchantmen were sunk as a result of marine casualty.

Other losses included a British trawler, sunk on the 3rd near Reykjavik with only one known survivor of a crew of 25. Two small vessels were sunk during the month as a result of marine casualties.

Submarine sinkings began on the 18th. A U. S. destroyer-escort group attacked a U-Boat off Halifax, using Hedgehog and magnetic depth charges in approximately 70 fathoms. German papers, first-aid kits, deck planking and human remains were picked up.

DAILY AVERAGE M/V TONNAGE LOSS PER MONTH BY SUBMARINE (IN 1000 TONS)



The U-Boat is considered sunk. A report of this action is on pages 31 and 32.

On the night of the 20th, in full moonlight, a Canadian warship sighted and rammed a Schnorchel 12 miles off Inishtrahull, Ireland. Surface craft searched the area and on the 23rd, 33 survivors from the U-Boat were picked up from dinghies about five miles from the scene of the ramming. The submarine was identified as U-1003.

Wreckage of German origin and quantities of diesel oil were recovered after a British frigate attacked and sank a U-Boat on the 27th off Cape Wrath, Scotland.

The next day two ships of a British escort group picked up an asdic contact 20 miles northeast of Barra Island. Their Hedgehog and depth charge attacks brought to the surface diesel oil, and later the body of a German seaman was recovered.

Another U-Boat sunk was attacked off Cape Wrath on the 30th. Hedgehog explosions were heard five and one-half seconds after the projectiles entered the water, and diesel oil was found on the surface. Later attacks produced wreckage and photographs of a German U-Boat crew.

Barents Sea Area

Submarines Sunk or Probably Sunk..........0
Merchant Vessels Lost (Submarine Action).....2—14,386 Gross Tons
Merchant Vessels Lost (All Causes)...........2—14,386 Gross Tons

Most of the losses in the Barents Sea area were from one convoy, in which two U. S. merchantmen and one British escort vessel were destroyed on the 20th as the Russia-bound group neared Kola Inlet. The first U. S. vessel to go down was torpedoed in midmorning. She was towed for a time by a Russian escort ship before sinking. One of her crew was killed and three are missing.

The other vessel was taken in tow by the British after she was struck, but was ordered abandoned. Russian tugs then towed her to the beach, where she later settled and sank. Four of her crew are missing.

Three hours later a British sloop escorting the convoy was hit by torpedo and sank with a loss of 150. Five officers and 55 ratings were landed in Russia.

Pacific Area

Submarines Sunk or Probably Sunk...........2
Merchant Vessels Lost (Submarine Action)......0
Merchant Vessels Lost (All Causes)...........1—2,652 Gross Tons

The closing days of March brought the destruction of two enemy submarines resulting from attacks by U. S. destroyers in the Okinawa vicinity. The first kill occurred on the 22nd, when a destroyer launched a depth charge attack that forced a Japanese I-class submarine to the surface. The U. S. ship then rammed and sank the submarine. (Continued on page 6)

MERCHANT VESSELS LOST WORLD-WIDE 1945 ALL CAUSES*

Period	Submarine		Aircraft		Surface Craft		Enemy Mine		Other Enemy Action		Marine Casualty		Total	
	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons
JANUARY	11	56,988	1	7,176	1	2,365	4	16,352			16	30,784	33	113,665
FEBRUARY	15	65,233	1	7,177	2	3,889	5	18,031			7	15,199	30	109,529
MARCH	13	56,679			3	4,813	8	31,539	3	2,347	4	6,820	31	102,198
TOTAL	39	178,900	2	14,353	6	11,067	17	65,922	3	2,347	27	52,803	94	325,392

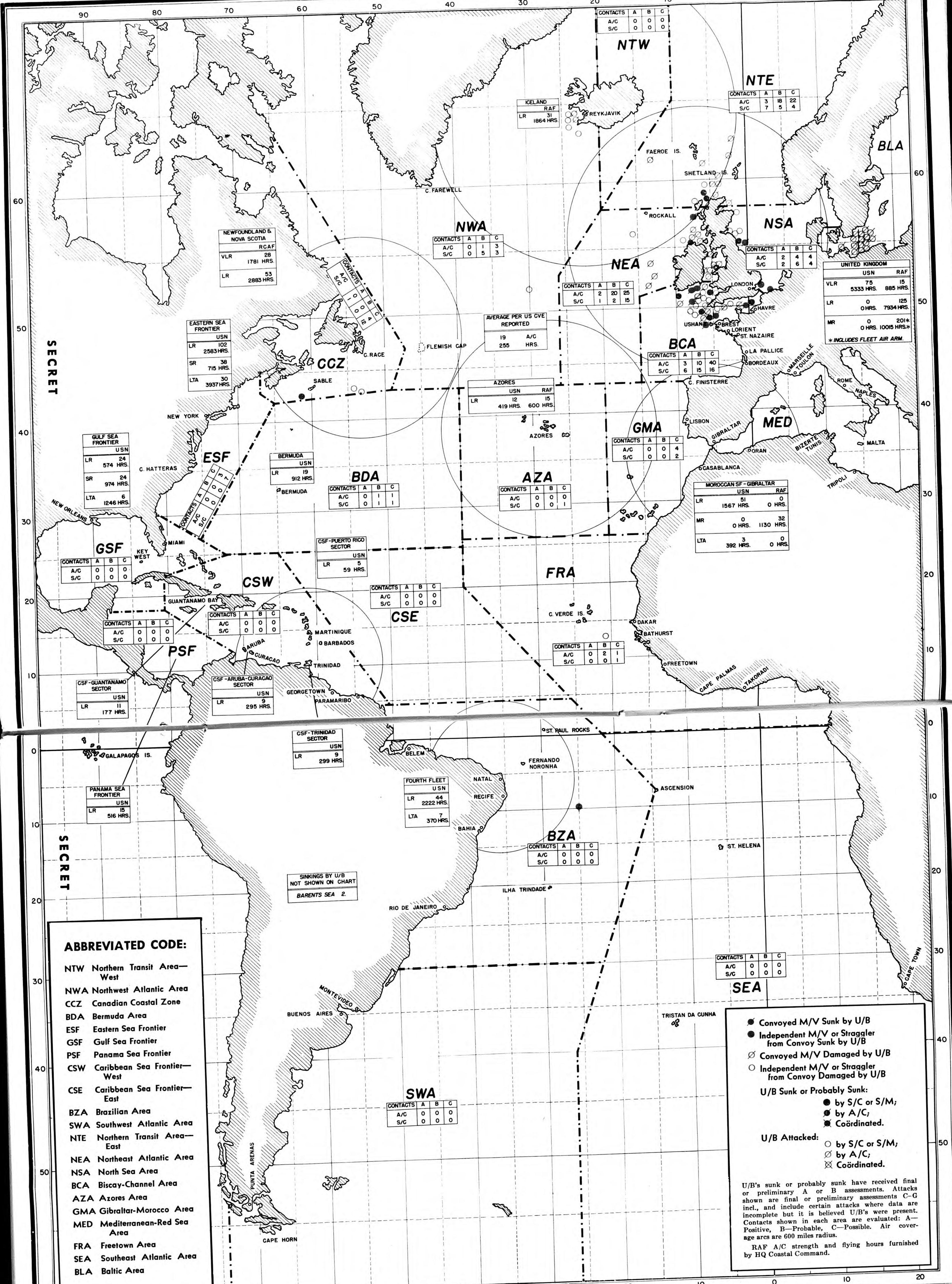
MERCHANT VESSELS LOST WORLD-WIDE 1945 ALL CAUSES BY TYPES*

Period	Tanker		Cargo		Passenger		50–1,000 G. T.		Total	
	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons
JAN. thru MARCH	7	51,220	63	264,229			24	9,943	94	325,392

CONVOY STATUS M/V LOST WORLD-WIDE 1945 BY ENEMY SUBMARINE*

Period	Independent		In Convoy		Straggler		Total	
	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons	No.	Gross Tons
JANUARY	4	12,360	7	44,628			11	56,988
FEBRUARY	3	14,958	12	50,275			15	65,233
MARCH	3	11,742	10	44,937			13	56,679
TOTAL	10	39,060	29	139,840			39	178,900

*Statistics on M/V apply only to Allied and neutral vessels, and do not include any in the service of the Axis.



OPERATIONS—MARCH 1945

REVIEW *(Continued from page 3)*

On the last day of the month a patrol plane sighted a surfaced submarine southwest of Okinawa. Two U. S. destroyers homed to the scene by the plane carried out depth charge attacks. The submarine was forced to surface and was destroyed by gunfire from the attackers while the plane provided illumination.

The only merchant vessel loss recorded in the Pacific was a small Chilean cargo vessel which burned and sank off the Peruvian coast. A U. S. destroyer was torpedoed on the 26th and on the 27th a U. S. minesweeper struck a mine and sank. Both actions occurred off Okinawa. Eleven officers and 90 enlisted men were rescued from the minesweeper.

None of the attacks mentioned in this article had received a final assessment as of 4 April 1945.

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U-BOAT TACTICS AND TRENDS

March U-Boat Operations

U-Boat kills in the Atlantic were maintained at the gratifying level of February with all of them occurring in coastal waters. The number of U-Boats operating in the Atlantic, particularly of outbound boats, increased gradually throughout March.

Most of the U-Boat attacks on shipping occurred in United Kingdom coastal waters. (See "Review of M/V Losses and A/S Operations during March" on pages 1-3 for details.) Five U-Boats were accounted for in the same areas, the majority by surface anti-submarine groups and one by a U. S. Navy Liberator. The crew of a fifth landed from rubber boats in southern Ireland and it is surmised that the U-Boat was a mining casualty.

In the North Channel survivors were taken from dinghies of another U-Boat which had been rammed while Schnorcheling by a Canadian frigate. Late in March a British escort group achieved a signal success in sinking three U-Boats in the Minch-Cape Wrath area, where a small merchant ship had been torpedoed earlier in the month.

Contacts off the east coast of England and Scotland indicated the presence of up to four U-Boats on patrol during the month. A U-Boat kill south of the Firth of Forth on 14 March followed almost immediately upon the torpedoing of a small merchant vessel in a coastal convoy. The appearance in this area of Type XXIII U-Boats is suggested by the statement of U-Boat P/W's captured in mid-March that at least two of this new type had been operating in the North Sea.

A patrol of one or two U-Boats continued off Reykjavik throughout March without success other than the sinking of a trawler at the beginning of the month. In the Kola area an attack by a U-Boat pack on

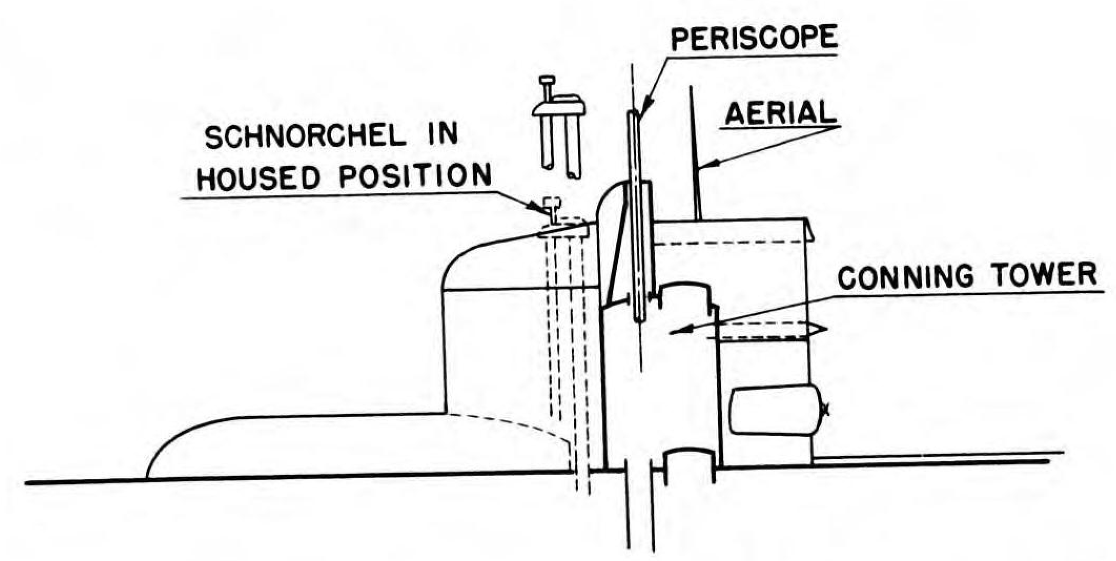


Diagram of conning tower of Type XXIII U-Boat, taken from a British secret publication. See diagram of hull on page 14, December 1944 U. S. Fleet Anti-Submarine Bulletin.

a Murmansk-bound convoy resulted in the sinking of two Liberty ships and an escort on 20 March.

It is estimated that four U-Boats moved into North American coastal waters replacing two others whose patrols were entirely unsuccessful. One of our DE groups operating against the first of these arrivals achieved a kill on 18 March southwest of Sable Island. The report of this action is on pages 31 and 32. Numerous contacts toward the end of the month indicated the probable presence of two U-Boats on patrol in the Gulf of Maine and another off Halifax. At the end of the month a fifth U-Boat was estimated westbound in the Grand Banks area.

By the end of March two of the U-Boats enroute from the Far East were estimated nearing Norwegian waters. A third, which torpedoed POINT PLEASANT PARK northwest of Capetown on 23 February, probably passed to the eastward of the Azores, as there were several contacts indicating such a passage. It is considered that the last of this group torpedoed BARON JEDBURGH west of Ascension on 10 March and OKLAHOMA about 900 miles northeast of the Amazon on 28 March.

All Japanese submarine activity in the Pacific occurred during the latter part of March in the Okinawa area where one of our destroyers was torpedoed. Several promising attacks by our anti-submarine forces in the same area resulted in at least two probable submarine kills.

The Battle of the Atlantic

In view of the increasing gravity of the European situation, it is evident that the enemy will make every effort to throw his maximum naval strength into the final stages of the Battle of the Atlantic. It is felt, therefore, that the number of U-Boats operating in the Atlantic will continue to increase during the remainder of the European War. How fast this increase will occur is, of course, dependent upon the number of U-Boats which can be made ready. Inasmuch as no older types

have been laid down in more than a year, the main reservoir of U-Boats is the new Type XXI. Until the latter begins operations, the increase in the number of U-Boats in the Atlantic probably will be gradual and dependent upon the number of older type previously used in the Baltic, and those still working up, which can be made ready for Atlantic cruises. When the Type XXI does become operational there should be a marked increase in Atlantic U-Boats as it is likely that a large number of the new type will come out together.

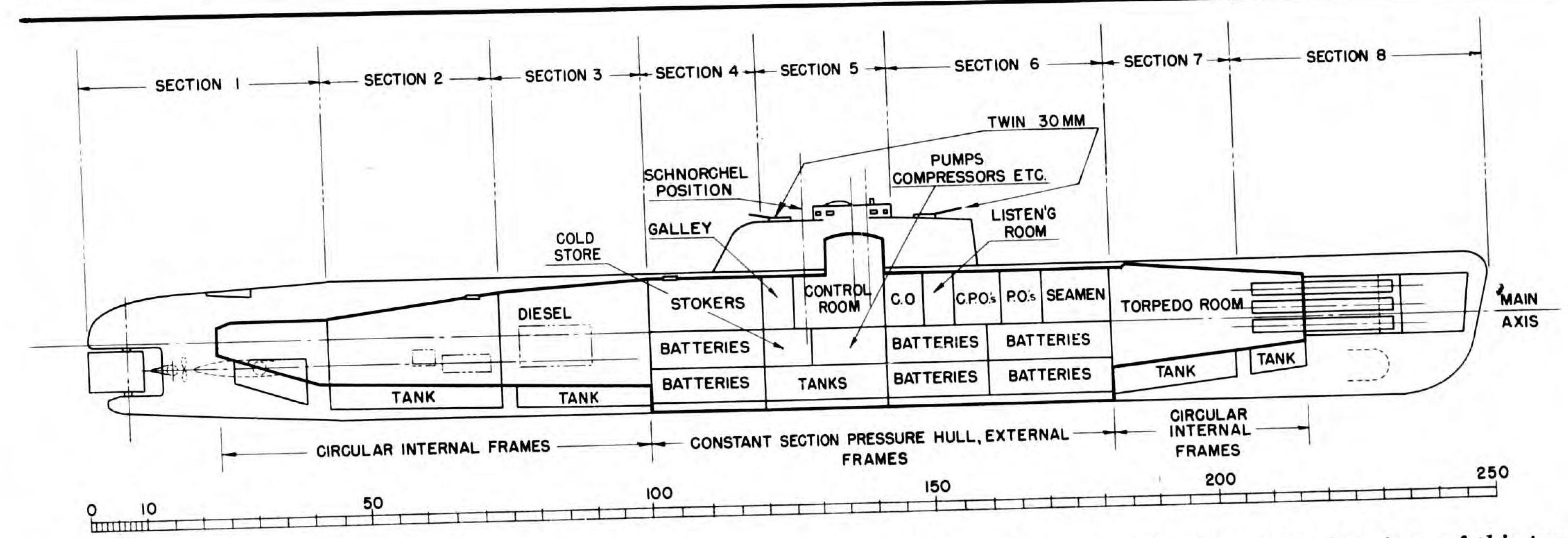
The problems which face Admiral Doenitz, however, are becoming increasingly more complex and difficult. The loss of the East Baltic ports immediately created serious problems of maintenance and repair for the remaining German bases in the western Baltic and Norway. With these bases in easy range of Allied aircraft, and with a greater bombing effort being diverted to these targets, it will take all the enemy's skill and ingenuity to maintain a large U-Boat fleet at sea. In addition, the steady loss of industrial centers and areas of vital raw materials cannot but have an increasingly profound effect upon the U-Boat war.

U-Boat Trends

U-Boat operations for April are expected to follow the general trends of the past several months with the main enemy thrust directed against shipping in the approaches to Britain. Increased activity is anticipated in the western Atlantic between Hatteras and Newfoundland during the latter half of April. Indications that several Type XXIII U-Boats already have operated in the North Sea presage increased activity by this type off the east coast of Britain in the near future. Use of single U-Boats of this type to gain operational experience suggests that similar operations may be undertaken by one or more of the larger Type XXI before the main group is sent out. The interrogation of a U-Boat prisoner of war recently captured tends to strengthen this supposition. He stated that a Hamburg-built Type XXI under an experienced commander and with a specially selected crew was expected to sail shortly on a war cruise to determine the capabilities of this new type.

At the beginning of April there appeared to be a general falling off in U-Boat activity around Britain. This decline probably was due mainly to the departure of a large number of U-Boats, which arrived in patrol areas during the first part of March, before the freshly outbound U-Boats had arrived in operating areas. Numerous contacts indicate up to ten U-Boats in the general area south of Ireland, possibly patrolling convoy lanes in that area. About six are estimated at focal points between the English Channel and North Scotland with several more off east coast ports in the North Sea. Up to fifteen mostly outbound appear to be in transit between Faeroe-Shetland passage and West Ireland.

In addition to one weather reporter about eight other U-Boats are estimated outbound in the central North Atlantic. It is probable that the majority of these will operate in the western Atlantic. Four U-Boats are estimated operating in the western Atlantic between Hatteras and Nova Scotia. The South Atlantic and Indian Ocean remain quiet with no indications of any U-Boats at sea in these areas. In view of the successful passage recently of a group of cargo U-Boats from the Far East, it is likely that other German U-Boats will be used for cargo exchange between Germany and Japan in the near future.



Sectional diagram of the Type XXI prefabricated U-Boat, taken from a British secret publication. Other drawings of this type appear on page 7, October 1944 U. S. Fleet Anti-Submarine Bulletin.

ENEMY SUBMARINE OPERATIONS

SPRAY, STEAM COMPOSE SCHNORCHEL HAZE; PERISCOPE MAY BE HIDDEN

The photographs opposite on page 9, reprinted from the January 1945 *Coastal Command Review*, illustrate the "smoke" or "haze" produced by a Schnorcheling U-Boat (discussed on page 21, February 1945 *U. S. Fleet Anti-Submarine Bulletin*).

The haze appears to be composed entirely of spray and steam, produced by the hot gases exhausted under pressure below the surface of the water.

Not only does this haze reveal the presence of a U-Boat, but it may obscure the U-Boat's periscope lookout, thus masking the approach of Allied aircraft.

The wake, apparent in both photographs, is believed to be caused mainly by the exhaust, rather than by the passage of the Schnorchel through the sea; consequently it does not provide an indication of speed. In these photos, the U-Boat probably is proceeding at a normal Schnorcheling speed of four to six knots.

The extent both of the wake and the Schnorchel haze will depend on the r.p.m. of the diesels, and the depth of the exhaust outlet. The influence of varying climatic conditions is still to be calculated.

M/V AND U/B DISTRIBUTION BY AREAS—MARCH*

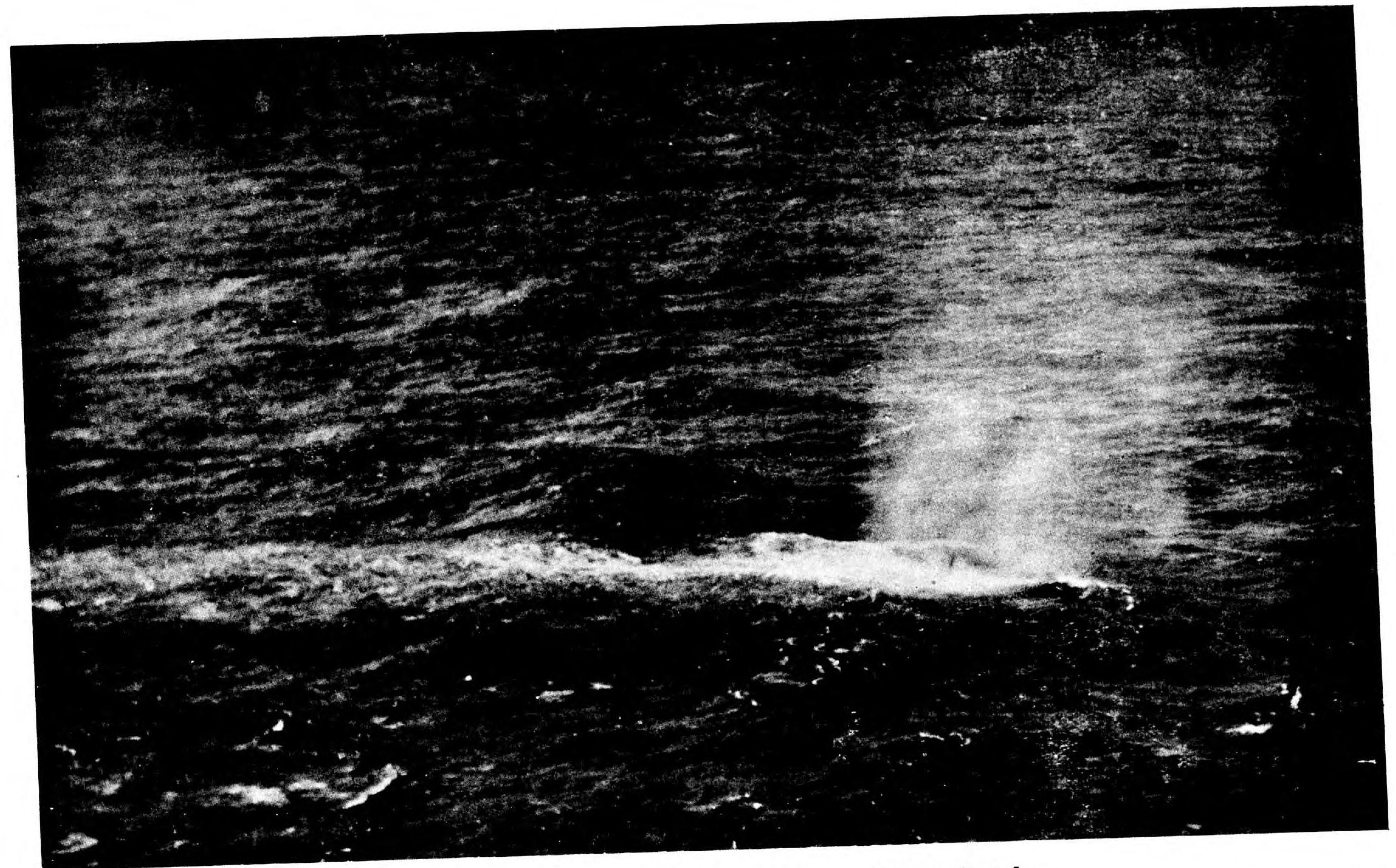
		Average No. Subs Estimated for the Area during Month	Distribution of Allied M/V's at sea, average no. in area during the month	
			Independent	Convoyed
ESF	Eastern Sea Frontier	0	70.2	75.8
CSW	Caribbean Sea Frontier, West	0	70.8	13.1
CSE	Caribbean Sea Frontier, East	0	9.1	0.3
BDA	Bermuda Area	0	50.2	189.2
CCZ	Canadian Coastal Zone	1	1.4	101.2
NWA	Northwest Atlantic Area	6	2.1	173.7
GSF	Gulf Sea Frontier	0	95.4	5.5
PSF	Panama Sea Frontier	0	18.2	2.9
BZA	Brazilian Area	0	36.5	2.2
FRA	Freetown Area	1	21.8	3.6
AZA	Azores Area	1	10.5	98.0
GMA	Gibraltar-Morocco Area	0	14.6	77.3
NEA	Northeast Atlantic Area	13	1.7	101.2
BCA	Biscay-Channel Area	10	1.1	71.9
NTE	Northern Transit Area, East	15	0	2.2
NTW	Northern Transit Area, West	1	0	2.2
SEA	Southeast Atlantic Area	2	15.3	0
SWA	Southwest Atlantic Area	0	9.3	0
NSA	North Sea Area	2	—†	—†
	TOTAL (ATLANTIC)	52	428.2	920.3
IND	Indian Ocean	0	160.9	5.7
MED	Mediterranean-Red Sea Area	—†	14.8**	20.4***
NPA	North Pacific Area	—†	25.0	0
CPA	Central Pacific Area	—†	325.9	186.5
SPA	South Pacific Area	—†	36.9	6.0
SEP	Southeast Pacific Area	—†	51.0	0
SWP	Southwest Pacific Area	—†	36.8	98.4
	TOTAL (PACIFIC)	—†	475.6	290.9

*Compiled by an actual daily count of the number of vessels or U-Boats plotted at sea at a given time in each area, adding the daily counts and dividing the sums by the number of daily counts, to obtain the average population for the month.

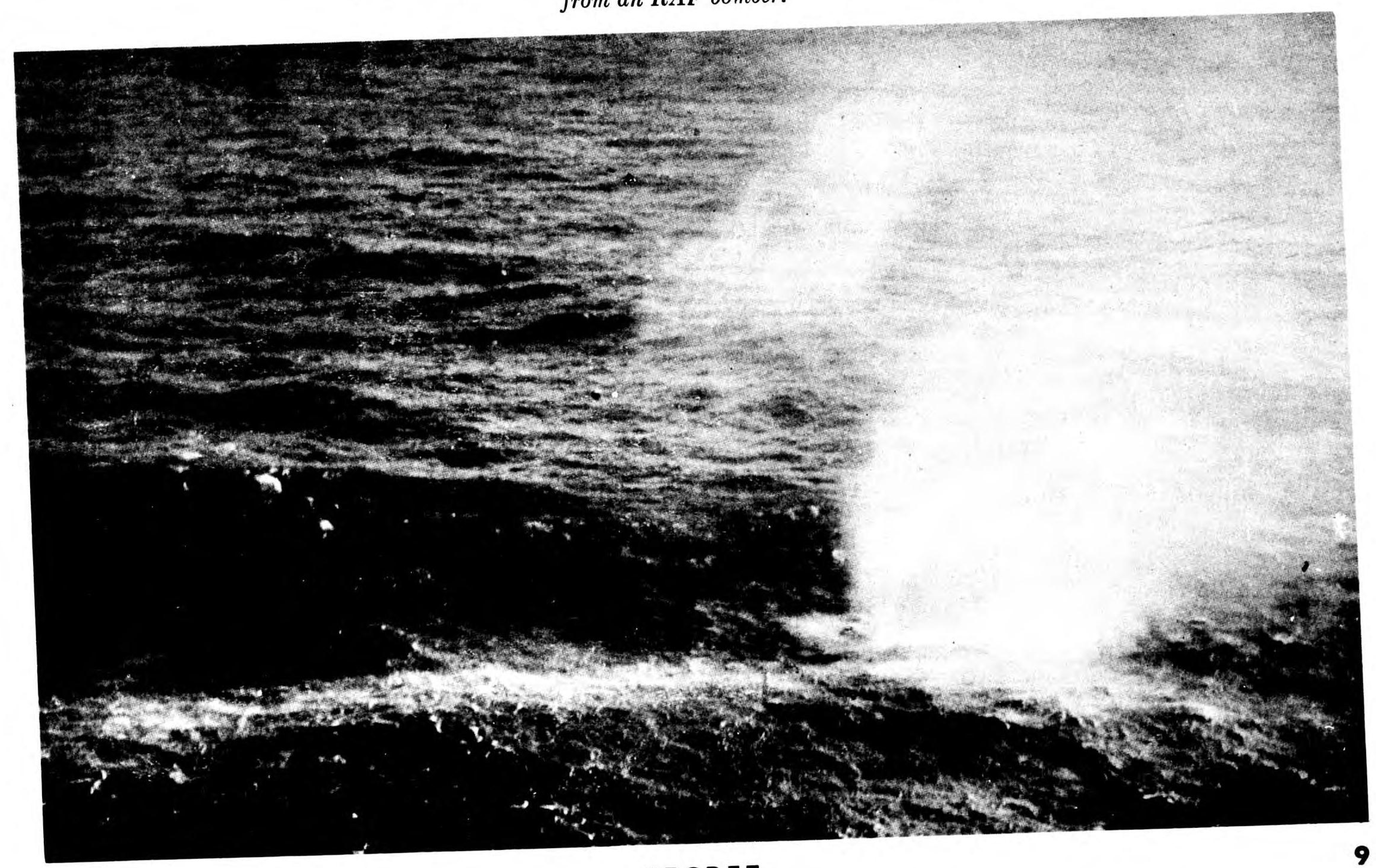
**Represents independent shipping in the Red Sea only. The figure for independent shipping in the Mediterranean is not available.

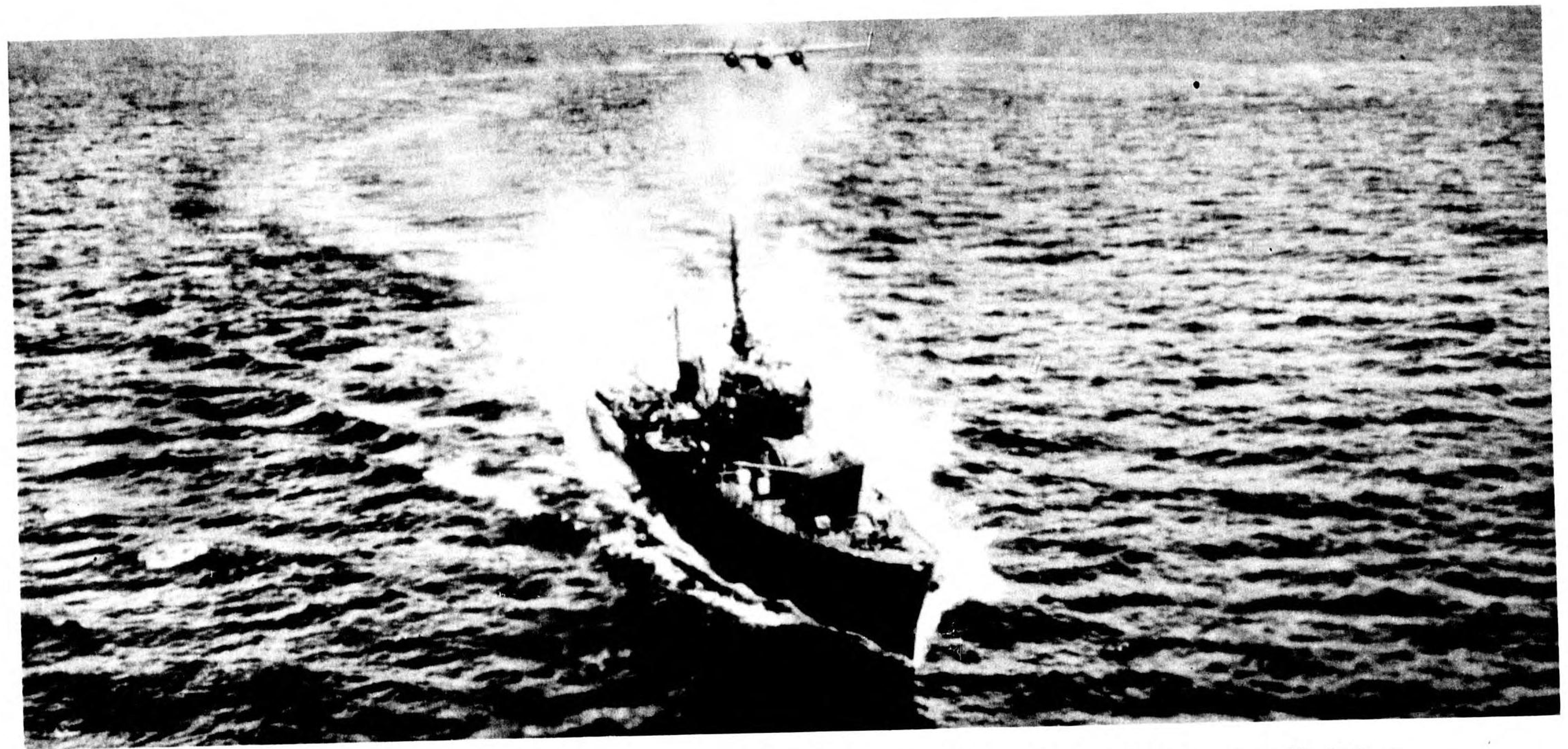
***All the convoyed shipping is in the Mediterranean Sea.

†Figures not available.

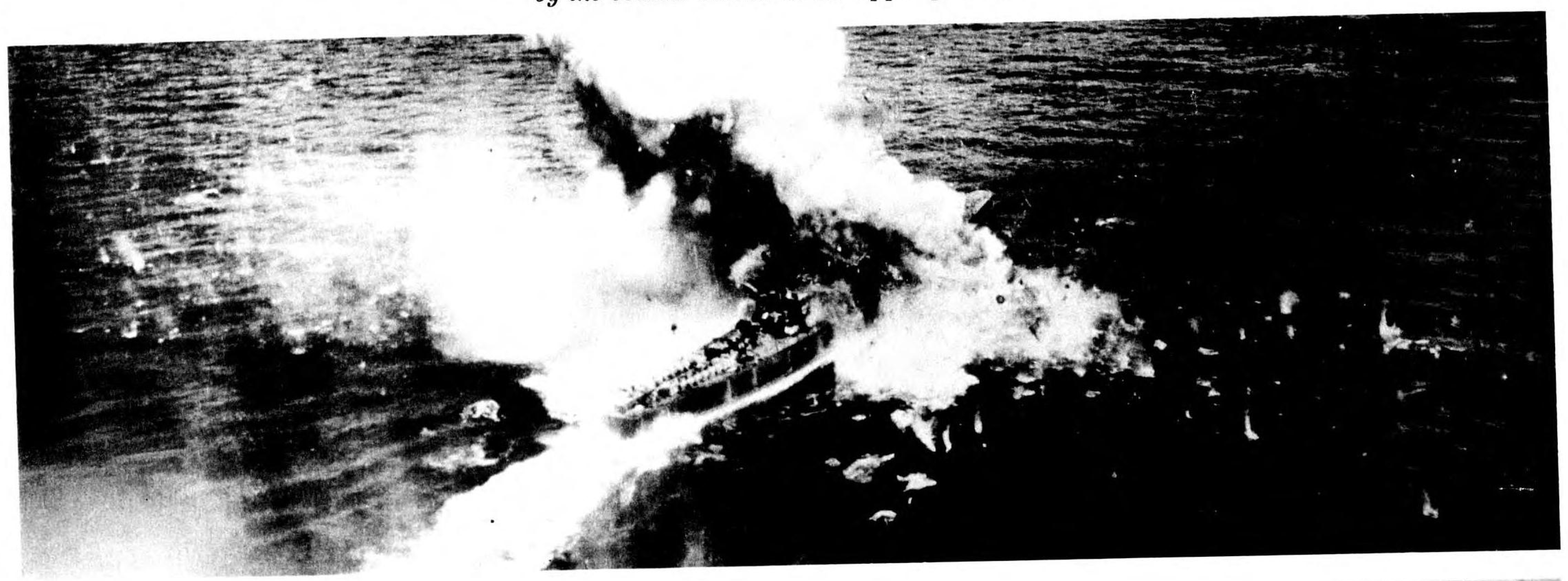


U-Boat Schnorchel haze is shown in these photographs taken from an RAF bomber.





What may have been an excellent quarter photo of a Japanese Kaibokan No. 1 PF was "altered" (below) by the bomber shown in the upper picture.



A Japanese patrol frigate (PF) of the Mikura class.

ENEMY SUBMARINE OPERATIONS

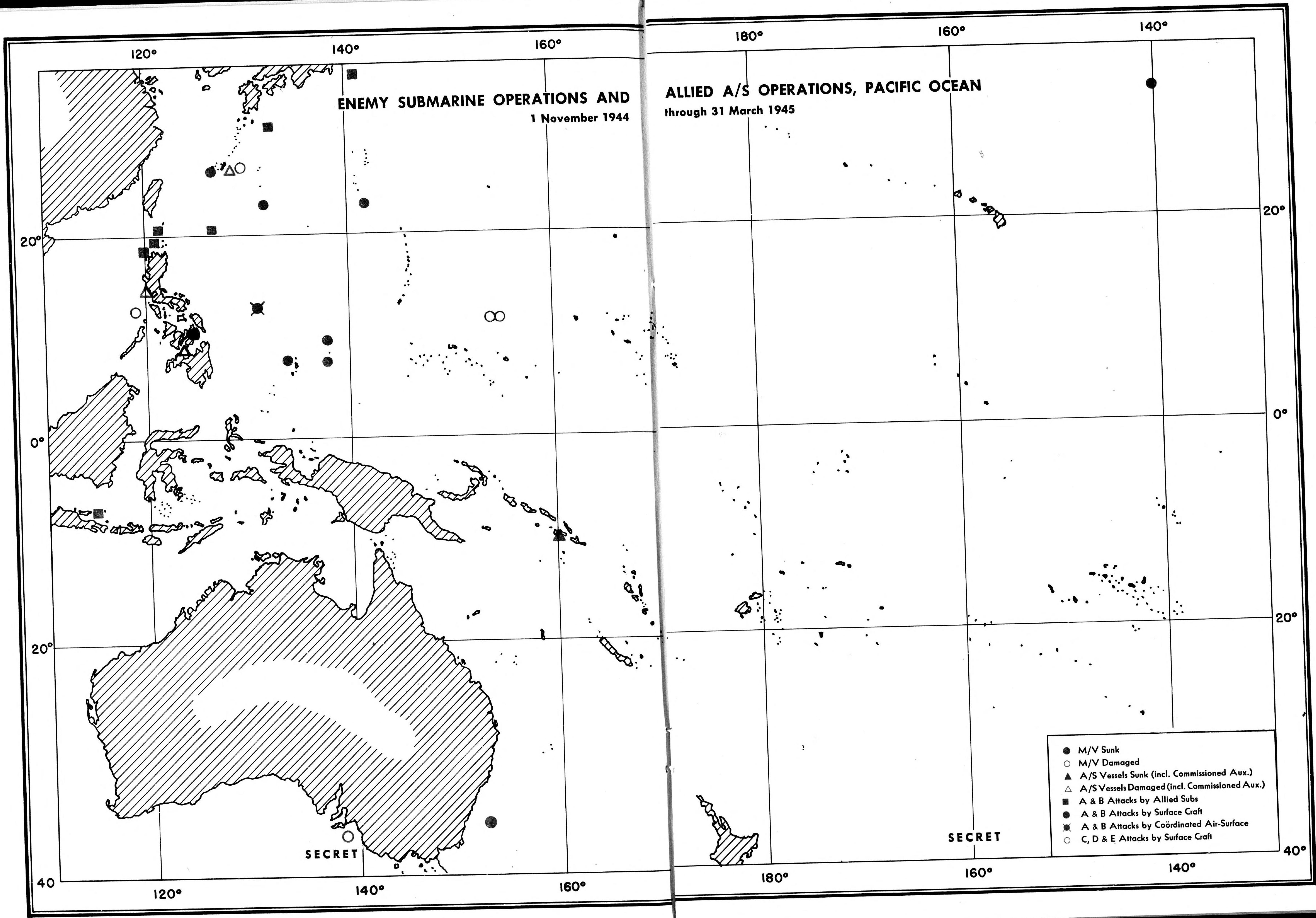
CHARACTERISTICS OF JAPANESE PATROL FRIGATES (PF's)

Below is the first compilation ever presented in which the names of Japanese patrol frigates (PF's) are shown in conjunction with characteristics derived from photo identification. The information published here brings up to date and enlarges on the article, "Japanese Patrol Frigates (PF's)," which appeared on pages 19 and 20 of the July 1944 *U. S. Fleet Anti-Submarine Bulletin.*

The patrol frigate is considered the most important Japanese escort craft. More than 100 are afloat and new ones are being completed at the rate of approximately five every month. Photographs of two of the types are shown opposite on page 10.

Class	*Ships Afloat and Complement*	*Tonnage, Dimensions, Speed*	*Armament*	*Engines and Steering*	*Radar and Sound*
Shimushu	Shimushu, Kunajiri, Hachijo, Etorofu, Oki, Tsushima, Fukue, Amakusa, Manju, Kanju, Kasado, Ukuru, Okinawa, Amami, Aguni, Ioshima* Built 1940–1944. Complement 150	860 tons 245′ length 30′ beam 9′ draft 19.7 knots	Three Single 4.7″/50 cal. DP in shield mounts Four 25 mm. guns Ten K-guns. One Y-gun Four paravanes Minetracks	Two diesels Two Kampon boilers Two screws 4,500 H.P.	Radar RDF Sonar
Mikura	Mikura, Miyake, Kurabashi, Nomi, Chiburi, Yashiro, Shonan, and others Built 1943–1944. Complement 149	1200 tons 275′ length 35′ beam 11′ draft 16 knots	Two twin 4.7″ DP in shield mounts Number of 25 mm. guns, K-guns and Y-guns not known		Radar Radar search receiver Sonar
Kaibokan # 1	Nos. 1, 3, 9, 13, 17, 19, 23, 25, 27, 29, 31, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, and others Built 1944. Complement 131	800-900 tons 220′ length 27′ beam 11′ draft 14 knots (estimated)	Two 4.7″/45 cal. DP in shield mounts Five 25 mm. guns Two 13 mm. guns 12 K-guns One Y-gun	Two 8 cyl. direct-drive diesels Two 4-foot high-pitched screws Hydr. steering with single balanced rudder	Radar Radar search receiver Sonar
Kaibokan #2	Nos. 2, 4, 6, 8, 12, 14, 16, 18, 22, 26, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 112, 130, and others Built 1944. Complement 141	900-1,000 tons 260′ length 31′ beam 14 knots (estimated)	Two 4.7″ DP guns Six 25 mm. guns (triples) Five 13 mm. guns 12 K-guns	Steam turbine drive	Radar Radar search receiver Sonar

*Name not definitely known


ENEMY SUBMARINE OPERATIONS AND ALLIED A/S OPERATIONS, PACIFIC OCEAN
1 November 1944 through 31 March 1945
120°
140°
160°
180°
160°
140°
20°
0°
20°
40°
M/V Sunk
M/V Damaged
A/S Vessels Sunk (incl. Commissioned Aux.)
A/S Vessels Damaged (incl. Commissioned Aux.)
A & B Attacks by Allied Subs
A & B Attacks by Surface Craft
A & B Attacks by Coördinated Air-Surface
C, D & E Attacks by Surface Craft
SECRET
SECRET

CHARACTERISTICS OF JAPANESE SUBMARINES

This table cancels a similar table published on pages 10 and 11, March 1944 *U. S. Fleet Anti-Submarine Bulletin.*

Class	Ships Afloat	Tonnage and Dimensions	Max. Speed (Surf. and Sub.)	Max. Range (Miles)	Bow and Stern Tubes and Guns	Radar and Sound	Engines	Diving Time (Seconds)	Max. Depth (Feet)	Complement	Other Equipment and Information
I-5	I-5 and I-6. Completed 1932–1935	1955 and 1900 tons, 320′ L.O.A., 29′6″ beam, 15′5″ draft	19 knots (surfaced) 8 knots (submerged)	12,000 at 14 knots	4B, 2S One 5.5″ gun One 25 mm. gun*	RDF, Echo-ranging gear	Two 7 cyl. diesels, 6,000 H.P. Two electric, 1,800 H.P.	—	262	97	One float plane.
I-7 (I-8)	I-8. Completed 1938	2230 tons, 359′ L.O.A., 30′ beam, 14′5″ draft	22 knots 8 knots	15,000 at 14 knots	6B Two 5.5″ guns Four 25 mm. guns*	RDF, Hydrophones, Echo-ranging gear	Two 10 cyl. diesels, 6,000 H.P. Two electric, 1,800 H.P.	70	328	100	One float plane.
I-9 (I-10)	I-10, I-12, I-13, I-14, I-15, I-1 (2nd). Completed 1941–1945	2400 tons, 373′ L.O.A., 31′ beam, 14′ draft	22 knots 8 knots	16,000 at 16 knots	6B One 5.5″ gun Two 25 mm. guns*	RDF, Hydrophones, Echo-ranging gear	Two 10 cyl. diesels, 6,000 H.P. Two electric, 1,800 H.P.	80	328	98	One float plane.
I-15 (I-17)	I-26, I-36, I-37, I-38, I-41, I-44, I-45. Completed 1941–1945	2100 tons, 344′ L.O.A., 30′ beam, 16′ draft	20 knots 8 knots	14,000 at 16 knots	6B One 5.5″ gun Two 25 mm. guns	Radar, RSR, RDF, Hydrophones, Echo-ranging gear	Two 10 cyl. diesels, 6,000 H.P. Two electric, 2,000 H.P.	120	328	87	One float plane.
I-16	I-46, I-47, I-48, I-49. Completed 1944	2180 tons, 348′ L.O.A., 30′ beam, 16′ draft	22 knots 8 knots		8B One 5.5″ gun	Radar, RDF, Hydrophones, Echo-ranging gear	9,000 H.P.	120	328	85	Midget submarine.
I-52 (I-54)	I-54, I-56, I-58, I-60. Completed 1944–1945	2800 tons*	16 knots 7.9 knots	8,000 at 14 knots	2B	Radar			295		
I-53	I-53, I-55, I-57. Completed 1944	2800 tons*	16 knots 7.5 knots	8,000 at 14 knots	2B*	Radar			295		
I-121	I-121, I-122. Completed 1927–1928	1,142 tons, 279′6″ L.O.A., 24′6″ beam, 14′ draft	14 knots 6 knots	12,000 at 10 knots	4B, 2S minelaying shafts One .30 cal. AA gun	Hydrophones	Two Kampon, 2,400 H.P.	80	246	66	
I-153	I-155 (1927), I-156 (1929), I-157 (1929), I-158 (1928), I-159 (1930)	1,635 tons, 331′ L.O.A., 26′ beam, 16′ draft	19 knots 8 knots	7,000 at 14 knots	4B, 2S One 4.7″ DP gun One 25 mm. gun	RDF, Hydrophones	Two Sulzer diesels, 6,000 H.P.	81	200	82	
I-161 (I-162)	I-162. Completed 1930	1,638 tons, 321′ L.O.A., 26′ beam, 16′ draft	19 knots 8 knots	7,350 at 14 knots	4B, 2S One 4.7″ DP gun One 25 mm. gun	RDF, Hydrophones	Two Rosenblatz diesels, 6,000 H.P.	81	246	79–82	
I-165	I-165. Completed 1932	1,638 tons, 321′ L.O.A., 27′ beam, 16′ draft	20 knots 8 knots	8,000 at 14 knots	4B, 2S One 4.7″ DP gun	RSR, RDF, Hydrophones	Two Sulzer diesels, 6,000 H.P. Two electric, 1,800 H.P.	66	246	79–82	
I-176	I-177, I-186. Completed 1942–1943	1,609 tons, 335′ L.O.A., 27′ beam, 13′ draft	23 knots 8 knots	8,000 at 16 knots	6B One 4.7″ gun* Two 25 mm. guns*		Two diesels, 8,700 H.P.		275	88	
I-351	I-351, I-352. Completed 1944–1945	1,600 tons*								76	
I-361	I-361, I-362, I-363, I-364, I-366, I-367, I-368, I-369, I-370, I-371, I-372. Completed 1944–1945	1,100 tons*								48	
I-400	I-400, I-401, I-402, I-403, I-405. Completed 1944–1945	3,000 tons*								142	Plane.
RO-35	RO-41, RO-43, RO-46, RO-47, RO-48, RO-50, RO-55, RO-56. Completed 1943–1945	950 tons, 255′ L.O.A., 24′ beam, 12′ draft	20 knots 8 knots	5,000 at 16 knots	4B Two 20 mm. guns			50	263	62	
RO-57	RO-57, RO-58, RO-59. Completed 1922–1923	889 tons, 245′ L.O.A., 24′ beam, 13′ draft	17 knots 8 knots	4,500 at 14 knots	4B One 3″ DP gun One 25 mm. gun	Hydrophones	Two 12 cyl. diesels, 2,400 H.P. Four electric, 1,200 H.P.		197	59–65	RO-57 and RO-59 have been unreported for some time.
RO-60 (RO-62)	RO-62 (1924), RO-63 (1924), RO-64 (1925), RO-67 (1926)	988 tons, 250′ L.O.A., 24′ beam, 12′ draft	15 knots 7.8 knots	6,000 at 10 knots	6B One 3″ DP gun One .30 cal. gun	Hydrophones	Two 8 cyl. diesels, 2,400 H.P. Two electric, 1,800 H.P.		197	58	
RO-100	RO-109, RO-112, RO-113, RO-115. Completed 1943	500 tons, 180′ L.O.A., 20′ beam, 12′ draft*	14 knots 8 knots	2,500 at 12 knots	4B Two 25 mm. guns	Hydrophones		100	246	38	
RO-500	RO-500 (ex-German). Completed 1943	740 tons, 244′ L.O.A., 21′ beam, 13′ draft	21 knots 8 knots	18,000 at 6 knots	4B, 2S One 37 mm. gun Four 20 mm. guns	Radar, RSR	Two 9 cyl. diesels, 4,400 H.P. Two electric, 1,500 H.P.	41	600	53	Built in Germany.

*Not definitely known.

ESCORTS' GUNFIRE SINKS U-300

On the morning of 22 February 1945, U–300, a 500-ton German submarine, was sunk by gunfire from HMS Recruit and HMS Pincher in position 36–24N/08–16W. U–300 was commanded by Oberleutnant Zur See Erich Hein, who did not survive.

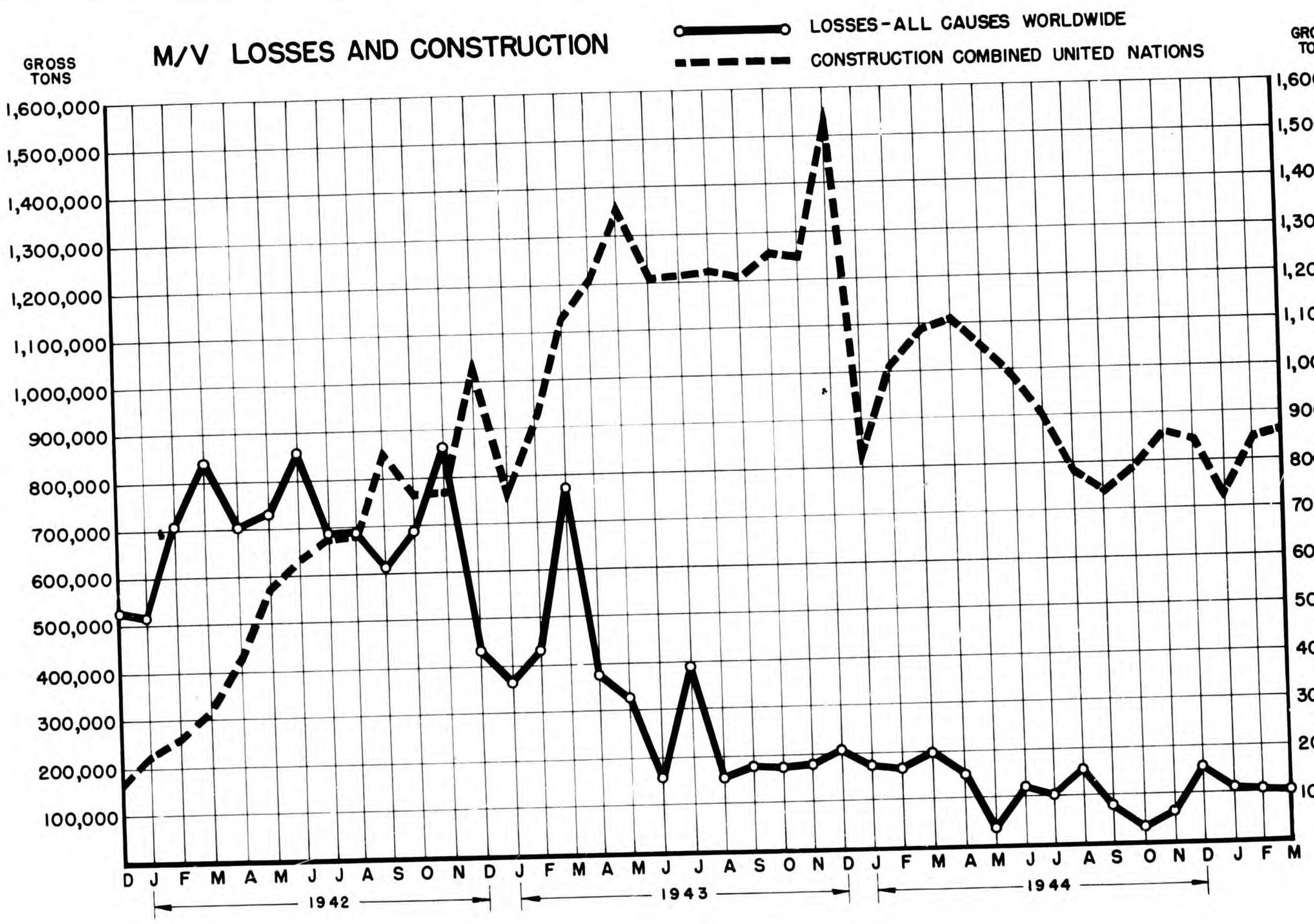
During his training period Hein was regarded as the "star" pupil, having always been first in all competitions, such as time for crash diving, and so forth. He was reputed to have been the "master snorter" of the U-Boat arm. U–300 was the second boat to be fitted with Schnorchel and on her second cruise Hein is reported to have crossed the North Sea—using this device—in nine days without surfacing. It was stated that although the majority of U-Boat commanders Schnorchel at about 250 r.p.m. (about six knots), Hein had Schnorcheled at more than 280 r.p.m. (seven to eight knots).

Hein's tactics using Schnorchel varied. At first he preferred to use the device at night, but later reversed this procedure and "snorted" by day even when aircraft were in the area.

Although U–300 was sunk by gunfire, a major cause of her destruction was a previous depth charge attack, probably by HMS Evadna. After leaving Trondheim, U–300 proceeded to a patrol area near the United Kingdom, but upon finding a large number of U-Boats already there, Hein requested, and received from U-Boat Command, permission to continue to an area near Gibraltar where Hein torpedoed two ships in a UGS convoy on 17 February 1945. Two days later, while submerged at a depth of approximately 120 feet, U–300 was suddenly depth charged, and three or four charges exploding close aboard caused extensive damage.

The pressure hull was fractured and the forward torpedo compartments filled with water. Both periscopes were put out of order and it appears probable that the sonar gear also was rendered inoperative. Some repairs were effected, the worst leaks being stopped with wooden plugs.

U–300 turned homeward, coming up to Schnorchel from time to time, but finding that after each "breather" she could dive only to depths which grew less and less. Finally, blind and deaf, the boat surfaced in the midst of a convoy and was destroyed by gunfire from two of the escorts.



FLIEGE-MÜCKE (TUNIS) DETECTION EQUIPMENT

It has been known for some time that surfaced German U-Boats were capable of detecting microwave radar, but the efficiency of their equipment for this purpose was not definitely known. With the fall of Toulon, items of the equipment became available and Anti-Submarine Development Detachment, Atlantic Fleet, has now completed tests on the Fliege-Mücke (Tunis) detection equipment. The tests were designed to determine the maximum interception range of the German equipment when operated against airborne microwave search radar and to analyze its operational characteristics for possible counter-measures.

Description of Receiver

The Fliege-Mücke interception receiver is a device used by the enemy to detect microwave search radar and to provide them with early warning against attack. Illustrations and a brief description of the equipment appear on page 9 of the January 1945 *U. S. Fleet Anti-Submarine Bulletin*. It consists of two detectors, one capable of receiving transmissions in the S band and the other in the X band. The S-band detector consists of a ten-centimeter dipole backed up by a parabolic reflector. The X-band detector consists simply of a three-centimeter horn. The radar transmission picked up by these antennae are detected by separate crystals and the resulting output is amplified by a video amplifier and used as a warning signal. Because the detectors are directional, the antennae have to be rotated continuously through 360 degrees to give an all around warning. In order to accomplish this without the use of coaxial transmission line bearings, sufficient transmission line is used to allow wrapping a full turn around the rotating mast. The array has quick-acting clamps by which it is fastened to the submarine's D.F. loop antenna.

How the Tests Were Made

The equipment was mounted on a ship in a manner that closely simulated the submarine mounting, and the ship was anchored in an area as free from radar interference as possible. Various aircraft equipped with AN/APS–15, AN/APS–3 and AN/APS–2 radar and functioning as in a normal search operation made runs on the ship at various altitudes. The ship and aircraft used synchronized chronometers and accurate aircraft positions were plotted against time. The time of first detection of the radar by the Fliege-Mücke detection equipment was then compared with the plot to obtain the range of first detection. This maximum range information was then plotted against altitude to provide a graphical illustration of the ability of the equipment.

Results and Conclusions

Early warning range against three-centimeter radar was determined to be 18 miles at 100 feet and 50 miles at 2,000 feet; against ten-centimeter radar maximum ranges of 19 miles at 100 feet and 70 miles at 5,000 feet were obtained. The X-band horn used has a beam width of about 15 degrees so that bearings on three-centimeter airborne radar are quite accurate. The S-band antenna is broader and will detect ten-centimeter transmissions through a sector of 80 to 90 degrees. It was noted also that warning through 360 degrees is possible on ten-centimeter transmissions at short ranges (five to eight miles). Transmissions of three-centimeter can be detected on the ten-centimeter antenna for limited ranges but ten-centimeter transmissions cannot be detected by the three-centimeter horn.

The equipment is simple in operation and other than training the antenna no adjustments are necessary to search completely the X and S radar bands for transmissions. It was concluded that the Fliege-Mücke equipment is apparently a simple, efficient and successful counter to the three-centimeter and ten-centimeter radar. It was found to be very dependable under normal operating conditions. From inspection and operation it was assumed that rough weather and spray might reduce the early warning range to some extent but not sufficiently to render it undependable. Failures of the equipment should be very rare and easily repaired.

Evaluation of Results

In evaluating these results it was noted by Anti-Submarine Warfare Operations Research Group that the dipole of the Fliege and the crystal detector of the Mücke were oriented horizontally at ASDevLant; that is, they were oriented so as to detect most favorably the horizontally polarized radiations from an airborne radar. It is known that the Germans orient the dipole and crystal so as to pick up all radiations; *i.e.*, at an angle of 45 degrees from the horizontal. The maximum ranges obtained by the Germans in practice therefore would be about 20 per cent less than the corresponding ranges obtained at ASDevLant. The figure of 20 per cent is based on a theoretical calculation and on experiments made at Radio Research Laboratory.

The above, plus other known information, was taken into consideration and the following table was drawn up showing the expected operational ranges against our radar.

ALTITUDE (*Feet*)	EXPECTED OPERATIONAL RANGES (*Miles*) *APS-2*	*APS-3*	*APS-15*
500	20	22	20
1000	25	30	25
1500	30	38	30
2000	35	45	35

For altitudes greater than 2,000 feet, little increase in range is to be expected.

The expected operational ranges of Tunis listed above are greater than the corresponding average radar ranges on surfaced submarines. Apparently the Germans are unaware of this, or do not obtain such good ranges in practice; otherwise they would not have gone almost entirely to Schnorchel operation, with all its attendant disadvantages, including the impossibility of the use of Tunis in such operation.

Counter-Measures Suggested

As pointed out, the three-centimeter detector is directional to 15 degrees and the ten-centimeter detector to 80–90 degrees. Scanning through a maximum of 360 degrees then back again is manual, therefore probably irregular. This suggested that a counter-measure might be found in the intermittent operation of search radar. An analysis of the probability of detection of Fliege-Mücke by search radars operated in this manner indicated this to be a worthwhile procedure. The intermittency operation will reduce the radar contact efficiency. However, it was considered that this reduction would be small compared with the large increase in the probability of undetected approach. Intermittency schedules were drawn up therefore and sent to ASDevLant to be tested for their practicability of operational use and their effectiveness against the latest GSR.

An Anti-Submarine Interim Instruction based on the above appears in this issue of the *U. S. Fleet Anti-Submarine Bulletin*. It must be noted that this applies specifically to search for surfaced U-Boats equipped with directional microwave search receivers. *Schnorchel U-Boats may be expected to operate with meter search receivers only and therefore the use of radar in this case is entirely different. Radar search for Schnorchel U-Boats was covered in Anti-Submarine Interim Instruction No. 15, appearing in the March issue of the* U. S. Fleet Anti-Submarine Bulletin.

GERMAN-JAP DISTRUST REVEALED IN CAPTURED U-188 REPORT

Document Describes Facilities At Penang and Singapore

An experience report of the German 740-ton submarine U–188, describing operations in the Indian Ocean, has been captured in Europe and translated.

Although the report covers operations only up to 1 January 1944, the following information on the German attitude toward the Japanese, the facilities available to Germans, and evidence of mutual distrust should prove of interest to our forces. (The following statements are from the captured document, and should be evaluated accordingly.)

Submarine Base at Penang

The yard at Penang is located at Swettenham Pier in the vicinity of the submarine berths. It is so equipped with manpower and machinery that all normal repairs can be accomplished there. While execution of work is slow in comparison with German, it is excellent, and machine construction is especially precise. Places and machinery were readily provided in the workshops for the boats. The distribution of materials, on account of the great lack of finished products, is subjected to severe restrictions, and a thorough proof of need is required in every case.

Equipment

Japanese fuel is good, but, because of considerable residue, engines are more frequently driven at high speed. Lubricating oil is very thin and consumption as compared with the German is disproportionately high.

The care and maintenance of torpedoes can be regarded as on a par with that at the front bases in western France.* As the torpedo-adjusting station is located in the same building as the Japanese torpedo workshop, *it is difficult to conceal innovations from the keenly observant Japanese. New torpedo types are therefore unsuited for Penang.*†

Policy at Penang

The German policy of U-Boats provided for the Indian Ocean appropriately stations them at Penang for at least two years, having them return as raw material transports only when a deficient supply of torpedoes on hand requires a decrease in the number of boats in the Indian Ocean. This is done because the long approach and return voyage require more extensive utilization of the boats than a single commitment makes possible. Prospects of success are considerably better on account of greater knowledge of quarters, and stable conditions and longer presence facilitate coöperation with the Japanese. Boats returning to the home territory travel exclusively as raw material transports without intermediate tasks.*

*Written before the neutralization of the Bay of Biscay by the Allies.
†Italics are ours.

Aerial photo of Penang reveals the submarine berths and yard mentioned in Kapitänleutnant Lüdden's report of U-188. A submarine can be identified alongside the largest pier.

The Commanding Officer of U–188 stated that "long absence from the home territory requires the most modern, up-to-date equipment and armament before leaving France.

"Crews must be more plentifully provided with respect to clothing. Appearance with an ally as sharply observant as the Japanese requires more than one tropical submarine pack."

Facilities at Singapore

In contrast with Penang, the Shonan (Singapore) base presented great deficiencies and was poorly organized. With its present organization and personnel the Shonan base is not able to overcome the severe burdens which the employment of submarines always entails. For major repairs (ripped torpedo tubes or similar bomb damage) transfer to Japan proper can be counted upon.

The yard operates satisfactorily, but is not so obliging and accommodating as the Penang submarine yard.

Supplies at Japanese Submarine Bases

Many commodities are difficult or impossible to obtain in both Penang and Shonan. The utilization of U-Boats to the fullest extent for supply service to these bases is therefore necessary. Materials taken to Penang include diesel engine parts, instruments and tools of all kinds, and electrical devices.

Personnel of Submarine Operations Division

The personnel of the Japanese submarine division for the Indian Ocean includes Submarine Chief, Rear Admiral Ishioka; Chief of Staff, Commander Jura; and several reporters and administrative officers. Rear Admiral Ishioka was formerly a submarine commander. Before the war he was for a considerable time in Germany and therefore speaks a little German. He takes a very positive attitude on all questions relating to joint operation.

Commander Jura is a submarine commander of many years experience. Before he was ordered to Penang, he was in the Ministry of the Navy in Tokyo as naval staff officer for submarine matters.

*This statement conflicts with CominCh records which credit these U-Boats with many sinkings enroute to home territory.

ENEMY SUBMARINE OPERATIONS

Procedure

The submarine division works independently with respect to operations, but the procedure cannot be compared with that of the German staffs. The attached fighting forces are small at the present time on account of transfers to the southeast (Solomons). In January 1944 there were available for the Indian Ocean about seven to nine submarines of different classes (600 to 2800 tons). Of these—during the inactive period of the monsoon group—three on the average were in engagement. The inactive periods of the yard are amazingly brief. The Japanese in wartime knows no furlough.

Principal Engagement Areas

Small boats (600 tons) undertake mine and attack expeditions in the Bay of Bengal, the south and west coasts of Ceylon up to the southern tip of the Indies. Large boats (two with shipboard plane) operate in or off the Gulfs of Oman and Aden. East Africa and the Mozambique Channel were seldom occupied. From a conversation with the commander of the I–10, it was learned that no significance is attached to the shipboard plane, except for special missions, on account of the difficult conditions of its use.

Attack Tactics

Attack occurs mostly under water and at night. Commanders, therefore prefer the clear phase of the moon for the area of operation. Night attacks on the surface are exceptions. The effect of these tactics has been perceived repeatedly in the Gulf of Aden. On dark nights steamers followed a straight course; in clear moonlight the course became extremely and irregularly zigzagged. Japanese generally fire in triple charges. Torpedoes move at a speed of 43 knots almost without bubbles.

Coöperation with Submarine Division

Reception (of the Germans) by the (Japanese) submarine division at Penang gave the impression that every effort was exerted to show the Germans the finest kind of hospitality and to make their stay as agreeable as possible. Official visits and receptions are arranged on a peacetime basis. The reception in Shonan (Singapore) was impersonal and more correct than friendly.

On matters of operation the Japanese were at first very reserved. The exchange of experiences was therefore rather a one-sided informing of the Japanese concerning German experiences in the areas navigated. A somewhat more extensive communication of fundamentals from the Japanese fund of experience began only after closer personal association and repeated discussions of German observations and experiences.

On the whole, the impression created was one of mistrust, strongly marked among the Japanese, and would make possible fruitful coöperation, only when the self-evident prerequisite of longer presence and intimate personal relation had been granted. Frequent change of boats and commanders would therefore not be expedient for development of German operative plans in the Indian Ocean.

Total Impression

The Commanding Officer of U–188 has stated his impressions as follows: "The inevitable concentration of (Allied) traffic on the main traffic arteries facilitates an effective interruption of the supply of fuel and war material to the Indies. (Bait to interest the Japanese in a wider employment of German boats.) An intensive effort to combat the supply of war material to Russia (Gulf of Oman) and the supply of fuel to the Mediterranean, as well as to the South African theater, promises greater results than in other sea areas, as the enemy here, not accustomed to sorties, has only a little reserve tonnage available. The Japanese with their smaller number of boats are not in a position to utilize such promising pursuit grounds, even in only an approximate degree."

In conclusion, the Commanding Officer of U–188 reported: "The great chance of finally being able to conduct a submarine offensive makes all difficulties of supply and any difficulties of negotiation with the Japanese which may arise seem small, compared with the possibility of bridging over the time, until a new offensive in secret waters begins."

Details of U-188

U–188, a 740-ton Type IX C* submarine, belonged to the Tenth Flotilla at Lorient, France. She left Lorient 30 June 1943 on her second patrol, and arrived in Penang 30 October. On her third patrol she proceeded from Penang (31 October 1943) to Singapore (12 December), returned to Penang, 31 December, and left for her operational area in the Arabian Sea and the Gulf of Aden. U–188 claims to have sunk seven steamers and seven sailing ships on this patrol.

She arrived in Bordeaux 19 June 1944. Kapitänleutnant Siegfried Lüdden, U–188's Commanding Officer, was captured in France by the Maquis while on his way to report to the C. O. U-Boats (West). He managed to escape, however, and return to Germany, where he was awarded the Knight's Cross.

It has been reported that Kapitänleutnant Lüdden was killed recently in an accident.

*See page 3, March 1944 *U. S. Fleet Anti-Submarine Bulletin* for characteristics of Type IX C.

ANTI-SUBMARINE OPERATIONS

A TO E ASSESSMENTS

(Additions and Amendments)

Attacks by All Forces

GERMAN SUBMARINES—A—KNOWN SUNK

U-Boat	Ship or Aircraft Concerned	Date	Position	
		1944		
U-1209	Grounded	18 Dec	49–57N	05–47W
		1945		
U-1199	HMS Icarus and HMS Mignonette	21 Jan	49–57N	05–42W
	HMS Aylmer, HMS Calder, HMS Bentinck and HMS Manners	26 Jan	53–39N	05–23W
	HMS Nyasaland, HMS Papua, HMS Loch Scavaig and HMS Loch Shin	4 Feb	55–17N	06–44W

B—PROBABLY SUNK

Ship or Aircraft Concerned	Date	Position	
	1944		
RAF Squad 220 (3)†	26 Sept	43–18N	36–28W
RCAF Squad 407	30 Dec	50–05N	02–31W
	1945		
HMS Tyler, HMS Keats and HMS Bligh	27 Jan	52–24N	05–42W

D—PROBABLY DAMAGED

Ship or Aircraft Concerned	Date	Position	
	1944		
RAF Squad 413	3 Nov	09–00N	76–00E

E—PROBABLY SLIGHTLY DAMAGED

Ship or Aircraft Concerned	Date	Position	
	1944		
RAF Squad 205	2 Mar	04–53N	79–57E
HMS Racehorse	8 July	05–39N	80–12E

JAPANESE SUBMARINES—D—PROBABLY DAMAGED

Submarine	Ship or Aircraft Concerned	Date 1945	Position	
	USS Bell, USS O'Bannon, USS Jenkins and USS Ulvert M. Moore	31 Jan	13–20N	119–20E

E—PROBABLY SLIGHTLY DAMAGED

Ship or Aircraft Concerned	Date	Position	
	1944		
RAF Squad 160	28 Oct	15–28N	90–15E
	1945		
USS Bebas	3 Feb	12–16N	155–16E

†Figures in parentheses indicate the number of planes sharing in the assessment when there are more than one.

F TO J ASSESSMENTS

(Additions and Amendments)

Attacks by U. S. Forces

FD—INSUFFICIENT EVIDENCE OF DAMAGE, FINAL ASSESSMENT DEFERRED

Date	Ship or Plane Making Attack	Latitude	Longitude
1945			
7 Feb	Thomason	15–27N	119–25E

F—INSUFFICIENT EVIDENCE OF DAMAGE

Date	Ship or Plane Making Attack	Latitude	Longitude
1944			
3 Oct	VC–65 from Midway and Richard M. Rowell	02–30N	129–17E
13 Nov	VMB–612	26–10N	141–50E
1945			
30 Jan	La Vallette	15–09N	118–56E
13 Feb	VC–58 from Core	51–55N	29–14W
16 Feb	Clamour	15–12N	146–17E
17 Feb	Breese	24–40N	141–29E
25 Feb	Newcomb	25–03N	140–28E
17 Mar	Sutton	42–55N	53–46W

G—NO DAMAGE

Date	Ship or Plane Making Attack	Latitude	Longitude
1944			
25 Oct	Trathen	10–00N	126–55E
1945			
1 Feb	VC–58 from Core	49–19N	28–43W
9 Feb	SS Moses Brown	23–38S	04–25W
11 Feb	VC–58 from Core	52–29N	28–30W
17 Feb	Francis M. Robinson, Fowler, Knoxville and Atherton	35–54N	05–50W
28 Feb	Newman	09–59N	119–57E
17 Mar	Neal A. Scott	43–05N	54–35W

H—INSUFFICIENT EVIDENCE OF PRESENCE OF SUBMARINE

Date	Ship or Plane Making Attack	Latitude	Longitude
1944			
30 Dec	VPB–114	51–09N	08–25W
1945			
3 Feb	Woodson and Rolf	07–43N	130–32E
3 Feb	Stockton	10–50N	160–25E
4 Feb	Sloat	49–20N	29–37W
6 Feb	Thomason and Neuendorf	15–00N	119–00E
10 Feb	Triton and PC–1546	38–49N	70–16W
10 Feb	PC–1130	07–51N	137–15E
11 Feb	SS Sidney Lanier	08–30S	41–50E*
11 Feb	SC–1012	07–53N	130–13E
15 Feb	PC–1264	40–30N	74–01W*
16 Feb	Thomas	53–02N	28–30W
16 Feb	Mannert L. Abele	17–10N	144–04E
16 Feb	Edwin A. Howard	10–45N	125–39E
16 Feb	Connolly and Finnegan	16–22N	144–16E
17 Feb	SS M. E. Comerford	07–37N	77–44E
18 Feb	Atherton	34–28N	10–20W

*Assessed without action report.

19 Feb	Crosby	14-42N	120-12E
20 Feb	Rhodes	42-03N	65-35W
20 Feb	PC-1243, Triton and Blimps K-58, K-30, K-77, K-98	40-17N	73-42W
20 Feb	Taussig	25-45N	140-03E
20 Feb	McCord	25-58N	139-52E
24 Feb	Nelson	37-13N	41-25W
25 Feb	Uniontown	38-45N	73-53W
26 Feb	Covington	44-00N	62-12W
28 Feb	O'Bannon	10-02N	120-10E
28 Feb	Allentown	15-30N	119-38E
6 Mar	PC-1599	23-03N	141-15E
9 Mar	Cook Inlet	20-00N	143-48E
17 Mar	Neal A. Scott	43-00N	54-13W
18 Mar	Modoc	42-30N	67-13W

I—TARGET NOT SUBMARINE

Date	Ship or Plane Making Attack	Latitude	Longitude
1944			
20 Nov	Caperton	09-55N	139-45E
1945			
8 Feb	Cook Inlet	18-37N	171-12W
9 Feb	PC-1170	40-08N	73-40W*
11 Feb	PC-1247	39-54N	73-32W*
11 Feb	Koiner and Howard Crow	39-30N	72-58W*
20 Feb	Haste	40-03N	73-15W
20 Feb	Climax	15-07N	146-41E
22 Feb	Haste	39-41N	72-25W
23 Feb	Edgar G. Chase	37-03N	47-51W
4 Mar	Orlando	35-53N	06-15W
6 Mar	Mayrant	33-13N	35-39W
19 Mar	Pride	43-25N	61-10W
19 Mar	Pride	43-15N	61-10W

J—INSUFFICIENT INFORMATION TO ASSESS

1945			
29 Jan	SC-1039	09-24S	160-02E*
15 Feb	Scroggins	44-24N	63-23W*
15 Feb	SS Charles F. Amidon	36-40N	126-20W*

*Assessed without action report.

CHANGES IN LISTING OF SUBMARINES SUNK

Pages 22-29, February 1945 *U. S. Fleet Anti-Submarine Bulletin*

Page 24—*Change*	U-662, Aircraft, U. S Army, 24 July 1943
To	U-622.
Page 29—*Add*	I-52 to VC-69 from USS Bogue (2), 24 June 1944.
Page 29—*Delete*	USS Ward, 7 Dec 1941 (midget submarine).
Page 29—*Change*	HMS Telemachus, 17 July 1944, from B (probably sunk) to A (known sunk).

RADAR SEARCH FOR SCHNORCHEL BY AIRSHIPS

Two articles on pages 21 and 22 of the March 1945 *U. S. Fleet Anti-Submarine Bulletin* dealt with visual and radar search for Schnorchel by aircraft. The present article considers radar search for Schnorchel by blimps. Extensive tests conducted by Anti-Submarine Development Detachment, Atlantic Fleet, have shown that radar performance from blimps is superior to the performance of similar equipment carried in airplanes as regards range and probabilities of Schnorchel detection. The blimp possesses the additional advantage that its normal altitude of flight is low and not far from the optimum for search for these small targets. The greater probability of contact with the blimp is explained in part by the slower speed at which the blimp flies. This increases the number of scans which are made, and on which the target may appear, during a given run. The longer duration of airship patrols, combined with the somewhat greater swept path, probably will permit the search of areas of equal size by either airship or heavier-than-air craft on a single patrol.

When an aircraft picks up a Schnorchel on its radar scope it frequently occurs that the blip disappears during the run toward the target. This is especially true when the aircraft must turn or bank or otherwise maneuver before completing its approach. Experience has shown that these difficulties are much less serious when the contact is made by a blimp. The blimp can maintain contact throughout its run. If the contact is momentarily lost, it is relatively easy to recover since the blimp can remain near the lost contact, continuously searching through 360 degrees.

While the airship tests referred to above not only indicated that superior radar performance against small targets may be obtained from airships, they also showed that the results with blimps are in agreement with airplane performance with respect to such factors as optimum search altitude, relative efficiency of up-wind, down-wind and cross-wind searches, and effect of sea return. Anti-Submarine Interim Instruction No. 15 (Search for Schnorchel by Aircraft), reprinted in the center of this issue, therefore applies.

RÉSUMÉ OF AIRCRAFT ATTACKS

VC-58 **0905 GCT** **(Zone plus 2)**	**Plane No. 29** **1 February 1945** **Incident No. 7617**	**USS Core** **49-19N/28-43W**

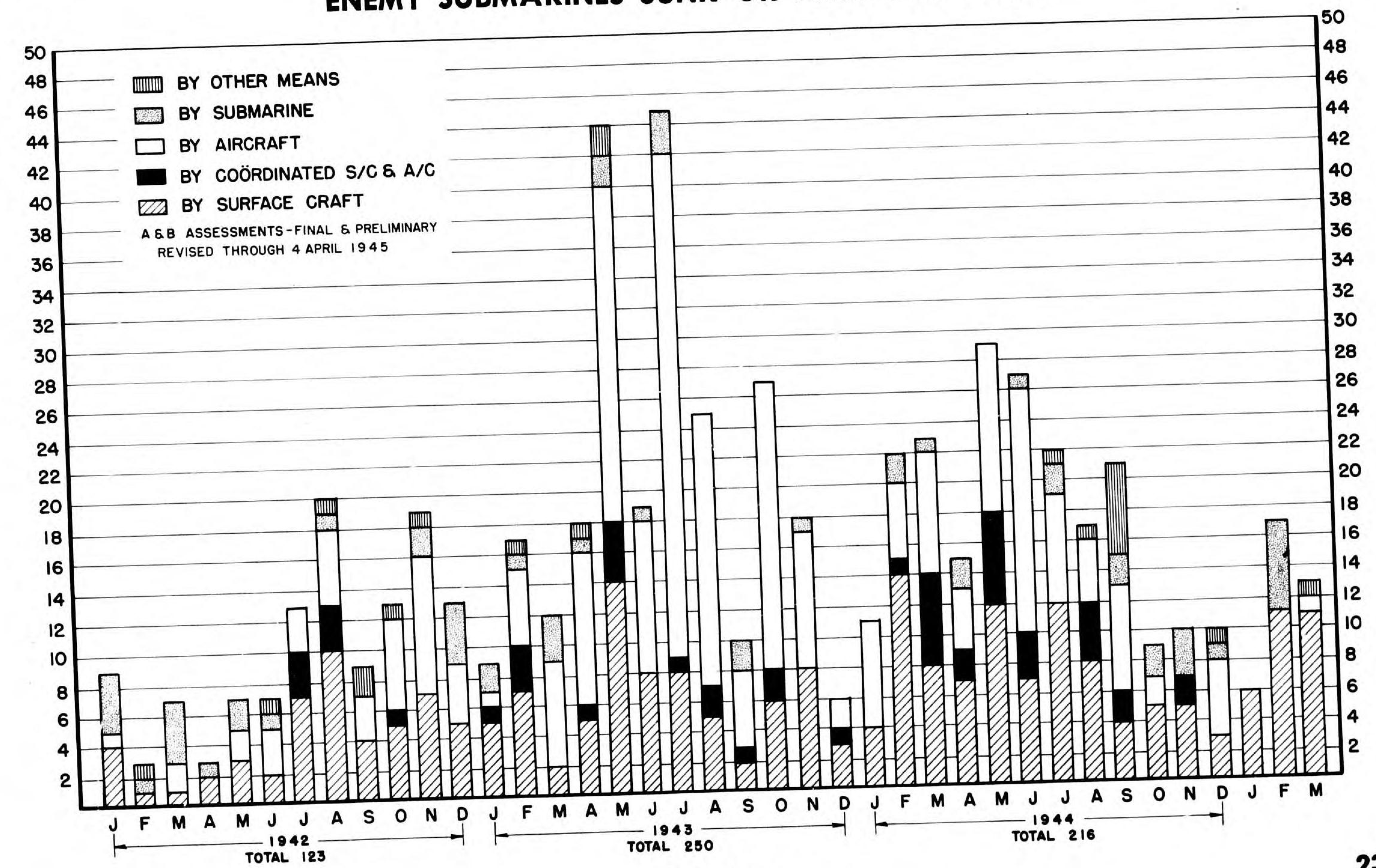
While on anti-submarine sector search in a TBM, the radioman reported a radar blip on the port bow at a range of eight miles. The blip was then lost but regained at four miles. The pilot turned and commenced letting down from 1900 feet to investigate and the blip again disappeared but reappeared at two and one-half miles. At one and one-half miles range, visual contact was made on a submarine with decks awash and waves breaking over it. The pilot immediately attacked from the submarine's starboard beam with two Mark 54 depth bombs, intervalometer setting 210 knots, 170 feet, to result in 70-foot surface spacing. Because of high tail winds, the glide angle was 25 degrees steeper than intended and release was made at 400 feet, speed 210 knots. Only one bomb was released because of faulty intervalometer, the bomb exploding an estimated 70 feet over in range. Had the second bomb released, it would have fallen beyond the first. Subsequent search of the area was negative due in part to the heavy seas, which made it difficult to keep the spot properly marked.

COMMENT: The attack was made under very unfavorable conditions, and the pilot's failure to consider the full effect of the tail wind of gale force was probably responsible for overshooting the target. Had the attack been made along the longitudinal axis of the submarine, it is possible that it might have been lethal. However, the pilot is considered to have exercised good judgment in not delaying the attack to select a favorable angle at the expense of surprise and speed.

VC-58 **0922 GCT** **(Zone plus 2)**	**Plane No. 3** **11 February 1945** **Incident No. 7705**	**USS Core** **52-29N/28-30W**

While flying at 1800 feet beneath a 2,000-foot overcast on anti-submarine sector search, the pilot of an FM-2 sighted a fully surfaced submarine about ten miles directly ahead and on the same course as the aircraft. The pilot climbed into the overcast and made an approach at maximum speed. Two rockets were fired inadvertently when he armed his rocket circuit. Upon emerging from the overcast, the pilot saw the

ENEMY SUBMARINES SUNK OR PROBABLY SUNK



submarine was almost submerged. An attack was commenced immediately and 25 seconds after submergence six rockets were fired in a 20-degree glide at a slant range of 350 to 400 yards. The pilot then dropped a smoke light, sent a contact report and climbed to 6,000 feet to permit his ship to obtain radar fix. Upon descending below the overcast about 18 minutes after the attack, the pilot found two DE's and two additional aircraft had reached the scene. A full sono-buoy pattern was laid but no results were obtained either from sono-buoys or from the surface craft search. No damage to the submarine was observed.

COMMENT: The pilot executed good judgment in use of cloud cover and direct approach. Evidently the submarine discerned the approach of the aircraft by some means, or sighted the two rockets fired prematurely. Considering the fact that the submarine had been submerged for 25 seconds when the rockets were fired, the pilot finds hearty agreement in his statement that the attack was almost hopeless.

VC-58	**Plane No. 21**	**USS CORE**
0909 GCT	**13 February 1945**	**51-55N/29-14W**
(Zone plus 2)	**Incident No. 7724**	

The radioman of a TBM on anti-submarine sector search reported a radar blip on the starboard bow. The pilot immediately sighted a submarine at six and one-half miles range and commenced an attack from the port beam. Two Mark 54 depth bombs were released about eight seconds after submergence. The explosions were observed an estimated 80 feet ahead of the swirl and on the projected track of the submarine. Although the intervalometer was set for 210 knots, 170 feet, intended to give a surface impact spacing of 70 feet, and release was made at 300 feet altitude, 220 knots speed, while in a 15-degree glide, the explosions were observed to be an estimated 25 feet apart. Shortly after the attack, a purple sono-buoy was dropped with negative results. No reason is given for failure to lay the entire sono-buoy pattern. Five minutes after the attack, another TBM attempted to lay a sono-buoy pattern but could not release. Fifteen minutes after the attack, still another TBM arrived and a full sono-buoy pattern was laid, but no submarine indications were heard. Surface craft reached the scene about 30 minutes after the attack and the resulting sonar search was negative. No evidence of damage to the U-Boat was observed at any time.

COMMENT: This was a well executed attack and the bombs actually were released in a blinding rain squall. The close impact spacing of the bombs may have been caused by an underestimation of the distance apart of the explosions or by a faulty intervalometer, for the setting used and the release conditions should have given a greater spacing. Inasmuch as this was a beam attack and the explosions were on the projected track of the submarine, it is not considered that the results of the attack were affected materially. The previous extremely bad weather conditions extending over a considerable period of time created a maintenance problem which probably accounts for the difficulties experienced in the release of the sono-buoys.

ADVANCE CORRECTION TO FTP 223A

Page [1-60], Article 1435, 2nd and 3rd lines, delete the words "or to be stationary on the bottom." (The effect of this correction is to remove the present restrictions prohibiting the use of ahead-thrown weapons against bottomed submarines in depths less than 400 feet.)

• • •

ENEMY SUBMARINE AND SMALL BATTLE UNIT TYPES STANDARDIZED

By agreement with the Admiralty, definitions of U-Boats, small battle units, midgets, and so forth, have been standardized as follows:

U-Boat—Enemy combat submarines Type XXIII (German), Type HA (Japanese) and larger.

Small Battle Units (SBU)—Includes all forms of small enemy waterborne units used in offensive operations, other than E-Boats and R-Boats. This type includes the YU Japanese Army transport.

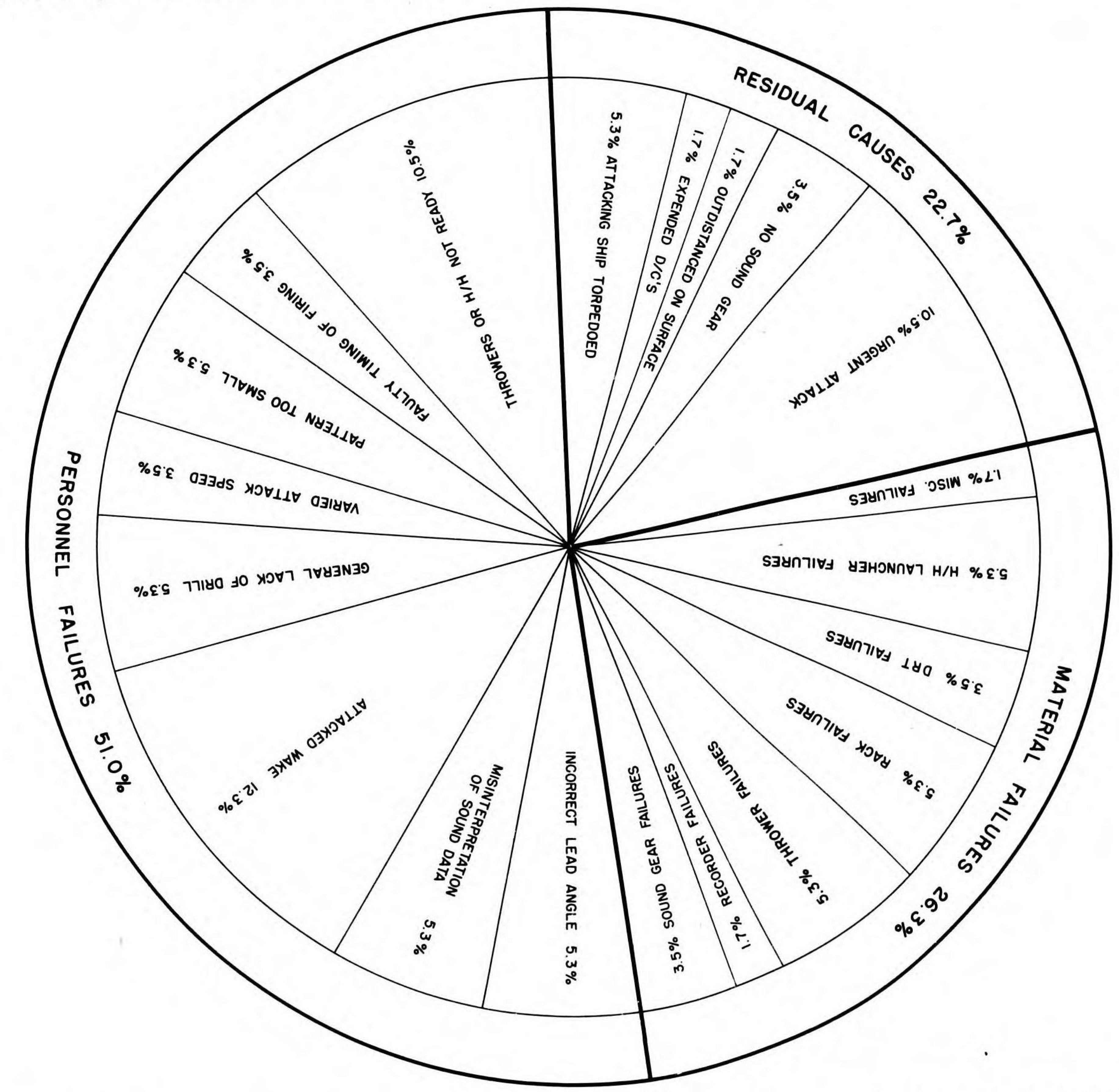
Midget—A small battle unit piloted from a pressure tight control position and capable of complete submergence, *e.g.* Seehund, Molch, Biber, Marder (one-man torpedoes) and Hecht and various Japanese types.

Pigmy—A small battle unit in which the coxswain has no protection and which normally remains on the surface, *e.g.* Linsen (explosive motor boat EMB), Italian human torpedoes, swimming saboteurs.

Attacks against U-Boats are assessed by the CominCh Assessment Committee. Assessment of attacks against the remaining types has been delegated to Fleet Commanders. When the type target is in doubt, but there is a possibility it is a U-Boat, reports are made as for U-Boats and the Assessment Committee determines in which class the target belongs.

CAUSES OF FAILURE 1944

Attacks by U. S. Anti-Submarine Ships, Assessed "G" (Submarine Present—No Damage)



Note: These 57 faults occurred in 30 incidents from 1 January to 31 December 1944. The ten incidents without sufficient information for analysis and 18 attacks by merchant vessels and by U. S. submarines have been excluded.

CAUSES OF FAILURE 1944

The change in the distribution of "causes of failure" in the accompanying chart, when compared with a similar analysis of incidents assessed "G" in 1943 (January 1944 *U. S. Fleet Anti-Submarine Bulletin*), is worthy of comment.

A slight increase in the percentage of material failures is characterized by a decrease in the number of sonar gear and recorder failures with an increase in the number of thrower and rack failures. A smaller proportion of urgent attacks and attacks by ships without sound gear reduced the percentage of residual failures. However, the advent of the acoustic torpedo is seen in the number of attacking ships which were torpedoed before they could damage the submarine.

Although the personnel failures were not in excess of those in 1943, the large number of cases in which the depth charge throwers or Hedgehog were not ready is important. The high percentage of failures classed as attacks on wakes is not necessarily significant, since there is considerable ambiguity in making this assessment.

It must be pointed out that these failures were not always the main reason for missing the submarine, but many were minor contributing factors.

U-BOAT SIGHTED, LIBERATOR ATTACKS MINUTE LATER; SINKS U-681

While on anti-submarine patrol southwest of the Scilly Isles on 11 March 1945 at 1025, the pilot of VPB-103 PB4Y-1 (103-14-N) sighted a surfaced U-Boat two miles distant, bearing 305° relative. The aircraft was on a course of 265°(T). The U-Boat was on a course of 330°(T) making about five knots. The aircraft was flying at an altitude of 1500 feet and making a true airspeed of 155 miles per hour. The patrol plane commander ordered an attack immediately and put his plane into a sharp turn to port, losing altitude rapidly for the attack.

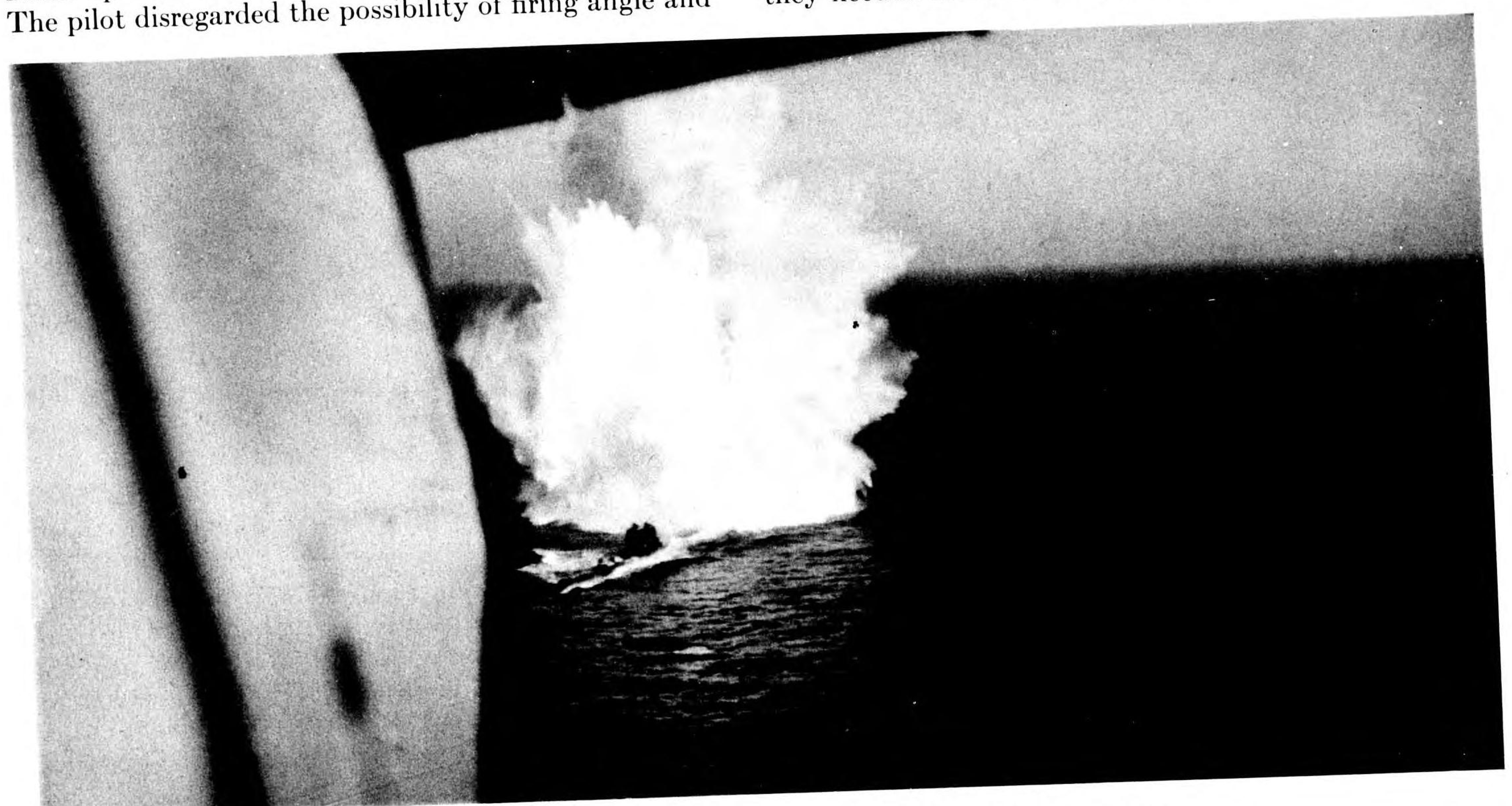
The submarine took evasive action in making a tight 180-degree turn, also to port, and appeared to be diving. With excellent crew coördination the attack was delivered at 1026 in position 49-53N/06-31W, with aircraft on a course of 123° at an altitude of 100 feet and indicated airspeed of 190 miles per hour. The U-Boat was then on course 153° making approximately eight knots. Eight British Mark XI depth charges, spaced at 45 feet, were dropped and a straddle was obtained. The last two depth charges presumably caused the lethal damage. One sono-buoy and a smoke float also were dropped at this time. The attack was made up sun on the starboard quarter of the U-Boat. The pilot disregarded the possibility of firing angle and light conditions favorable to the U-Boat in order to attack immediately.

Plane Makes Strafing Run

After completing the first run, the pilot executed a 360-degree turn to starboard and made a strafing run. The U-Boat's course was approximately the same as on the previous run, but its speed had diminished. On this second run the bow turret fired 100 rounds, starting from 1,000 yards out. The starboard waist fired 25 rounds. After the second run, the pilot circled the submarine and shortly afterward the U-Boat's stern commenced to submerge. Soon many dinghies with survivors were seen in the area. Still later, heavy debris and an oil slick were observed.

Homing procedure then was begun and other aircraft came into the area. Approximately two hours later a British PC arrived on the scene and picked up a few survivors. By 1315 a British escort group, composed of two frigates, one of which was the HMS Lochfadda, had arrived. The escort group and PC picked up a total of 40 survivors, including three officers. Of the 40 survivors, two died before the escort group reached port.

At 1330, the patrol plane commander set course for base, having been so ordered by 19 Group Coastal Command. The escort group previously had advised that they needed no further assistance.



Two of Liberator's eight charges explode on U-681's starboard quarter.

COMMENT: The squadron commander attributes the success of this attack entirely to the high state of training, self-reliance and alertness at which the patrol plane commander had maintained his crew. The importance of this cannot be overstressed and this excellent action is a fitting exemplification of the benefits to be derived from such training. Anti-submarine patrols are often long and tiring and many hours are flown for each sighting. There is a tendency for crews to become lax, and often as a result, when the sighting is made, they are not ready for the attack. The squadron commander gives an interesting breakdown of individual crew responsibilities, most of which functions had to be accomplished within one minute.

(a) The pilot announced the sighting and ordered the attack without further amplifying instructions.

(b) The acting bombardier, who is not regularly assigned as such in this crew, opened the bomb-bay doors, set the bombing panel to depth charges, brought his sight to bear, and executed the drop.

(c) The starboard waist gunner made ready the first sono-buoy and smoke light. At "bombs away" these were dropped. On the second pass this station strafed.

(d) The port waist gunner manned the K20 camera immediately. Midway in the action he had the self-assurance to change the camera settings, which resulted in improved photographs.

Crew Ready for Attack

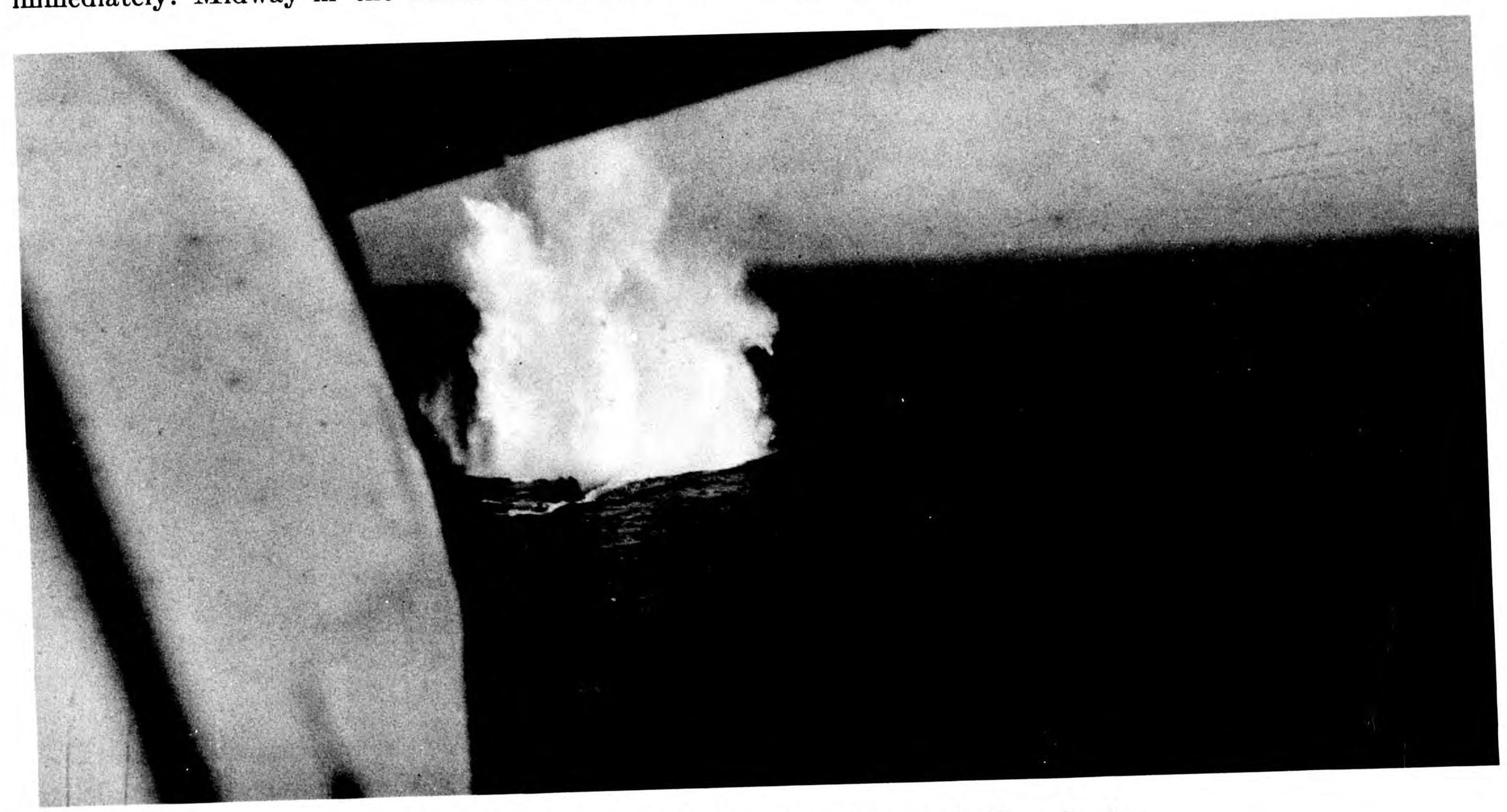
(e) The navigator struck off a position for the flash report and commenced logging the attack data with times.

(f) The radio watch flashed the initial sighting report, turned on IFF to stud 4 and 5 and began preparations for frequency shift and homing.

(g) The bow gunner failed to get his guns into action on the initial pass but strafed on the second pass.

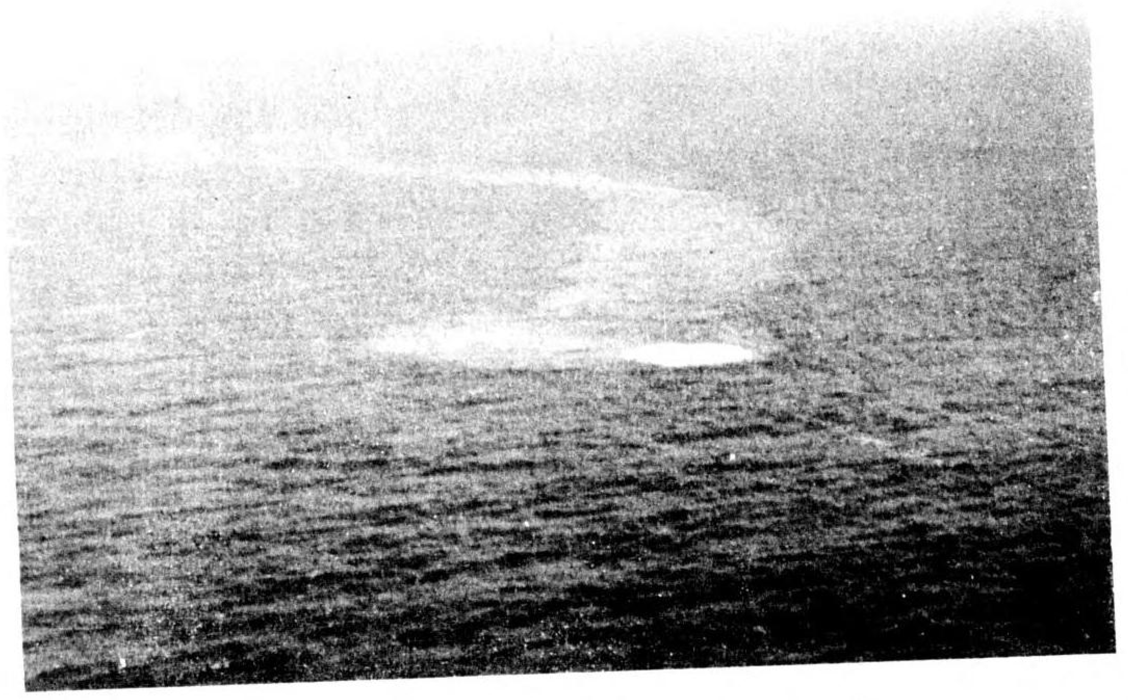
(h) The remainder of the crew had no immediate functions to fulfill except in the event of material or personnel failures. For example, the plane captain did not man the crown turret but scrambled to open the command deck hatch, operate the bomb-bay door utility handle, or otherwise be available to troubleshoot the bombing system.

Subsequent information identified the U-Boat as U-681, a 500-ton Type VII C and the Commanding Officer was Oberleutnant Zur See Gebaner. U-681 left Kiel on 7 February with provisions for 12 weeks to operate in an area between the Scilly and Ushant Isles, with later intention to approach the convoy route near Devonport.



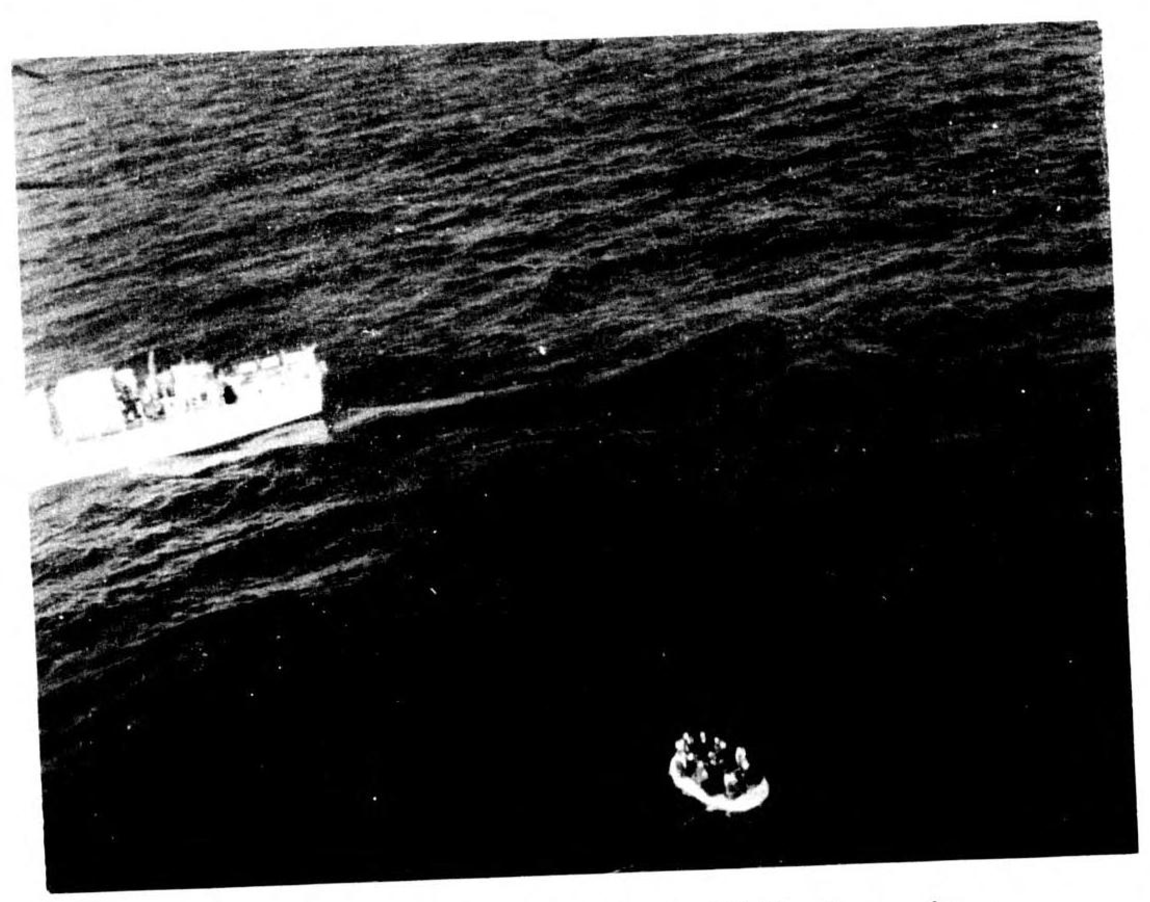
Plane commander carried out attack up sun to gain time advantage.

Two more explosions slow U-681's speed as plane circles for strafing run.



Oil slick signals U-681's destruction to airmen.

As bomber circles scene of attack, survivors and life rafts dot the surface.



British escort stands by to pick up U-Boat survivors.

Liberator camera pictures British escort ships completing rescue of German crew.

ANTI-SUBMARINE INTERIM INSTRUCTIONS

FROM APRIL 1945 ISSUE,

UNITED STATES FLEET ANTI-SUBMARINE BULLETIN

1. This issue of ASII contains all effective Anti-Submarine Interim Instructions including the revision of No. 11 and new Instruction No. 16, which cancels No. 12. ASII now in effect are Nos. 10, 11, 14, 15 and 16. Number 11 is revised in this issue.

2. ASII are separately numbered and printed on pages in the center of the *Bulletin* in order that such pages may be removed if desired for incorporation in appropriate operating folders.

3. ASII No. 7, No. 8 and No. 9 are cancelled, as the information is included in FTP 223A.

ANTI-SUBMARINE INTERIM INSTRUCTION

SURFACE

No. 10 Subject: Counter-Measures for Acoustic Torpedo.

1. Estimated characteristics of acoustic torpedo:
   (a) Electric propulsion;
   (b) Range about 6,000 yards;
   (c) Speed about 25 knots;
   (d) Turning radius about 80 yards;
   (e) Homing radius about 300 yards on a ship making 15 knots or more.
2. Heading directly toward a submarine is the most dangerous approach course if an acoustic torpedo is fired.
3. Recommended tactics for ships with FXR gear operating:
   (a) Stream FXR when submarines are estimated to be in the locality.
   (b) Use maximum practicable speed consistent with FXR protection while closing contact. In making sonar search and attack, make maximum speed consistent with efficient sonar and FXR operation.
   (c) Keep the submarine bearing at least 20 degrees on either bow until the final stages of the attack.
4. Recommended tactics for ships with FXR gear not operating:
   (a) When initial contact is made outside of 4,000 yards, close submarine at high speed. Zigzag during approach.
   (b) At 4,000 yards carry out the following procedure:
      (1) Change course so that bearing of the submarine moves from one bow to broad on the opposite bow.
      (2) After proceeding about 1200 yards, change course 45 degrees in the direction of the submarine. (The course is now parallel to the original bearing of the submarine.)
      (3) Continue this course for about 1200 yards, still at high speed. (Speed should be reduced when submarine is estimated within sonar range.)
      (4) Conduct normal sonar search and attack at maximum speed consistent with effective sonar searching.
   (c) When initial contact is made at less than 4,000 yards and more than 2500 yards, conduct procedure similar to 4 (b) with appropriate shortening of legs.
5. (a) Upon reasonable assurance that the submarine is at medium or deep submergence, if FXR is found to interfere seriously with sonar operation, the FXR may be taken in.
   (b) When FXR interferes with listening to sono-buoys, engines should be slowed or stopped for intervals as necessary.

ANTI-SUBMARINE INTERIM INSTRUCTION

SURFACE

No. 11 (Revised) Subject: Report Where Use of Acoustic Torpedo is Suspected or Known.

1. In event the use of an acoustic torpedo on the part of the enemy is suspected or known, the following information is to be included in the action report:
   (a) Time, range, relative position and nature of initial contact.
   (b) Tactics of submarine stating whether known or estimated.
   (c) Contacts obtained by other ships or aircraft.
   (d) Local submarine estimate.
   (e) Disposition of force screened and of ships in screen prior attack.
   (f) Courses and speeds of screening ships including own ship, during the 15-minute period prior to hit.
   (g) Type FXR gear in use; any variation from standard instructions; if Harp, state periods on and off during 15 minutes prior to hit.
   (h) If FXR was tested shortly prior torpedoing, give details including speed.
   (i) What other ships within 4,000 yards were using FXR gear. State range and relative bearing.
   (j) Time and position of torpedo explosion relative to ship.
   (k) Visibility, weather and sea conditions.
   (l) Any other relevant information.

ANTI-SUBMARINE INTERIM INSTRUCTION

AIRCRAFT

No. 14 Subject: Aerial Escort of Convoys in Danger Areas.

1. Analysis of recent U-Boat attacks indicates that 85 percent occurred during daylight or twilight.

2. With the advent of Schnorchel operation, U-Boats have increased probability of undetected entrance to areas covered by aerial escort plans ABLE through ITEM, FTP 223A, up to angles of 40° off each bow.

3. For aerial escort of convoys approaching and passing through danger areas such as shipping focal points, convoy dispersal points, and approaches to swept channels, the following plan is recommended:

(a) For convoys with speeds over 11 knots, use only plan KING.

(b) For convoys with speeds less than 11 knots, use the aerial escort plan in FTP 223A which applies, plus an additional aircraft flying plan JIG.

ANTI-SUBMARINE INTERIM INSTRUCTION

AIRCRAFT

No. 15 Subject: Search for Schnorchel by Aircraft.

1. The following procedure is issued for guidance when searching for submarines presumed to be operating with Schnorchel:

Radar.

(a) Microwave-equipped aircraft use radar continuously. Meter radar should not be used.

(b) Altitude of search should be 400–800 feet for sea state of 0 or 1 and 300–500 feet for sea states of 2 or greater. The rougher the sea the lower the altitude should be to reduce the extent of sea returns and increase radar contact efficiency.

(c) Range scales should be used as follows: APS–2, 20 miles; APS–3, 10 miles; APS–15, 20 miles expanded so only 12 miles appear on scope; APS–15A&B, 5–30 miles using 12 miles of range only.

(d) Use slow scan when searching and sector scan when closing on target.

(e) Use azimuth stabilization, if available.

(f) Use low altitude reflector with APS–15 radar when tilt stabilizer is available. Only particularly proficient operators should use low altitude reflector if tilt stabilizer is not available.

(g) Use maximum gain setting which will allow control of sea return and target signals. Tilt control should be used for maximum signal at ten miles through 360° of search. Operator should concentrate on region just outside sea return limits and vary gain and tilt adjustments about the optimum values at frequent intervals.

(h) Search plans shown in FTP 223A should be used when practicable, using the effective visibilities for Schnorchel given in Table X of FTP 223A.

(i) If practicable, search plans should be laid out so as to minimize upwind flying. This will permit the gain of increased sweep widths in crosswind and downwind flying.

(j) Training operators on search and approach to small targets, such as Schnorchel mock-ups, spars and buoys, should be practiced regularly.

Visual.

(a) Altitude of search should be about 1,000 feet unless radar is being used, in which case use radar search altitude given above.

(b) Use binoculars.

(c) Scan closely at all ranges but with particular emphasis on the shorter ranges.

(d) Be particularly alert for and investigate smoke or haze, possible wakes, small flames, or other unusual indications.

(e) Search plans shown in FTP 223A should be used when practicable, using one-half the effective visibility for a surfaced U-Boat as obtained from Nomograph X.

ANTI-SUBMARINE INTERIM INSTRUCTION

AIRCRAFT

No. 16 **Subject: Search for Surfaced Submarines by Aircraft.**

1. Anti-Submarine Interim Instruction No. 12 is hereby cancelled.

2. With the advent of Schnorchel and microwave radar search receiver, searches for German submarines have fallen into two categories. The continuous use of radar as prescribed for Schnorchel search renders a very small chance of contacting a surfaced U-Boat effectively using a radar search receiver. Conversely the use of the below-described procedure practically precludes the making of a radar contact on Schnorchel. Subject to the foregoing remarks, the following procedure is suggested when searching for German submarines presumed to be surfaced:

Radar.

(a) *Microwave* radar equipped aircraft use radar in accordance with the following intermittency schedule, except use continuously during escort of convoy or other tactical situations in which the primary object is to hold the U-Boat down:

AN/APS–3: Use "stand by" switch to turn power on for four scans (two
AN/APS–4: cycles) every two minutes.
AN/APS–15: With power on, use spinner switch to make either two scans at 12 RPM or three scans at 24 RPM every two minutes. Keep spinner trained aft when not sweeping.
AN/APS–2: Treat as meter radar.

(b) *Meter* radar equipped aircraft use radar at night only or when visual effective visibility is less than radar detection range and during escort of convoy.

(c) Altitude of search should be 300–800 feet to reduce the range advantage of radar search receivers.

(d) Approach tactics: Upon obtaining contact, operator should make one or more scans to establish range and bearing. Let down to attack altitude rapidly. Complete the approach by DR with the assistance of occasional single scans. Do not use sector scan or searchlighting.

(e) When using this intermittency schedule for search plans, use one-half of the effective visibility for surfaced U-Boat as given in Table X, FTP 223A.

Visual.

(a) Aircraft patrol at altitude given in Article 2112, FTP 223A.

3. The following procedure is suggested when searching for Japanese submarines presumed to be surfaced:

Radar.

(a) During daylight the aircraft should patrol at the altitude prescribed for visual search in Article 2112, FTP 223A. At night fly at 2,000-feet altitude or below clouds.

(b) *Microwave* radar equipped aircraft use radar continuously.

(c) *Meter* radar equipped aircraft use radar at night only or when visual effective visibility is less than radar detection range and during escort of convoy. If aircraft is equipped with radar search receiver, radar and search receiver should be operated alternately.

(d) If a submarine radar signal is received on the search receiver, the aircraft should descend immediately to an altitude of 1,000 feet or below and close submarine. Upon own radar contact reduce altitude to 200 feet or below and commence homing.

Visual.

(a) Aircraft patrol at altitudes given in Article 2112, FTP 223A.

USS BATFISH SINKS THREE JAP SUBS IN FOUR DAYS NORTH OF LUZON

A submarine of the same class as USS BATFISH *(SS–310).*

Enemy Submarine Air Search Radar Discovered During Attacks

During the sixth war patrol of USS BATFISH (SS–310) in the South China Sea and Luzon Straits, three daring attacks were made in four days, resulting in the probable sinking of three Japanese I-class submarines, totalling 4500 tons.

While conducting these attacks, BATFISH made the discovery that enemy submarines have air search radar on 158 mgcs. It is assumed to be non-directional, for BATFISH was able during the first attack to close to 900 yards without the enemy's giving any sign of detection.

The first submarine did not turn off his radar until it was secured by one of BATFISH's torpedoes. The second submarine keyed his occasionally, while the third keyed at intervals of from one to two minutes.

First Sub Explodes in Night Action

Employment	War patrol
Time	1450 GCT, 9 February 1945
Position	18–56N/121–34E
Weather conditions	Partially overcast, no moon
Depth of water	180 fathoms
Contact first made by	Radar
Range	11,000 yards
Number of attacks	Two

While patrolling surfaced in the Babuyan Channel south of Camiguin Island (north of Luzon), BATFISH received a radar signal on APR at 158 mgcs., 500 PRF. Forty minutes later at 2250 (Zone minus 8) 9 February, she obtained radar contact at a range of 11,000 yards. A surface approach was made on the target and at 2331 four Mark 18 torpedoes were fired at a range of 1850 yards, with negative results.

BATFISH made an end-around and prepared to launch a second attack at closer range. The target was now identified as a Japanese I-class submarine. At 0002 (10 February) three Mark 18 torpedoes were fired at a range of 990 yards. One torpedo hit. The target then exploded with a brilliant red flare and sank almost immediately, leaving a large oil slick that extended over a radius of two miles. Radar indications on the APR ceased abruptly. The target disappeared from visual sight and on the radar screen, screws stopped, and loud breaking up noises were heard in the sound gear.

BATFISH remained in the vicinity in order to make a daylight search for debris but was prevented from doing so when she was attacked by a torpedo, apparently launched by a friendly Black Cat.

Analysis of Second Attack

Time	0002
Range	990 yards
Target course	020°(T)
Target speed	14 knots
Target angle	090°
Gyro angle	019°–10′ to 038°–30′
Own ship's course	290°
Own ship's speed	Five knots
Depth	Surfaced
Angle at firing	0°
Number torpedoes	Three
Mark torpedoes	18
Depth setting	Two feet

This was a night surface radar attack. First torpedo was a hot run in the tube. Second torpedo hit; third torpedo apparently passed over former position of target and exploded at end of run.

Jap Radar Signals Tip Off BATFISH for Second Kill

Employment	War patrol
Time	1151 GCT, 11 February 1945
Position	18-53N/121-47E
Weather conditions	Overcast, no moon
Depth of water	530 fathoms
Contact first made by	Radar
Range	8,000 yards
Number of attacks	One

The next day while patrolling on the surface near Calayan, BATFISH at 1915 (Zone minus 8) received radar signals on APR at 158 mgcs., 500 PRF. Since this was the same radar found on the submarine target the night before, BATFISH began searching carefully on SJ radar, finally determining the approximate true bearing of the source. At 1951, BATFISH obtained radar contact at a range of 8,000 yards. Since Japanese radar had proved so ineffective the night before, BATFISH decided to make a surface attack in the complete darkness. At 2044 when range had been closed to 1200 yards, the target submerged. One half hour later, sonar heard a swishing noise and identified it as a submarine blowing her ballast tanks. This was confirmed at 2106 when Japanese radar reappeared on the APR at 158 mgcs., and SJ radar made contact at 8650 yards range. BATFISH made an end-around and dived for a submerged attack. At 2202 four Mark 18-2 torpedoes were fired at a range of 800 yards. Three hits were made and the target sank almost immediately. Explosions and breaking-up noises continued for one-half hour.

Analysis of Bow Tube Attack

Time	2202
Range	880 yards
Target course	120°(T)
Target speed	12 knots
Target angle	89°
Gyro angle	341-354°
Own ship's course	021°
Own ship's speed	Three knots
Depth	44 feet
Angle at firing	0°
Number of torpedoes	Four
Mark torpedoes	18-2
Depth setting	Four feet

This was a night submerged radar attack with firing on a 70° starboard track, 15° left gyros.

Debris Recovered After Third Nip Sub Blows Apart

Employment	War patrol
Time	1815 GCT, 12 February 1945
Position	19-10N/121-25E
Weather conditions	Not given
Depth of water	435 fathoms
Contact first made by	Radar
Range	10,700 yards
Number of attacks	One

After her second kill, BATFISH set course to an area west of Calayan Island. While patrolling on the surface between Calayan and Dalupiri Islands, BATFISH at 0155 (Zone minus 8) 13 February received a weak APR signal at 157 mgcs., 500 PRF. In hope that this might be another Japanese submarine, BATFISH swung the ship and at 0215 made radar contact at a range of 10,700 yards. The target was tracked and BATFISH submerged for the approach. At 0241 at a range of 7,150 yards, the enemy submarine dived but at 0353 surface radar contact was regained.

At 0448 BATFISH fired three Mark 18 torpedoes from the stern tubes at a range of 1700 yards. The first torpedo hit, causing a large yellow ball of fire which was observed through the periscope. The target could be seen blowing apart on the radar screen. Considerable oil and some debris marked the scene of the attack. A large oil slick with oil still bubbling to the surface was evident two hours later. After sighting several bits of wood and paper, much oil, but no survivors, BATFISH succeeded in recovering a wooden box that contained Japanese navigation equipment and a book of tables. BATFISH's report says, "From the positions listed in the work book, it looks like the guy went from Nagoya to Formosa before he headed down toward Luzon to join his ancestors."

Analysis of Attack

Time	0448
Range	1700 yards
Target course	140°(T)
Target speed	Six knots
Target angle	80° starboard
Gyro angle	175°30'-179°30'
Own ship's course	220°
Own ship's speed	Three knots
Depth	44 feet
Angle at firing	0°
Number of torpedoes	Three
Mark torpedoes	18
Depth setting	Six feet

This was a night submerged radar attack. Three torpedoes were fired from stern tube. First torpedo hit the target; remaining two torpedoes exploded at end of run.

KILLER GROUP ATTACKS GERMAN SUB OFF HALIFAX; RECOVERS DEBRIS

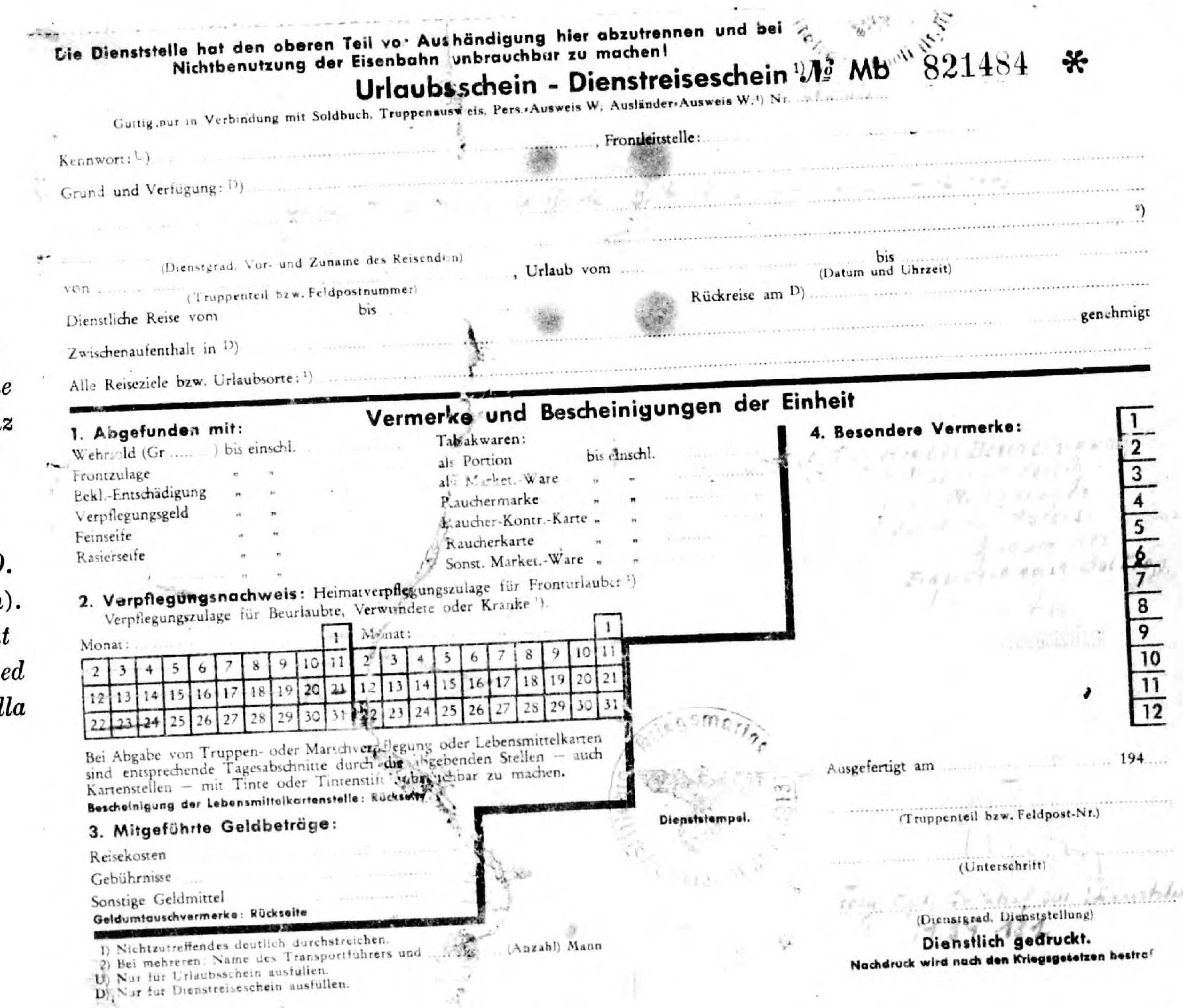
Damaging Hedgehog Attacks Make Two Hits on Bottomed Submarine

Employment	Killer group
Time	1419 GCT, 18 March 1945
Position	43-18.5N/61-08W
Weather conditions	Fog; visibility 300-500 yards, slight swell, wind five knots
Depth of water	72 fathoms
Contact first made by	Sonar
Range	1800 yards
Sonar conditions	Good
Number of attacks	Seven

Task Group 22.14, the first Coast Guard manned killer group consisting of USS PRIDE (DE-323) (ComCortDiv 46), USS MENGES (DE-320), USS MOSLEY (DE-321), and USS LOWE (DE-325), was engaged in killer group operations against a submarine reported westbound, south of Nova Scotia. Search was commenced on 6 March. On 13 March, MENGES made five attacks, with negative results, on a target which may have been a submarine.

At 1019 (Zone plus 4) 18 March southeast of Halifax, LOWE from her position in the scouting line made sonar contact at a range of 1800 yards. At 1042, LOWE attacked with Hedgehogs. The pattern detonated on the bottom. At 1059, LOWE fired her second Hedgehog pattern. During this attack the submarine apparently stopped on or near the bottom. Two detonations occurred 22 seconds after firing and the rest of the pattern detonated on the bottom immediately thereafter.

Oil and air were sighted bubbling to the surface at the point of the last attack, followed by quantities of debris. A boat was lowered and samples of the debris were recovered. At 1318, MENGES was directed by CTG 22.14 to take charge and, coördinating with LOWE, to drop full patterns of Mark 8 charges (set on magnetic) on the target. LOWE dropped three patterns and MENGES dropped two patterns of depth charges, bringing more oil and debris to the surface. At 1623, 40 minutes after the last depth charge attack, an underwater explosion occurred.


Die Dienststelle hat den oberen Teil vor Aushändigung hier abzutrennen und bei Nichtbenutzung der Eisenbahn unbrauchbar zu machen!

Urlaubsschein - Dienstreiseschein [1] № Mb 821484 *

Gültig nur in Verbindung mit Soldbuch, Truppenausweis, Pers.-Ausweis W, Ausländer-Ausweis W.[1] Nr.

Kennwort: [U] ...., Frontleitstelle:

Grund und Verfügung: [D]

(Dienstgrad, Vor- und Zuname des Reisenden), Urlaub vom .... bis .... (Datum und Uhrzeit)

von .... (Truppenteil bzw. Feldpostnummer) Rückreise am [D]

Dienstliche Reise vom .... bis .... genehmigt

Zwischenaufenthalt in [D]

Alle Reiseziele bzw. Urlaubsorte: [1]

Vermerke und Bescheinigungen der Einheit

1. Abgefunden mit: Wehrsold (Gr ....) bis einschl. / Frontzulage / Bekl.-Entschädigung / Verpflegungsgeld / Feinseife / Rasierseife

Tabakwaren: als Portion bis einschl. / als Market.-Ware / Rauchermarke / Raucher-Kontr.-Karte / Raucherkarte / Sonst. Market.-Ware

2. Verpflegungsnachweis: Heimatverpflegungszulage für Fronturlauber [1]) Verpflegungszulage für Beurlaubte, Verwundete oder Kranke [1]).

Monat: ... Monat: ...

Bei Abgabe von Truppen- oder Marschverpflegung oder Lebensmittelkarten sind entsprechende Tagesabschnitte durch die abgebenden Stellen — auch Kartenstellen — mit Tinte oder Tintenstift unbrauchbar zu machen.

Bescheinigung der Lebensmittelkartenstelle: Rückseite

3. Mitgeführte Geldbeträge: Reisekosten / Gebührnisse / Sonstige Geldmittel

Geldumtauschvermerke: Rückseite

4. Besondere Vermerke:

Dienststempel.

Ausgefertigt am .... 194....

(Truppenteil bzw. Feldpost-Nr.)

(Unterschrift)

(Dienstgrad, Dienststellung)

1) Nichtzutreffendes deutlich durchstreichen.
2) Bei mehreren: Name des Transportführers und .... (Anzahl) Mann
U) Nur für Urlaubsschein ausfüllen.
D) Nur für Dienstreiseschein ausfüllen.

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German Travel Permit recovered from the floating debris by USS LOWE. The permit is made out to Heinz Kuhs to join the naval replacement center at Bochum, Ruhr. Kuhs' address was F.P.O. 54899 (location not known). The permit was issued at F.P.O.M. 39131 (identified with Fourth U-Boat Flotilla at Stettin).

LOWE and MENGES held sonar contact intermittently with the bottomed submarine until the task group left the area at 2155, 18 March. The task group then returned to the area the next day to obtain additional evidence. At 1300 on the 19th, MENGES regained sonar contact on the same target and attacked with Hedgehogs, bringing up a large amount of fresh oil and a few pieces of wood. The task group then departed from the area to return to base.

German-Marked Debris Recovered

Considerable debris resulted from these attacks. Recovered were three gauze bandage packets with German markings, assorted pieces of wood, both interior and exterior, two documents in German one of which was a standard enlisted man's leave paper (travel permit), dated 22 December 1944 (*see photograph*). One piece of wood had a fragment of flesh and some hair adhered to it. A considerable oil slick resulted, enabling generous samples to be recovered. Oil continued to bubble to the surface 26 hours after the damaging Hedgehog attack. The heavy fog which cut visibility to from 300 to 500 yards prevented the recovery of more debris.

Analysis of Attacks

LOWE—*Attack No. 1*

Time	1042
Range at which contact was gained	1800 yards
Range at which contact was lost	100 yards
H.E.	None
Doppler	Slight down
Target movement	Right
Number of charges	24
Depth setting	Hedgehog

Submarine was plotted on course 345°(T), speed three knots. Bearing of contact at time of firing was 293°(T). Hedgehogs were fired on bearing 290°(T), and consequently missed astern.

LOWE—*Attack No. 2*

Time	1059
Range at which contact was regained	1600 yards
Range at which contact was lost	100 yards
H.E.	None
Doppler	Slight down to none
Target movement	Slight right to none
Number of charges	24
Depth setting	Hedgehog

Submarine showed little movement on this attack. Hedgehogs were fired on center bearing and resulted in two probable hits.

LOWE made three depth charge attacks at 1326, 1421 and 1543. MENGES made two depth charge attacks at 1334 and 1533. In all of these attacks full patterns of 13 Mark 8 depth charges, magnetic setting, were dropped. The target was stationary on the bottom in about 54 fathoms of water.

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JAP SUB PROBABLY JOINS ANCESTORS AFTER USS FINNEGAN HH ATTACK

Heavy Explosion, Debris Follow Action South of Iwo Jima

Employment	Anti-submarine screen
Time	1945 GCT, 25 February 1945
Position	22-41N/141-22E
Weather conditions	Visibility good; sea smooth; wind 8 knots
Depth of water	1300 fathoms
Contact first made by	Radar
Range	17,600 yards
Sonar conditions	Good
Number of attacks	Nine

While in the anti-submarine screen of a task unit proceeding from Iwo Jima to Saipan, USS FINNEGAN (DE-307) at 0545 (Zone minus 10) 26 February obtained a surface radar contact at a range of 17,600 yards. At 0612 FINNEGAN left the formation to intercept the contact. At 0620 contact was lost at a range of 6,700 yards. FINNEGAN arrived ten minutes later at the point where the target had disappeared and commenced operation "Observant." At 0642 sonar contact was made at a range of 1500 yards.

Between the time of initial sonar contact and 0800, FINNEGAN conducted five Hedgehog attacks with negative results. Two depth charge attacks with deep settings were then carried out followed by another Hedgehog attack, also with negative results.

At 1000, FINNEGAN fired a full pattern of depth charges with medium setting. Four minutes and 51 seconds after the first charge a heavy underwater explosion occurred, accompanied by rumbling and bubbling noises. Contact was not regained. Oil and debris were sighted on the surface and a boat was lowered to recover samples.

A ship of the same class as USS FINNEGAN *(DE-307).*

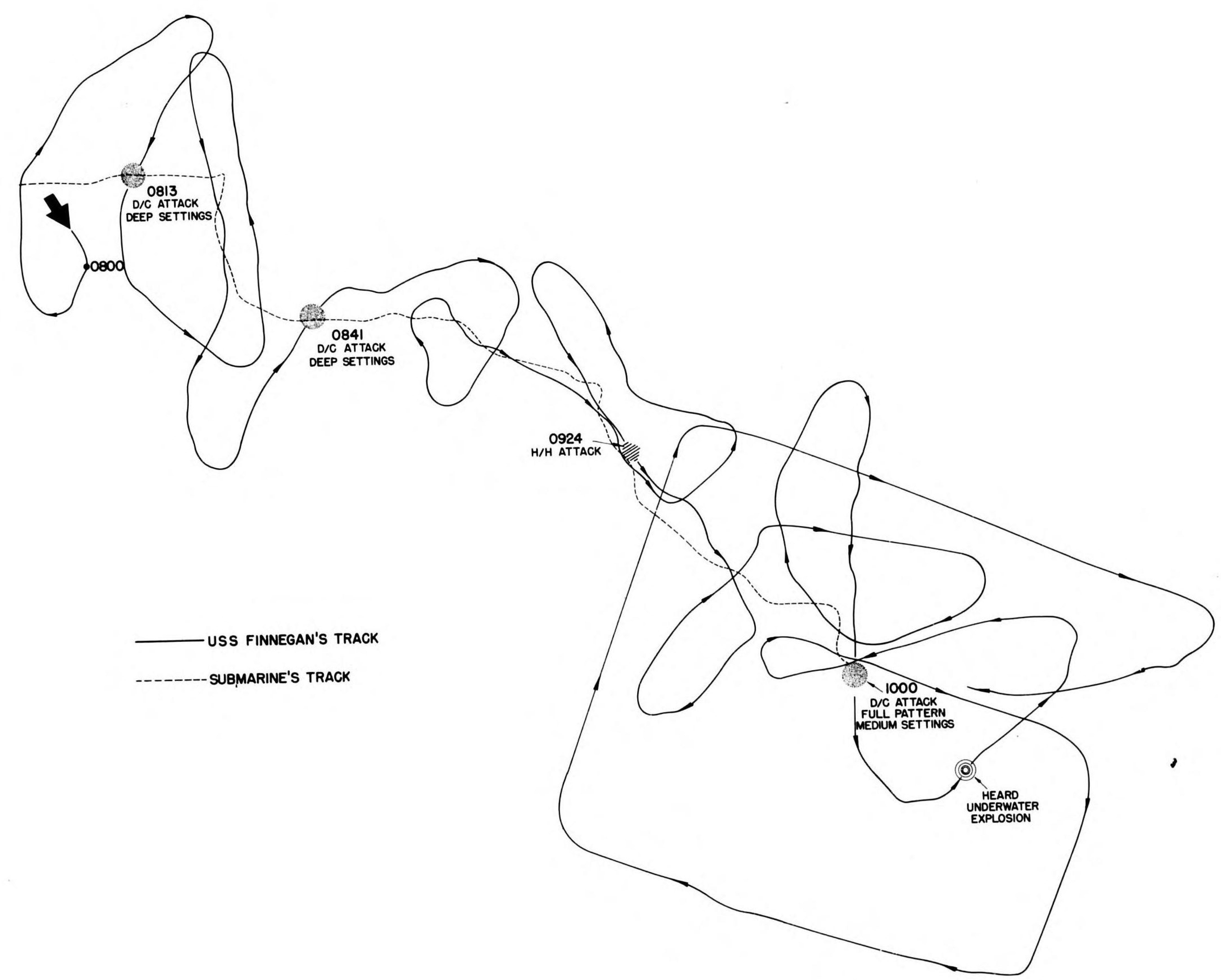
SECRET

Oil continued to rise at the scene of the attack until eight hours later and covered an area two miles wide and four miles long. Thirty-one pieces of timber of assorted sizes ranging from fragments of teak deck planks to pegs and splinters of what appeared to be interior woodwork were picked up. Several pieces bore Japanese characters. A sample of heavy grease or lubricating oil also was recovered.

Analysis of Attacks

Good recorder traces were obtained, but, as no data were recorded for any of the attacks, no detailed analysis can be made. On the last attack, an approach was made with a depth charge pattern on a deep setting. As contact was held to 100 yards, indicating that the submarine was shallow, the attack was broken off. A medium pattern was then set on the assumption that since the submarine was apparently changing depth and had been fairly near the surface at last estimate, it would now have submerged somewhat. FINNEGAN apparently "outguessed" the submarine and was rewarded by a probable hit.

TRACK CHART OF USS FINNEGAN (DE-307)



SECRET

CONVOYS ARRIVING IN MARCH 1945

Designation	Convoys	Average Voyage (Days)	Ships†	Ships per Convoy	Escorts	Escorts per Convoy	Casualties (Enemy Action) (a): Sunk in Convoy	Sunk as Straggler	Damaged
A. North Atlantic									
HX 339/344	6	14.8 (d)	413 (c)	69 (c)	32 (c)	5.3 (c)	0	0	0
SC 167/170	4	14.7 (g)	108 (c)	27 (c)	22 (c)	5.5 (c)	2 (t)	0	0
ON 284/290	7	16.5 (d)	545 (c)	78 (c)	42 (c)	6.0 (c)	0	0	0
ONS 42/44	3	18.0 (g)	81 (c)	27 (c)	17 (c)	5.7 (c)	0	0	0
CU 59/62	4	11.0 (d)	149	37	39	9.7	0	0	0
UC 57A/B, 58A/B, 59A/B, 60A/B	8	11.1 (d)	163	20	39	4.9	0	0	0
Special Convoys (b)	1	——	2	2	1	1.0	0	0	0
Total North Atlantic, March	33	——	1,461	44	192	5.9	2	0	0
Total North Atlantic, February	23	——	934	41	137	6.0	1	0	0
B. Middle Atlantic									
UGS 75/80	6	15.1 (e)	267	45	32	5.3	0	0	0
GUS 72/77	6	17.1 (f)	269	45	31	5.2	0	0	0
UGF 21	1	10.0 (e)	6	6	4	4.0	0	0	0
GUF 20	1	10.6 (f)	5	5	2	2.0	0	0	0
Special Convoys (b)	1	——	3	3	3	3.0	0	0	0
Total Middle Atlantic, March	15	——	550	37	72	4.8	0	0	0
Total Middle Atlantic, February	15	——	600	40	76	5.1	1	0	1
C. East Coast									
NG 492/497	6	6.9	59	10	25	4.2	0	0	0
GN 190/195	6	6.6	26	4	21	3.5	0	0	0
NK 671/677	7	5.6 (k)	5	1	7	1.0	0	0	0
KN 371/376	6	4.6 (j)	5	1	6	1.0	0	0	0
KG 764/770	7	2.9 (o)	15	2	18	2.6	0	0	0
GK 864/869	6	2.9 (l)	13	2	15	2.5	0	0	0
KH 643/653	6	2.4 (m)	11	2	8	1.3	0	0	0
HK 345/355 (i)	6	2.3	12	2	11	1.8	0	0	0
GAT 193/198	6	6.4	18	3	18	3.0	0	0	0
TAG 191/196	6	4.9 (n)	10	2	18	3.0	0	0	0
ZG 124/126, 128, 129	5	3.4	8	2	9	1.8	0	0	0
GZ 124/129	6	3.2	36	6	13	2.2	0	0	0
JT 66/70	5	14.0 (p)	15	3	11	2.2	0	0	0
TJ 216/220	5	17.0 (q)	14	2*	10	2.0	0	0	0
XB 148/153, 153A	7	2.2	69	10	15	2.1	0	0	0
BX 148/153	6	1.9	107	18	17	2.8	0	0	0
SG 60 (r)	1	3.8	1	1	2	2.0	0	0	0
GS 64 (s)	1	8.8	2	2	2	2.0	0	0	0
Total Regular Coastal, March	98	——	426	4.3	226	2.3	0	0	0
Total Regular Coastal, February	87	——	347	4.0	225	2.6	0	0	0
Special Convoys, March (b)	88 (h)	——	130	1.5	110	1.2	0	0	0
Special Convoys, February (b)	78	——	112	1.4	100	1.3	0	0	0
Total East Coast, March	186	——	556	3.0	336	1.8	0	0	0
Total East Coast, February	165	——	459	2.8	325	2.0	0	0	0

*Average of maximum ships at any one time in each convoy.
†All ships (including casualties, except escorts, and those returning to port).
(a) Including escorts.
(b) Not regularly scheduled; miscellaneous.
(c) Between WESTOMP and EASTOMP.
(d) Between New York and Liverpool.
(e) Cape Henry to Europa Point.
(f) Oran to Cape Henry.
(g) Between Halifax and Liverpool.
(h) Of which 38 originated in ESF, 26 in CSF, 19 in GSF, four in PSF, and one in Fourth Fleet Area.
(i) From Southwest Pass.
(j) Excluding KN 373 and 376, no merchant ships.
(k) Excluding NK 671, 674 and 677, no merchant ships.
(l) Excluding GK 869, no merchant ships.
(m) Excluding KH 649 and 653, no merchant ships.
(n) Excluding TAG 195, no merchant ships.
(o) Excluding KG 767, dispersed 76° W.
(p) Excluding JT 70, to Recife only.
(q) Excluding TJ 219 to Recife, and TJ 220 to Natal.
(r) St. Johns, N. F., to Greenland.
(s) Greenland to Boston.
(t) KING EDGAR, British cargo, and NOVASLI, Norwegian cargo, in SC 167, torpedoed 2 March in St. George's Channel.

GUS convoy passing through the Strait of Gibraltar.

CONVOYS—REVIEW OF THE MONTH

There were no enemy attacks on U. S. convoys during March. Two merchantmen in the break-off group of SC 107 were torpedoed and sunk 2 March in St. George's Channel enroute to Barry Roads.

Shipping statistics reveal several interesting facts. The largest number of merchant vessels ever to sail over the North Atlantic convoy routes to U. K. crossed the Atlantic in safety during March in the largest number of convoys. To be exact, 1,461 ships arrived in 33 convoys, an average of 44 ships, with 5.9 escorts per convoy. This is about double the number of ships and convoys arriving during the early months of 1943, when U-Boats were operating in wolf-packs in this area. The average convoy size then was almost the same, however, with about eight escorts each. The principal increase was in the ON convoys, of which seven arrived with an average of 78 ships.

Over the mid-Atlantic routes to the Mediterranean there was little change from the preceding month.

The average number of ships at sea in the Atlantic also reached a new record of 1,348, about double the number two years previously. Increases took place in all the Sea Frontiers (except the Brazilian area) as well as in the Northwest Atlantic area. Reflecting the location of U-Boats, however, the percentage of these ships which were in convoy dropped to a new low of 68. The proportion of shipping which was convoyed dropped to 16% in the Caribbean area, as compared with 89% two years ago, and to only 6% in the Brazilian region.

Among the coastal convoys, the principal event was the suspension of TJ/JT convoys, the last of which arrived safely on 17 March. In spite of this, March saw the largest number on record of regular coastal convoys: 98. Leaving out the BX/XB's, however, which shortened their sailing interval to five days about 26 February, these coastal convoys averaged 2.9 ships and 2.4 escorts each, taking into account the fact that 11 regular convoys sailed with no merchant vessels.

In the Pacific the number of ships at sea also averaged a new high of 766, of which the proportion in convoy declined slightly from the previous month to 38%. Even in the Indian Ocean the daily count of ships was high at 167, and there those which were convoyed were a mere 3%.

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PACIFIC CONVOYS, FEBRUARY 1945

The table on page 38 is the second monthly tabulation of Pacific convoys, but is the first to show the number of escort vessels involved. For explanation as to how these convoys are grouped for tabulation purposes, see the index sketch and article on page 35 of the March 1945 *U. S. Fleet Anti-Submarine Bulletin.*

The number of ships convoyed in February was 53% higher than in January, but as there were only a few more convoys, the average size increased from 3.6 to 5.2 ships. Escort vessels averaged 1.6 per convoy.

Chief new activity was in the New Guinea/Philippines area, 11 GI/IG convoys between Hollandia and Leyte averaging 38 ships and 3.7 escorts per convoy. GI 12 was the first to proceed through to Lingayen, arriving 1 March with 14 ships.

The average daily count of merchant ships at sea in the Pacific during February reached a new high level of 685, as compared with 635 in January. Of these, 287 or 42% were in convoy, also a new high, compared with 174 or 27% in the previous month.

CONVOYS

SUMMARY OF PRINCIPAL CONVOYS ARRIVING IN CALENDAR YEAR 1942*

Excluding Special or Miscellaneous Convoys

Designation	Period Covered (c)	Convoys	Ships (b)	Ships per Convoy	Escorts	Escorts per Convoy	Casualties (Enemy Action) (a)		
							Sunk in Convoy	Sunk as Straggler	Damaged
A. North Atlantic									
HX 165/219 (d)	15 Dec. '41–27 Dec.	55	1,899 (g)	34 (g)	316 (h)	5.7 (h)	9	5	1
SC 60/113 (e)	16 Dec. '41–31 Dec.	54	2,021 (g)	37 (g)	330 (h)	6.1 (h)	46	6	2
ON 48/153 (f)	19 Dec. '41–31 Dec.	104	3,660 (g)	35 (g)	647 (h)	6.4 (h)	71 (i)	28	14
Total North Atlantic Trade Convoys		213	7,580 (g)	36 (g)	1,293 (h)	6.1 (h)	126 (i) (j)	39 (k)	17 (l)
AT 10, 12, 14/18, 20, 23 (m)	15 Jan.– 6 Oct.	9	84	9.3	100	11.1	0	0	0
TA 10, 12, 17, 18, 20	1 Feb.–15 Sept.	5	26	5.2	47	9.4	0	0	0
CT 9/12, 14/19	8 Jan.–11 July	10	21	2.1	27	2.7	0	0	0
NA 1/6, 9, 11, 13 (m)	10 Jan.–29 July	9	19	2.1	19	2.1	1	0	0
Total North Atlantic		246	7,730	31	1,486	6.0	127	39	17
B. Middle Atlantic									
UGS 2, 3 (n)	13 Nov.–30 Dec.	2	83	41	11	5.5	0	0	0
UGF 2/3 (n)	2 Nov.–24 Dec.	2	39	19	25	12.5	0	0	0
GUF 1, 2, 2A	15 Nov.–25 Dec.	3	30	10	25	8.3	0	0	0
Total Middle Atlantic		7	152	22	61	8.7	0	0	0
C. East Coast (o)									
KS 500/533	14 May–28 Aug.	34	719	21	219	6.4	3	0	1
KN (old) 100/136	15 May– 8 Sept.	37	773	21	216	5.8	0	0	0
NK 500/515	28 Aug.–31 Dec.	16	318	20 (p)	81	5.1	0	0	0
KN (new) 200/214	8 Sept.–30 Dec.	15	368	25	80	5.3	0	0	0
NG 300/331, Spec. 1	27 Aug.–29 Dec.	33	722	22	160	4.8	0	0	0
GN Spec. 1/29	1 Sept.–26 Dec.	30	733	24	149	5.0	0	0	0
Total Eastern Sea Frontier		165	3,633	22	905	5.5	3	0	1
KG Spec. 1/2, 600/617	1 Sept.–25 Dec.	20	224	11	102	5.1	0	0	0
GK 700/718	1 Sept.–25 Dec.	19	158	8	85	4.5	0	0	0
KH 400/422 (even numbers)	3 Sept.– 3 Dec.	12	339	28	56	4.7	0	0	0
HK 100/128 (even numbers)	4 Sept.–25 Dec.	15	481	32	74	4.9	0	0	0
KP 401/429 (odd numbers)	9 Sept.–28 Dec.	15	127	8	67	4.5	0	0	0
PK 101/129 (odd numbers)	8 Sept.–29 Dec.	15	222	15	68	4.5	0	0	0
GM 201, 2/10	29 July–29 Aug.	10	97	10	29	2.9	0	0	0
MG 2, 4/11	30 July–28 Aug.	9	109	12	26	2.9	0	0	0
Total Gulf Sea Frontier		115	1,757	15	507	4.4	0	0	0
WAT 1/17	1 July– 5 Sept.	17	445	26	106	6.2	1	2	0
TAW 1/16, Spec. Slow	2 July–30 Aug.	17	438	26	88	5.2	13	0	2
GAT 1/31	31 Aug.–27 Dec.	31	706	23	173	5.6	0	1	0
TAG 1/31	29 Aug.–28 Dec.	31	734	24	164	5.3	12	0	2
TG 1/2	26 Oct.– 7 Dec.	2	17	9	7	3.5	0	0	0
OT 1/13, Spec. 2, 5	15 May– 5 Aug.	15	87	6	33	2.2	1	0	0
TO 1/10	23 May–28 June	10	58	6	20	2.0	2	0	0
TP 1, Spec.W, E3/9 / Trinidad 2/27	16 July– 8 Dec.	35	403	12	159	4.5	2	0	1
BRN 1/4, RT 1	5 Oct.–23 Dec.	5	82	16	21	4.2	0	0	0
Total Caribbean Sea Frontier		163	2,970	18	771	4.7	31	3	5

*1943 Summary appears on page 31, January 1944 *U. S. Fleet Anti-Submarine Bulletin*. The 1944 Summary appears on page 34 of the January 1945 issue.

CONVOYS

SUMMARY OF PRINCIPAL CONVOYS ARRIVING IN CALENDAR YEAR 1942

Excluding Special or Miscellaneous Convoys

Designation	Period Covered (c)	Convoys	Ships (b)	Ships per Convoy	Escorts	Escorts per Convoy	Casualties (Enemy Action) (a)		
							Sunk in Convoy	Sunk as Straggler	Damaged
C. East Coast (Continued) (o)									
PG 1/8	11 July–29 Aug.	8	131	16	41	5.1	1	0	1
GP 1/7	15 July–29 Aug.	7	48	7	38	5.4	0	0	0
ZG 1/16	31 Aug.–24 Dec.	16	195	12	88	5.5	0	0	0
GZ 1/17	31 Aug.–29 Dec.	17	250	15	104	6.1	0	0	0
CT 1	2 July–10 July	1	4	4	2	2.0	0	0	0
CW 2, 3	3 July–16 July	2	20	10	8	4.0	0	0	0
ZC 1/5	5 Oct.– 4 Dec.	5	39	8	18	3.6	0	0	0
CZ 2/7, CP 1	26 Sept.–28 Dec.	7	43	6	21	3.0	0	0	0
Total Panama Sea Frontier		63	730	12	320	5.1	1	0	1
XB 1/37	18 Mar.– 8 Sept.	37	373	10	99	2.7	2	0	0
BX 1/37	20 Mar.–11 Sept.	64	1,041	16	192	3.0	0	1	1
SG 1/16	6 July–29 Dec.	16	70	4	48	3.0	2	0	1
GS 1/16, 9A	7 July–27 Dec.	17	75	4	42	2.5	0	0	1
TH 1/4	17 May– 4 July	4	19	5	7	1.7	0	0	0
HT 1/3	22 May–30 June	3	12	4	6	2.0	0	0	0
AH 1/3	27 July–11 Sept.	3	35	12	12	4.0	0	0	0
HA 1/4	5 July–29 Aug.	4	58	15	15	3.7	0	0	0
Total Canadian/U. S. Convoys		148	1,683	11	421	2.8	4	1	3
Total Principal Coastals		654	10,773	16	2,924	4.5	39	4	10

(a) Including escort vessels.
(b) All ships (including casualties) except escorts and except those returning to port.
(c) From date of sailing of first convoy to date of arrival of last convoy of same letter designation.
(d) From Halifax to Liverpool until September, from New York commencing with HX 208 sailing 17 September.
(e) From Sydney (or Halifax) to Liverpool until 19 September, from New York commencing with SC 102 sailing 19 September. Odd numbered convoys usually had ships for Iceland, escorted from ICOMP to Iceland by TG 24.6.
(f) From Liverpool to Halifax, Boston or Cape Cod Canal until September, to New York commencing with ON 125 arriving 12 September. Odd numbered convoys generally fast, even numbers generally slow. (ON 152 arrived in 1943, therefore not included).
(g) Number crossing Atlantic, including those for or from Iceland (excludes ships only in local sections).
(h) Mid-ocean escorts only (Task Group 24.1)—excludes Western Local and Iceland "shuttle" escorts.
(i) Of which five are escort vessels, none U. S. (the only casualties to escorts in HX, SC and ON convoys).
(j) Of which 96 cargo vessels and 25 tankers.
(k) Of which 33 cargo vessels and 6 tankers.
(l) Of which three cargo vessels and 14 tankers.
(m) NA 7, 8, 10, 14/16 from Halifax to U. K. sailed with AT convoys.
(n) "Torch Operation" convoy sailing from Hampton Roads 23 and 24 October for capture of Casablanca not included in this table.
(o) Excluding short route convoys, such as New York/Delaware, Key West/Havana and subsidiary joiners to NK, NG, TAG/GAT convoys.
(p) Of which six joined from Norfolk.

Convoy Designations Used in This Table

AH	Curacao—Halifax
AT	U. S.—Iceland/UK (Military)
BRN	Rio de Janeiro—Trinidad
BX	Boston—Halifax
CT	Clyde—Halifax (CT 1: Panama—Trinidad)
CP	Curacao—Panama
CW	Panama—Key West
CZ	Curacao/Aruba—Panama
E	Trinidad—dispersal Southeast
GAT	Guantanamo—Aruba—Trinidad
GK	Guantanamo—Key West
GM	Galveston—Mississippi
GN	Guantanamo—New York
GP	Guantanamo—Panama
GS	Greenland—Sydney
GUF	Gibraltar—U. S. (Fast)
GZ	Guantanamo—Panama
HA	Halifax—Curacao
HK	Galveston—Key West
HT	Halifax—Trinidad
HX	Halifax or N.Y.—Liverpool (Fast)
KG	Key West—Guantanamo
KH	Key West—Galveston
KN (old)	Key West—Norfolk
KN (new)	Key West—New York
KP	Key West—Pilottown
KS	Norfolk—Key West
MG	Mississippi—Galveston
NA	Halifax—Clyde
NG	New York—Guantanamo
NK	New York—Key West
ON	Liverpool—Boston or N. Y. (Fast and Slow)
OT	Aruba/Curacao—Trinidad
PG	Panama—Guantanamo
PK	Pilottown—Key West
RT	Recife—Trinidad
SC	Sydney, Halifax or N. Y.—Liverpool (Slow)
SG	Sydney—Greenland
TA	U.K./Iceland—U. S. (Military)
TAG	Trinidad—Aruba—Guantanamo
TAW	Trinidad—Aruba—Key West
TG	Trinidad—Guantanamo
TH	Trinidad—Halifax
TJ	Trinidad—Rio de Janeiro
TO	Trinidad—Aruba/Curacao
TP	Trinidad—dispersal Southeast
Trinidad	Trinidad—dispersal Southeast
UGF	U. S.—Gibraltar (Fast)
UGS	U. S.—Gibraltar (Slow)
WAT	Key West—Aruba—Trinidad
XB	Halifax—Boston
ZC	Panama—Curacao/Aruba
ZG	Panama—Guantanamo

PACIFIC CONVOYS ARRIVING IN FEBRUARY 1945

Including Commissioned Vessels

(See Index Sketch, page 35 of the March 1945 *U. S. Fleet Anti-Submarine Bulletin*)

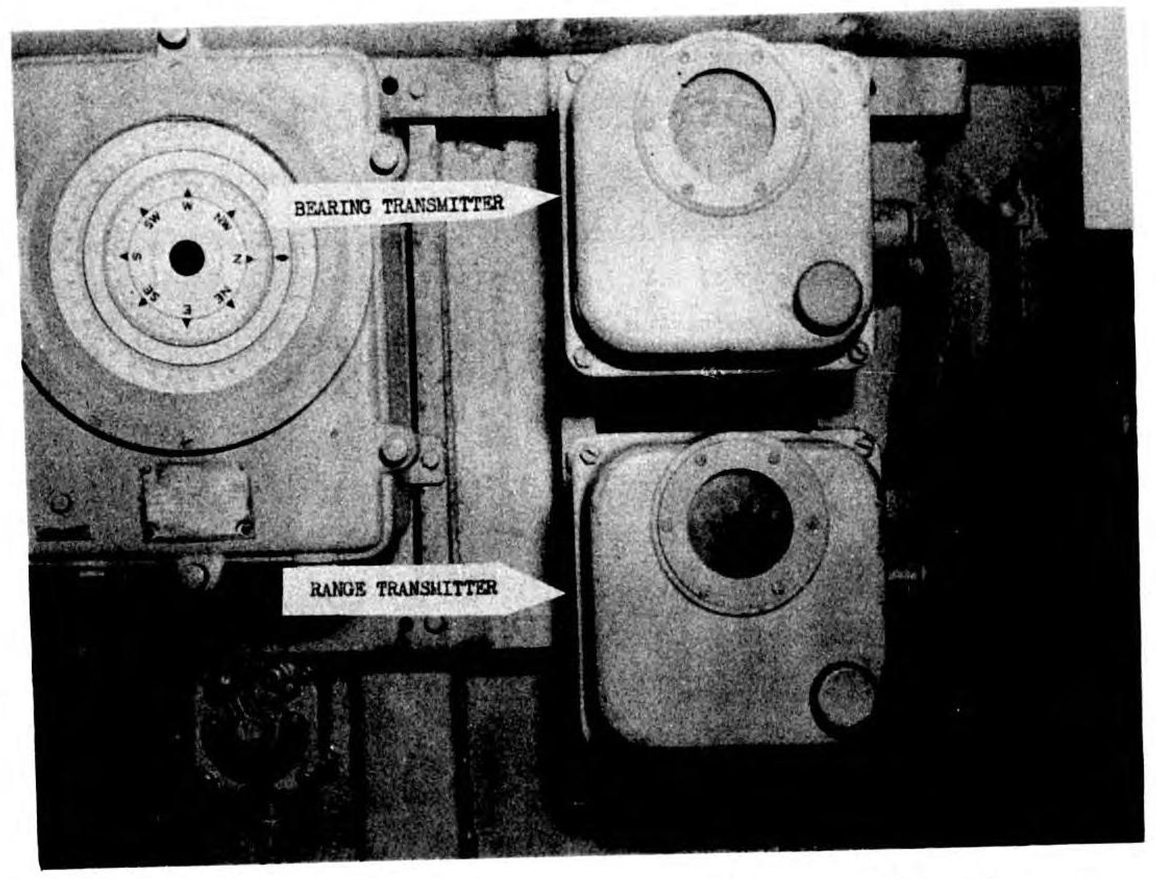
Convoy Title	*Convoys*	*Average Voyage (Days)*	*Ships*	*Ships Per C/V*	*Escorts*	*Escorts Per C/V*	*Casualties (Enemy Action)*
Group A—West Coast							
1. San Francisco/Pearl Harbor—SP 36/38	3	9	9	3.0	3	1.0	0
PS 281, 299	2	6.5	2	1.0	2	1.0	0
2. Saipan/San Francisco 4	1	11	11	11	1	1.0	0
3. Seattle/Pearl Harbor RP 6	1	8	3	3.0	1	1.0	0
Total	7	—	25	3.6	7	1.0	0
Group B—Pearl Harbor and West							
1. Pearl/Eniwetok—PD 272, 275, 278, 280, 291, 294, 297, 304/307	11	7.6	53	4.8	33	3.0	0
2. Pearl/Funafuti—Honolulu/Funafuti 261, 263, 265, 271, 276, 277, 289, 290, 292, 293, 300	11	12	40	3.6	0	0	0
Miscellaneous	3	—	5	1.7	5	1.7	0
Total	25	—	98	3.9	38	2.7*	0
Group C—Marshall Islands and West							
1. Eniwetok/Marianas—(a) Eni.-Guam 55/62	8	4.4	52	6.5	17	2.1	0
Guam-Eni. 49/53, 56	6	4.7	25	4.2	16	2.7	0
(b) Eni.-Saipan 53, 56/67	13	4	66	5.1	23	1.8	0
Saipan-Eni. 58/69	12	4.7	33	2.7	21	1.8	0
2. Eniwetok/Carolines & Palaus—(a) Eni.-Ulithi 38/44	7	5.9	21	3.4	9	1.3	0
Ulithi-Eni. 64, 66/81	17	5.3	46	6.6	29	4.1	0
(b) Eni.-Ulithi-Kossol 13/17	5	6	80	16	15	3.0	0
Kossol-Ulithi-Eni. 7	1	8	3	3.0	1	1.0	0
Miscellaneous	21	—	40	1.9	24	1.1	0
Total	90	—	369	4.1	155	1.7	0
Group D—Marianas, Carolines, Palaus and West							
1. Guam-Ulithi 13/14	2	1.5	3	1.5	2	1.0	0
Ulithi-Guam 36/46	11	1.5	20	1.8	12	1.1	0
2. Saipan-Ulithi 11/12	2	2	2	1.0	3	1.5	0
Ulithi-Saipan 15/18	4	1.8	4	1.0	4	1.0	0
3. Ulithi-Kossol (or Peleliu) 40/46, 4/7	11	1.6	25	2.3	14	1.3	0
Kossol (or Peleliu)-Ulithi 14/22	9	1.7	12	1.3	10	1.1	0
4. Kossol-Leyte 11/19	9	3.3	85	9.4	18	2.0	0
5. Ulithi-Leyte 4/6	3	4.3	12	4.0	7	2.3	0
Total	51	—	163	3.2	70	1.4	0
Group E—New Guinea and West							
1. New Guinea/Philippines—(a) GI 8/12, 10A	6	6.3	253	42	21	3.5	0
IG 5/9	5	7.2	164	33	20	4.0	0
(b) Biak/Morotai—BG 513/516	4	2.2	29	7.3	9	2.2	0
GB 730, 732/736	6	3.7	17	2.8	13	2.2	0
2. Manus-Ulithi 18/26	9	3.4	15	1.7	10	1.1	0
Ulithi-Manus 13/16	4	3	4	1.0	4	1.0	0
3. Manus-Kossol 9, Peleliu 2/3	3	3.3	3	1.0	3	1.0	0
Kossol-Manus 9/11	3	5.3	5	1.6	3	1.0	0
4. Admiralty-Philippines—AI 1	1	4	6	6.0	3	3.0	0
Leyte-Manus 1	1	14	4	4.0	2	2.0	0
Miscellaneous	11	—	40	3.6	1	—	0
Total	53	—	540	10.2	89	2.1†	0
GRAND TOTAL	226	—	1195	5.2	359	1.6	0

*Excluding Pearl/Funafuti convoys. †Excluding miscellaneous convoys.

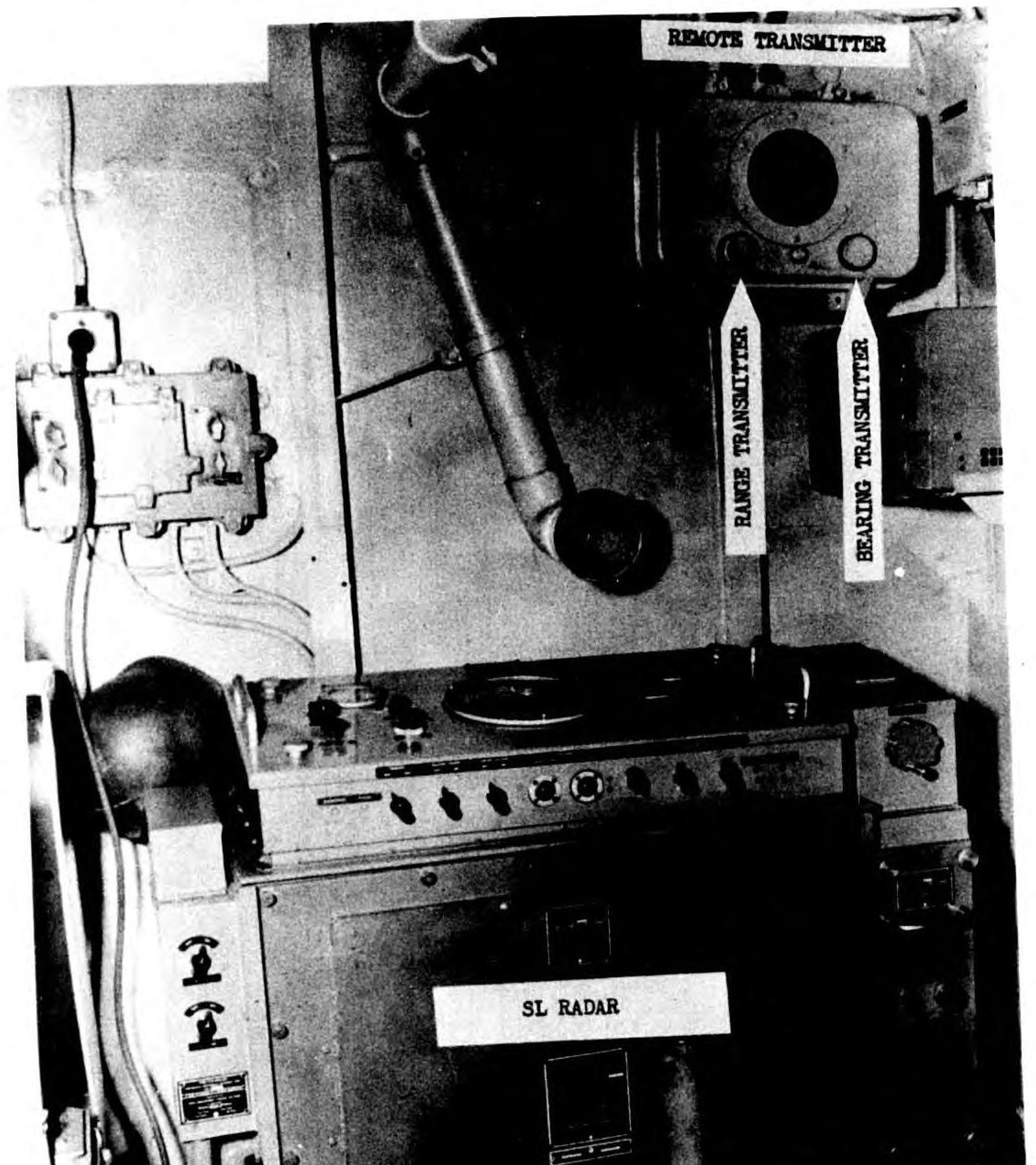
A NEW AID FOR THE COÖRDINATED ATTACK

A new coördinated attack aid known as the Remote Transmitter for Attack Plotter Mark 1 Mod. 0 is being procured by the Bureau of Ordnance. The original idea for the device was conceived by the West Coast Sound School and was known there as the Coördinated Attack Plotter or "COAP." As developed by the West Coast Sound School, the COAP was a small attachment for the Attack Plotter Mark 1 Mod. 0 which did away with the predictor line on the cathode ray tube, using this circuit to produce a spot of light which represented the attacking ship.

The attacking ship's pip could be readily positioned with respect to own ship's pip by means of a control box, the two dials of which set range and bearing of the attacking ship from own ship into the Attack Plotter. By placing the control box near the surface search radar or near the ship's pelorus and range finder, and by keeping the dials set to the range and bearing of the attacking ship, the position of the attacking ship could always be properly oriented on the Attack Plotter's screen. The great advantage claimed for the device was a marked reduction in plotting time and less confusion due to communication difficulties.



Remote Transmitter installation on bridge of USS PCE–869.



Remote Transmitter installation in CIC room of USS PCE–869.

The COAP was tested extensively and evaluated by ASDevLant, who found the general principle to be excellent. Unfortunately the circuit capacitances varied with time permitting the attacking ship's pip to drift out of position. Upon the recommendations of ASDevLant, the General Electric Company undertook to correct this deficiency.

The modified device, now known as the Remote Transmitter for Attack Plotter Mark 1 Mod. 0, was returned to ASDevLant and was thoroughly tested again and proved to be an excellent aid. The tests indicated that the Remote Transmitter is fairly simple to install and that the calibration is now quite stable. In its present form there is a range and bearing transmitter which will be mounted near the surface radar set. In addition a range transmitter and a separate bearing transmitter will be located on the bridge in positions convenient to operators.

With this arrangement and by using appropriate switches, inputs may be selected from radar ranges and bearings, stadimeter or range finder ranges and pelorus bearings, or any combination of the above. A dial setting on the Attack Plotter will correct the plot for speed of sound in water thus eliminating errors in range of the submarine from the assisting ship.

The Bureau of Ordnance has been directed to procure Remote Transmitters for all destroyers, destroyer-escorts and frigates equipped with attack plotters.

RESULTS OF DIRECTIONAL RADIO SONO-BUOY OPERATIONAL TESTS

Operational tests of the Directional Radio Sono-Buoy were conducted by Anti-Submarine Development Detachment, Atlantic Fleet, in the waters off Fort Lauderdale, Florida, during the period 9 January to 20 February 1945. Assisting in the tests were representatives from ASWORG, the Underwater Sound Laboratory at the Massachusetts Institute of Technology, and from the Underwater Sound Laboratory at New London, Connecticut. Nine surface craft, eight aircraft (one LTA), five submarines, and one CVE task group (five destroyers) were used. The following pertinent excerpts from the report of these tests, as well as the data contained in *Figures 1 to 6* will be of interest to those forces utilizing the radio sono-buoy in anti-submarine operations.

"The DRSB tests indicated that the sound output of Fleet-type submarines at all speeds, and of Italian submarines at slower speeds and considerable depth, is much lower than has generally been considered for tactical purposes. It is reasonable to assume that Germans and Japanese alike are aware of the possibility of sonic weapons and of sonic listening by aircraft. It is highly probable that German submarines have made similar improvement in silent running in an effort to escape sonic listening or attack.

"It was further shown that when cavitation did not exist, ranges on both the DRSB and ERSB were disappointingly low. It must be assumed that enemy submarine commanders know at all times their sound output, and that escape speeds following aircraft sighting or attack will not be high enough to induce cavitation or a noisy condition.

"Since every possible means of detection must be used in an effort to gain or to maintain contact with the enemy, the DRSB is recommended for use as a supplement to the ERSB. Its ability to confirm doubtful contacts may be of particular value."

Initial production of the DRSB is expected to commence with approximately 200 produced in May, increasing as rapidly as possible to a monthly rate of approximately 1500 by August. The ARR/16B receiver is expected also to become available by May in appreciable quantities. It is planned eventually to equip both the Atlantic and Pacific with the directional sono-buoy as a supplement to the expendable radio sono-buoy, now in use.

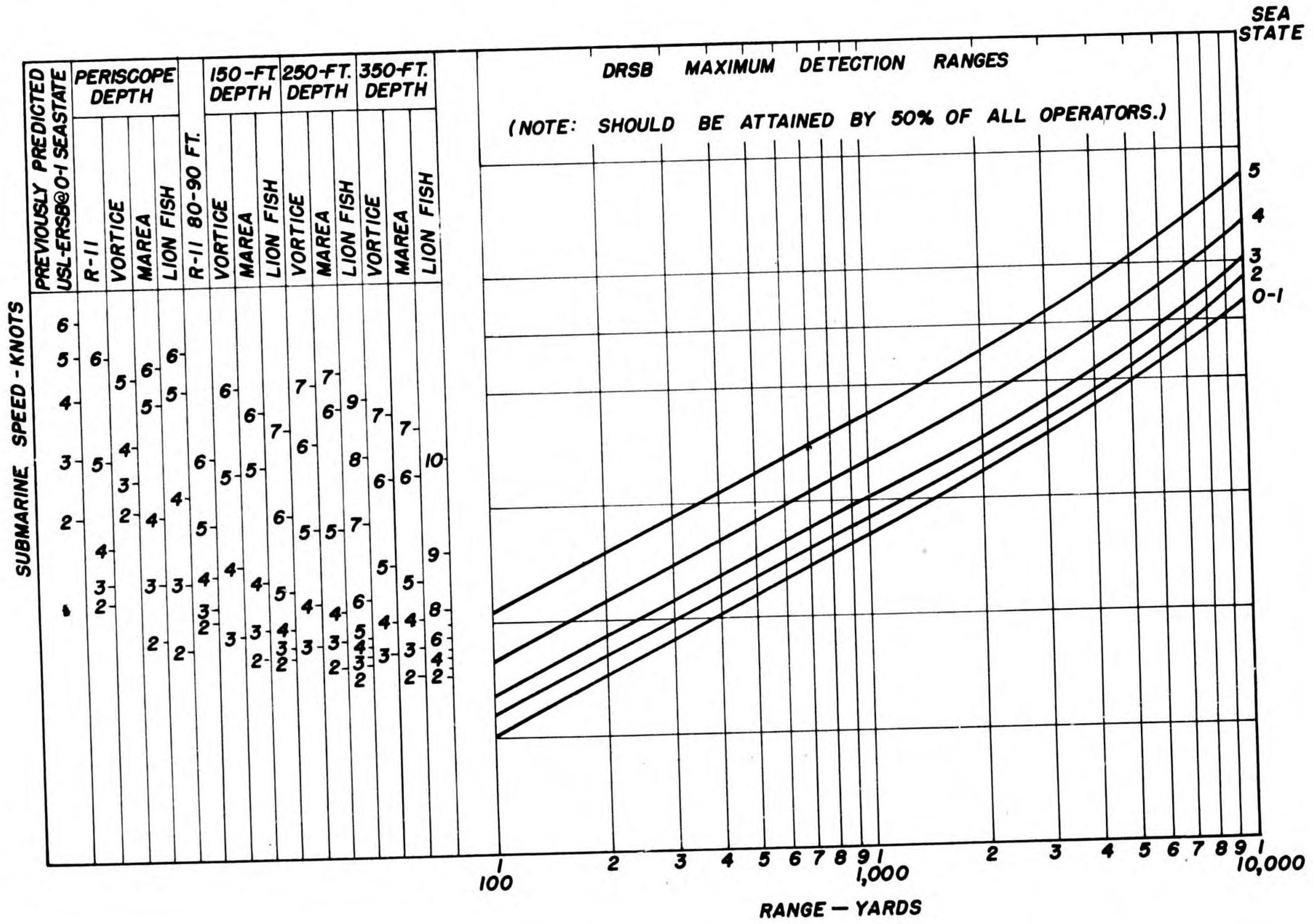


Figure 1—Chart of ranges of DRSB against submarines tested.

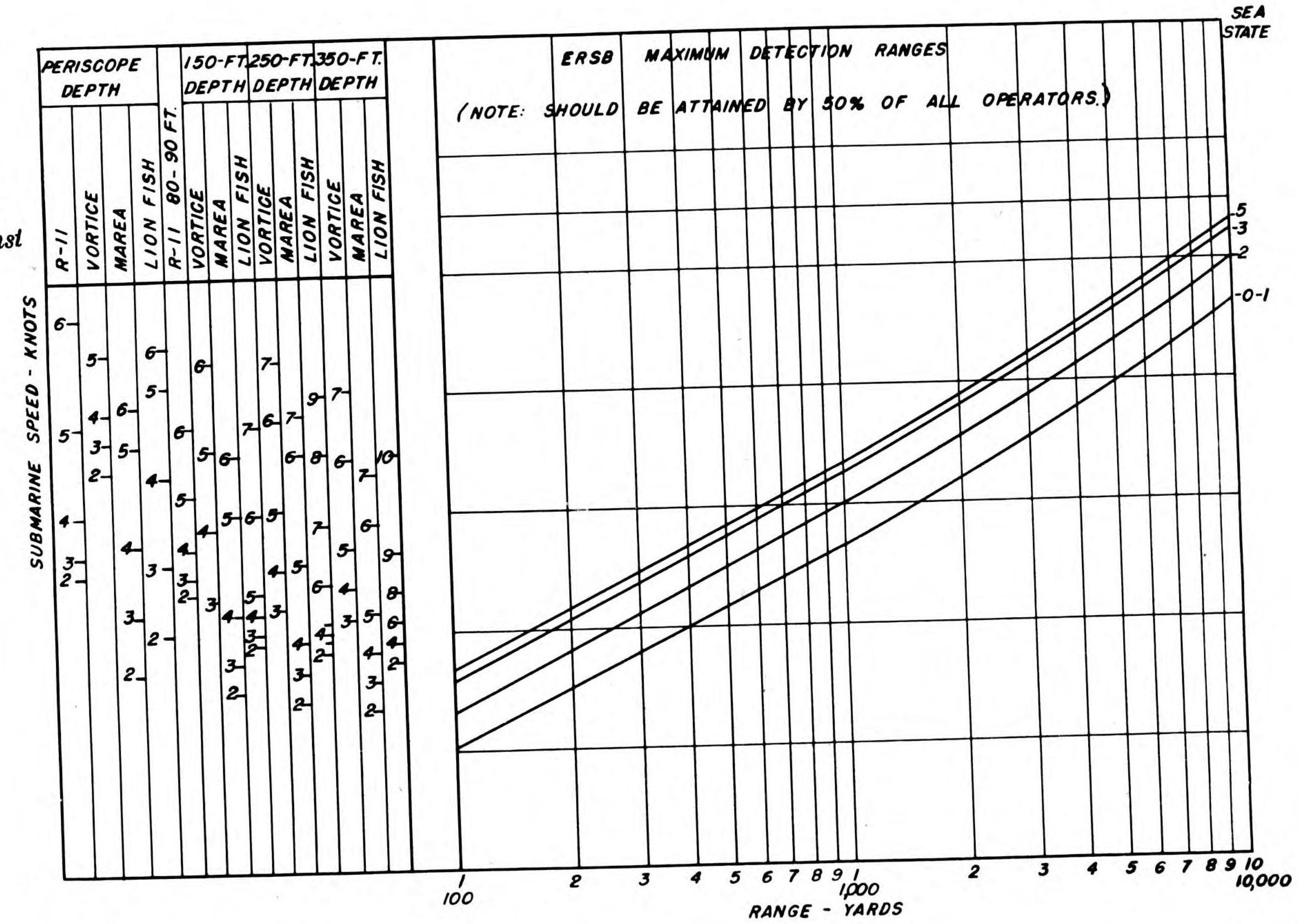


Figure 2—Chart of ranges of ERSB against submarines tested.

DRSB MAXIMUM DETECTION RANGES

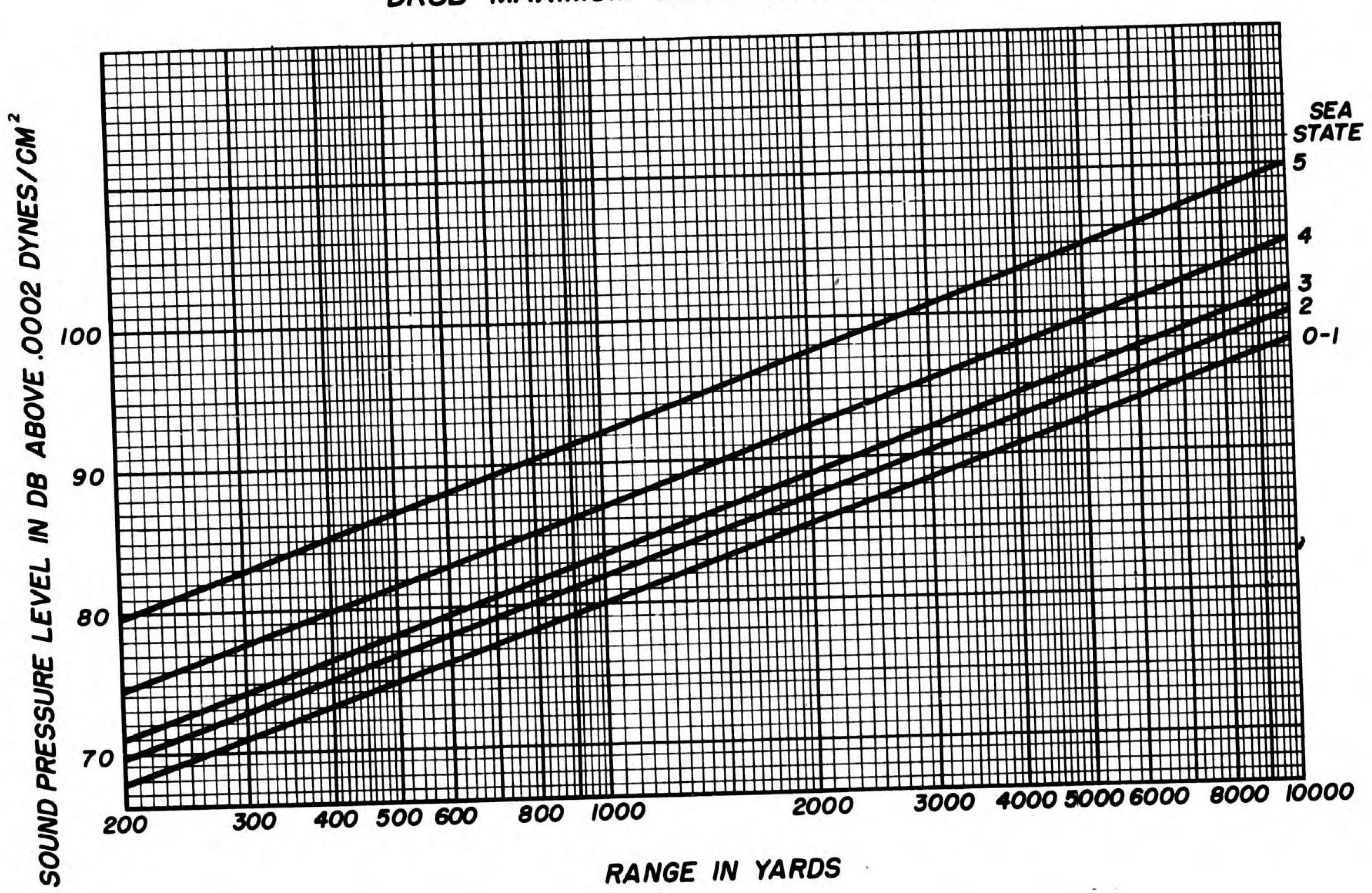


Figure 3—Chart of ranges of DRSB against decibel output of targets.

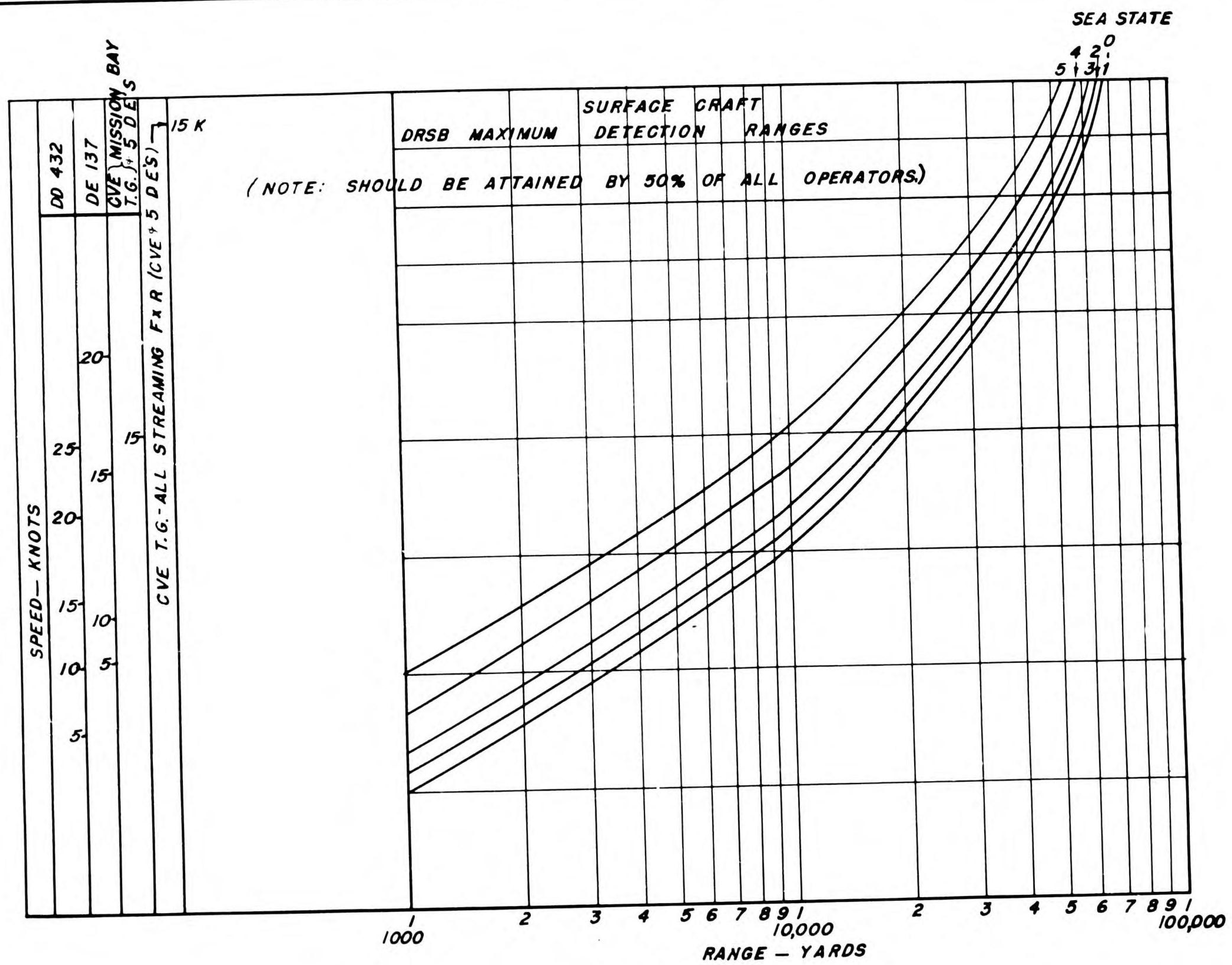


Figure 4—Chart of ranges of DRSB against surface craft.

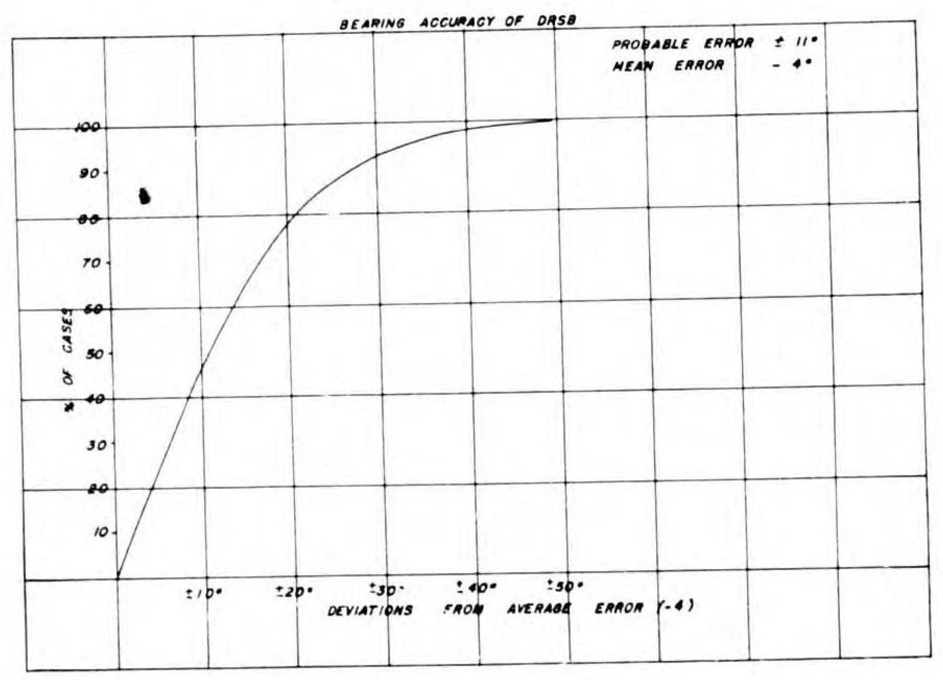


Figure 5—Chart indicating bearing accuracy achieved by operators using DRSB.

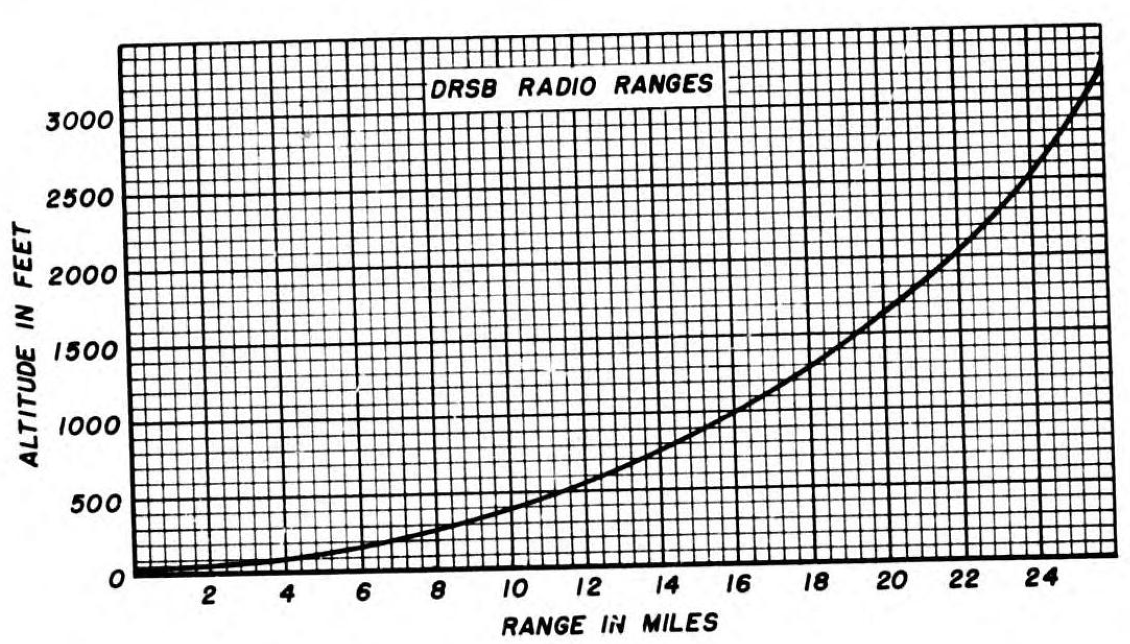


Figure 6—Chart indicating expected radio ranges of DRSB.

SONAR SEARCH FOR BOTTOMED SUBMARINES

Commander in Chief, U. S. Atlantic Fleet Serial 0500 dated 26 February 1945 was issued to interested Atlantic activities to acquaint them with the general problem of searching for bottomed submarines. The information contained in that letter was based on operations conducted on bottomed submarines in the Block Island and Casco Bay areas. These tests were initiated by Commander in Chief, U. S. Atlantic Fleet, and much valuable information was obtained from them.

The following article conforms in general with the form and substance of the CincLant letter, but certain paragraphs have been amplified to include recommendations of the Bureau of Ships, based on sonar transmission studies and observations made during wreck charting surveys.

The success of the inshore submarine campaign conducted in Canadian and British waters in the past few months is in part attributed to the practice by the enemy of bottoming in shallow water immediately following an attack. A series of tests on bottomed submarine targets has been conducted in an effort to develop methods for detecting and destroying bottomed submarines.

Problems of echo-ranging in shallow water were discussed in an article on page 32 of the November 1944 *U. S. Fleet Anti-Submarine Bulletin*. This article, however, did not deal specifically with the bottomed target. In the December 1944 issue, page 33, Operation "Scour" was described.

Observations Are Outlined

As a result of the above mentioned tests, certain observations were made which are discussed below. Many of these already are contained in standard anti-submarine publications but are recorded as follows to verify previous reports and to make complete the list of lessons learned from the recent tests:

(a) The range recorder trace of the echo from a bottomed submarine is identical with that received from a submarine underway, with the exception that the bow cannot be distinguished from the stern of the target. Beam traces are readily recognizable. Echoes from a bottomed submarine usually do not show doppler, and therefore are harder to recognize by listening than the echo from a moving submarine. Loudest echoes and strongest recorder traces are received from a target beam-on.

(b) The nature of the bottom on which the submarine is located will make a decided difference in the effectiveness of the search. Smooth, flat, hard sand affords most favorable conditions for search while irregular, rocky bottom makes the search more difficult. Because of the patchy character of the bottom in many localities, variable echo-ranging conditions are encountered frequently in shallow water. These effects are discussed on page 32 of the November 1944 *U. S. Fleet Anti-Submarine Bulletin.*

(c) The target may be discovered by sonar search even though it lies in a considerable depression or canyon if the surrounding bottom is relatively smooth. This may not be true if the sides and bottom of the canyon are irregular and rocky.

(d) Numerical estimates of maximum range may be made from a bathythermograph record only over *mud* bottoms. Such predictions must be used with caution, since temperature gradients in shallow water may change unpredictably within short periods of time, particularly in areas near shore with strong tidal currents.

(e) Large temperature gradients, when coupled with unfavorable sea and bottom conditions, sometimes may afford the submarine practical immunity from detection by sonar search.

(f) When positive thermal gradients are encountered, a submarine below the layer of increasing temperature is difficult to detect, especially if the wind is strong and the sea choppy enough to produce high reverberation.

(g) There is a tendency for a submarine when bottomed to lie to the tidal current. Such course affords the submarine the safest heading on which to bottom and will probably be chosen deliberately. There is also a tendency for the submarine to swing to the current. Since a submarine echo is much stronger at aspects within 15 degrees of the beam than at other aspects, best results will probably be obtained when echo-ranging directly across the current (other conditions being equal).

(h) When echo-ranging into or against the current, doppler may occasionally be heard from the target if most of the reverberation comes from the sea surface. This is particularly likely when positive gradients are present or when the wind force is four or more and the range is less than 1,000 yards. Apparent target motion will often be shown by ASAP or DRT in current areas.

(i) The strength and character of the reverberation and the range out to which reverberation can be heard afford a rough estimate of the effectiveness of a sonar search. With heavy reverberation an echo from a submarine and its trace on a recorder may easily be lost in the reverberation. When the reverberation disappears abruptly at some close range and cannot be heard at greater ranges, the main sound beam is being bent down to and absorbed by the bottom; echoes beyond the range where reverberation disappears usually cannot be heard unless the submarine is beam-on, giving very strong echoes, or the echo-ranging ship speed is low, giving low background noise.

(j) A distinct burst of bottom reverberation is characteristic of downward refraction produced by strong negative gradients. False echoes are often found with these conditions, but can nearly always be distinguished by their great width and recorder trace length.

Suggestions for Bottom Search

Since the conditions under which operations may be conducted will vary widely, hard and fast rules for search and attack, other than those already existing in departmental publications, are not laid down. Certain suggestions, however, may be made which may assist in the conduct of any search for a bottomed submarine.

(a) A fundamental which must not be overlooked is the fact that we cannot be assured that the submarine is actually on the bottom until it has been so located. Bearing this thought in mind the commander at the scene must take effective steps to make sure that a submarine does not escape from the scene after a sighting or torpedoing. If a submarine is bottomed within an assumed area, there is no urgency for the conduct of the search, but, if he is departing from an assumed point, the probability of interception decreases rapidly as time goes on. Containing or intercepting a moving submarine is a matter of urgency. The search for a bottomed submarine may proceed with greatest deliberation. On arrival near a datum point the first step must be to prevent escape, then to search the suspected area for a bottomed submarine.

(b) A single ship arriving at the datum point should proceed to search in accordance with Article 1120 or 1130 of FTP 223A as may be appropriate. If in shallow water where probability exists that the submarine has bottomed, the second ship arriving should initiate a search for a bottomed submarine. As additional ships arrive they should be assigned alternately to these two tasks until four have been assigned the task of scouring the area surrounding the datum point for a bottomed submarine. In instances where several ships arrive simultaneously at the scene, Operation "Scour" should be taken up at an appropriate point of the prescribed procedure depending on the "time late" of arrival.

Matching Search With Conditions

(c) Search for the *bottomed submarine* should be conducted in an orderly manner which assures that the entire area is afforded a thorough sonar investigation. Give consideration to the following:

A sweep through the datum point with all available ships in line, followed by parallel searches of the entire suspected area, affords the quickest and most promising preliminary search. Operation "Scour" is applicable for small areas: *e.g.* when the submarine is being subjected to search very soon after a torpedoing has established its presence.

Over flat, gently sloping, or irregular bottoms, where there is little current, successive searches should be conducted at right angles to each other.

When the bottom is sharply sloping (six degrees or more) it might be well to search on a course parallel to the bottom contours, using a 40-degree sweep sector centered on the bow; this avoids echo-ranging up slope or down slope, thus decreasing reverberation and "shadow" effects, and increasing contact probability.

If a strong current is present, and no contact has been made during repeated searches using standard tactics, it may prove advantageous to conduct a search on courses perpendicular to the current direction, using a 40-degree sweep sector centered on the bow. This should increase the probability of getting a strong echo from a submarine at beam aspect. Alternately, proceed on courses parallel to the current, using a fixed beam at 90° or 270° relative.

The first search of the area should be made at a speed of approximately 15 knots with the searching ships employing FXR. If such search does not locate the target, the area should be researched. The choice of ship speed in this more detailed search depends on whether or not reverberation can be heard beyond 2,000 yards during the first search. If reverberation can be heard at long ranges, a high background noise level is unimportant, and the search may be continued at 15 knots and with FXR gear streamed, if desired. If reverberation cannot be heard beyond 2,000 yards, water noise around the projector may mask an echo from the submarine. For best results under these conditions, the FXR gear should not be streamed, and the ship speed should be reduced to seven knots for protection against acoustic torpedoes and to reduce the noise level in the sonar gear.

Spacing of ships, if in a scouting line, should be about 1.3 times the surface range (maximum echo range on a large moving surface vessel). This figure applies to normal beam-to-beam searching; it is of course reduced,

when employing limited sector search, in order to ensure a tight pattern. Use the frequency-sweep modulator in determining the surface range, since otherwise the high doppler of the echo from the moving surface vessel may give a much greater range than would be possible on the submarine with no doppler.

Using Frequency-Sweep Modulator

When reverberation can be heard beyond 1500 yards, the frequency-sweep modulator is advantageous in searching for a bottomed submarine. Use of the modulator, in correct adjustment, usually increases the maximum range on a target with no doppler when reverberation is high. Under these conditions the echo may be noticed on the recorder before it is heard. The frequency-sweep modulator should not be used, however, in searching when the surface range exceeds the range to which reverberation can be heard. Under these conditions use of a constant frequency signal and a signal length of 160 yards or more is desirable, since this increases the chance of hearing an echo against a noise background. An echo beyond the reverberation range usually will be heard before it is noticed on the recorder.

Since surface conditions in a given area may vary considerably with change of weather or tide, search, once initiated, should be continuous until a thorough search of the suspected area has been made under the most favorable sonar conditions to be expected in that area, even though this may involve protracted operations over a period of days. The most favorable condition is one in which the search is conducted in isothermal water, with a calm sea.

(d) Since submarines may deliberately choose depressions in which to bottom, such areas should be carefully searched. If the depression is of the canyon type better results may be expected from searches conducted along the lengthwise axis. Careful study of a large scale chart of the area should be made to determine whether canyons or other depressions exist.

(e) Bathythermograph observations are recommended at intervals of about two hours to give warning as to changing conditions and as to the existence of thermal layers.

(f) MAD-equipped planes or blimps may help in searching areas and in identifying suspicious underwater observations.

(g) Small distinguishable buoys may be useful in marking objects which have been investigated and identified as non-submarine, and should be used in marking off areas as they are covered. With strong currents, buoy a possible target also to indicate the apparent drift. Attack can be made more deliberately and accurately when the target is buoyed.

(h) Accurate navigation is essential to prevent duplication of effort or possible holidays in the area searched. Tidal currents usually will prevail in the waters involved.

(i) Sono-buoys may prove useful in helping to identify targets and possibly in connection with barriers to prevent the escape of the target.

(j) The range recorder should be run continuously during a search, particularly when heavy reverberations are encountered. Because it has a "mechanical memory," the recorder will sometimes indicate an echo which the ear can scarcely distinguish from reverberations.

(k) If installed, 147–B should be used to assist in the search and to aid in evaluating suspicious targets.

Is Target Suspicious?

Suspicious targets should be attacked without undue delay which may be caused by awaiting positive identification. In evaluating targets which give reasonable echoes, consideration should be given to:

- Width of target.
- Nature of trace of target from different bearings.
- Shape and size of the target as determined by echo trace widths from various bearings.
- Study of wreck charts and bottom sediment charts where available.
- Fathometer trace of target from runs over target.
- Trace as shown by 147–B.
- Sounds heard from target.
- Effect of attacks on target.

Since the bottomed submarine affords a target on which no lead angle need be taken and which is at a known depth, there is a high probability that all identified bottomed submarines will be destroyed.

. . .

DISTRIBUTION OF TRAINING DEVICES

During the month of March the following equipment was shipped:

QFA–6 Attack Teacher

1	Casco Bay, Portland, Me.	Casco Bay Training Center, Grand Trunk Pier
1	Key West, Fla.	Fleet Sonar School
1	Guantanamo, Cuba	N.O.B.
2	San Francisco, Calif.	ComSeventhFleet
1	San Pedro, Calif.	AD–22

AUXILIARY FIRING METHOD IN CASE OF CASUALTY TO RECORDER

A number of auxiliary firing methods for use in case of casualty to the range recorder have been devised. This article presents a simple and effective method which appeared recently in *Information Bulletin No. 1–45* published by Commander Destroyers, Atlantic Fleet.

The method may be divided conveniently into three parts:

1. Determination of range rate from doppler or stop watch.

2. Determination of time to run from a selected reference range to the point where the first charge is dropped. (This is done with the recorder, even when inoperative.)

3. Determination of pattern spacing from a simple table.

To illustrate the method, suppose that a casualty occurs to the range recorder during the run-in for a depth charge attack, the casualty being such that the recorder will no longer record ranges and range rates. Let us assume that the recorder has been set up for an attack speed of 15 knots, 25 seconds sinking time, and the appropriate firing lag and projector-to-stern distance. All of these settings should be made, of course, with the firing knob of the recorder *in the number three position.*

Assume that the casualty to the recorder occurs at 700 yards range from the submarine. Then the following steps should be carried out (see *Figure 1*):

1. Note the doppler effect and make an estimate of the range rate, or determine the range rate using a stop watch. (In *Figure 1* this range rate is ten knots.)

2. Set the range rate on the recorder.

3. Move the firing knob to the *number one* position. (Note in *Figure 1* that this moves the data scale pointer to the right of the 15-knot diagonal on the stern plate.)

4. Choose a *reference range* at which one may expect to have contact with the submarine. (In *Figure 1* the reference range is 300 yards.)

5. Using the vertical crank handle in the lower left hand corner of the recorder, move the carriage upwards until the center line of the plotter bar crosses the line of stylus travel at the reference range (see *Figure 1*).

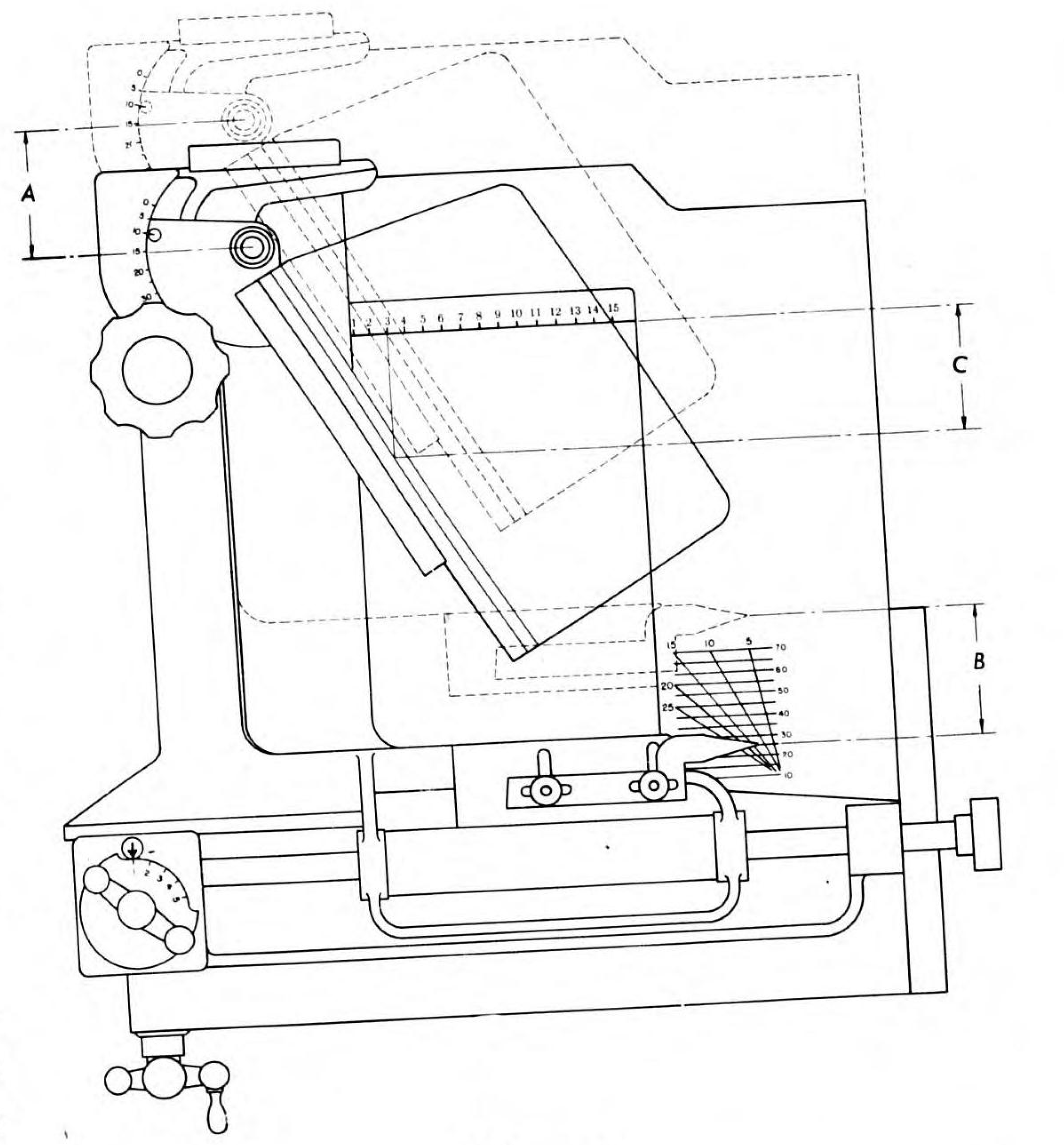


Figure 1

6. Note the distance in seconds which the data scale pointer has moved upwards as a result of step 5. (This is the distance B in *Figure 1*. Since the pointer frequently will run off the stern scale, it is necessary to extend the scale by a pasted strip properly graduated, or prepare a ruler for measuring the distance B in seconds.) This distance gives the number of seconds to run from the reference range to the point where the first charge is dropped.

7. Get a "mark" from the stack operator when the reference range is reached and start a stop watch. Drop the first charge after "B" seconds (as determined in step 6) have elapsed.

8. To obtain the appropriate pattern relative to the submarine, space the remaining charges in accordance with the following table:

Range Rate (Knots)	*Firing Interval (Seconds)*	*Range Rate (Knots)*	*Firing Interval (Seconds)*
24	3	11½	7
18	4	9½	8
15	5	8½	9
12½	6	7½	10

The preceding table, prepared in advance, should be pasted on the bulkhead in the sonar hut near the recorder.

Method Accounts for Corrections

It is easy to see why the method is valid. The crux of the procedure is contained in steps 4, 5, and 6. Suppose that the recorder had been operating and a trace obtained at range 300 yards, then firing time would have occurred when the paper travel had carried this trace downwards a distance C to the center line of the firing bar. But C = B, and hence the number of seconds which would have been required can be obtained as in step 6.

The method takes into account all of the corrections which are made in the standard settings to the recorder provided that these have been made with the firing knob in the *number three* position as required by doctrine.

It is important to observe that the firing knob must be shifted to the *number one* position before cranking up to the reference range; otherwise one would obtain not the time to the first charge but the time to the *center* charge.

In setting range rate from doppler effect or by stop watch, appropriate allowance should be made for the drop in range rate caused by lead due to ship's attack course. For example, with ship speed 15 knots, echo no doppler and bearing change indicating a beam attack, range rate should be set at about 13½ knots. For direct bow or stern attacks, or deep quarter attacks where lead is slight, the range rate may be taken directly from doppler.

The method can be used also in attacks with ahead-throwing weapons, but because of the greater accuracy required in firing times for such attacks, it may not prove as satisfactory as when using depth charges.

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SUBMARINE RECOGNITION IN THE PACIFIC

The problem of distinguishing between friendly and enemy submarines is not difficult in the Atlantic because the few Allied submarines can be adequately protected by sanctuaries, escort vessels, and an accurate plot. In the Pacific, however, the problem is complicated by the large number of American submarines on offensive operations in widely scattered areas. The establishment of restricted operating and bombing areas has done much to alleviate the difficulty, but even this system is not foolproof. Occasionally the opportunity arises to apply visual recognition. In this connection, the Anti-Submarine Warfare Division of Commander Fleet Air, West Coast has handled the recognition problem in a simplified and excellent approach and excerpts from their *Recognition Manual* are published here to obtain wide dissemination.

"Visual recognition of submarines in the Pacific would be exceedingly difficult were it not for the fact that American operational submarines are of one standard and distinctive appearance. The only friendly submarines likely to be seen in Pacific operations are of the 1500-ton Fleet type. Although these submarines are properly divided into five classes (Balao, Tambor, Sargo, Salmon, Porpoise), for purpose of recognition from the air they may be treated as one class."

All other types of American submarines including the USS Nautilus and USS Narwhal are employed in training areas and are almost certain not to appear in Pacific operating areas. In the unlikely event of their operational use, their movements would be accompanied by explicit submarine notices.

The types of Japanese submarines that might be encountered are illustrated in ONI 220J. Attention is invited to the article entitled "Japanese Submarine Fleet" appearing on pages 14 and 15 of the March 1945 *U. S. Fleet Anti-Submarine Bulletin*. This article gives recent information on the Japanese submarine situation.

Following are additional excerpts on recognition characteristics of Japanese and Allied submarines, as discussed in ComFairWestCoast's *Recognition Manual:*

Size

"Japanese I-type submarines, save for the I–151 and the five units of the I–121 class, are uniformly longer and generally larger than the U. S. Fleet-type submarine. The latter has a standard displacement of 1450 to 1525 tons as against 1400 to 2800 tons for Japanese I-type. The U. S. Fleet-type has a length of 300 to 312 feet overall, while standard Japanese I-type submarines range from 320 to 373 feet.

"The Japanese RO-type is measurably smaller than our war patrol submarines, ranging from 500 tons and 180 feet overall (RO–100) to 950 tons and 255 feet overall (RO–35).

Conning Tower

"Probably the most noticeable distinction in appearance and the one likely to prove most reliable and helpful is the difference in shape and position of American and Japanese conning towers. The U. S. Fleet-type submarine has a conning tower well forward of amidships, while the conning tower of all known Japanese submarines is almost squarely amidships. The American conning tower has low AA steps fore and aft, and a low center section out of which rise the tall, close set, and very heavy periscope shears which are unique with U. S. submarines, and which lend a pronounced triangular appearance to the tower when seen at a distance.

"The one feature which sets apart the new BALAO and TAMBOR classes from the older SARGO, SALMON, and PORPOISE classes is the break in the deckline aft on the BALAO's and TAMBOR's.

"The typical Japanese conning tower is by contrast large and bulky, with a higher enclosed section than the U. S. type, and has no periscope shears, and no AA steps. Most large I-type submarines have a bulge at the forward base of the conning tower, housing a motor-driven winch for raising and lowering radio masts. The I-15 class has either a long bulky aircraft hangar faired into the conning tower forward, or a raised and enclosed gun platform in place of the hangar. From a distance Jap conning towers appear as rectangles or mounds; never as triangles.

Insignia

"In the matter of identifying insignia, Japanese submarines are unique. The official recognition markings thought to be currently employed include a Japanese flag or a rising sun on a white background painted on the sides of the conning tower and on the after deck, a broad white stripe on the bow, and a large white cross on the deck forward of the conning tower. In individual instances two broad yellow stripes on the foredeck, and a white stripe or white cross on the sides of the conning tower have been reported. Of course no individual unit is likely to be emblazoned with all these insignia.

"American Fleet submarines are uniformly painted black or dark gray, or a combination of a black pressure hull, a dark gray deck and a lighter gray conning tower. No markings or insignia are visible."

(Some of our submarines now are painted a rather light gray and under some conditions of lighting look almost white. *All horizontal surfaces are painted black*, whatever the remainder of the color scheme.)

Minor Identifying Characteristics

"Many Japanese submarines still have net-cutters mounted forward, and all known operational types except the RO–100 have on the deck aft a vertical rudder large enough to be visible from many angles. No American submarine is so equipped. (A few S-Boats and R-Boats have a small fin above the pressure hull aft, but these are practically never visible when the subs are underway.) This is in contrast to the Japanese auxiliary rudders mounted high on the deck and used only in diving.

"Several classes of Japanese I-type submarines have a distinctive whale bow. No U. S. submarines have a similar bow. Although standard British submarines, especially the large ocean-going TRITON class, have bulbous bows which give them a superficial resemblance to the Japanese I-121 class, British goal-post periscope shears and very narrow decks are sufficiently distinguishing features.

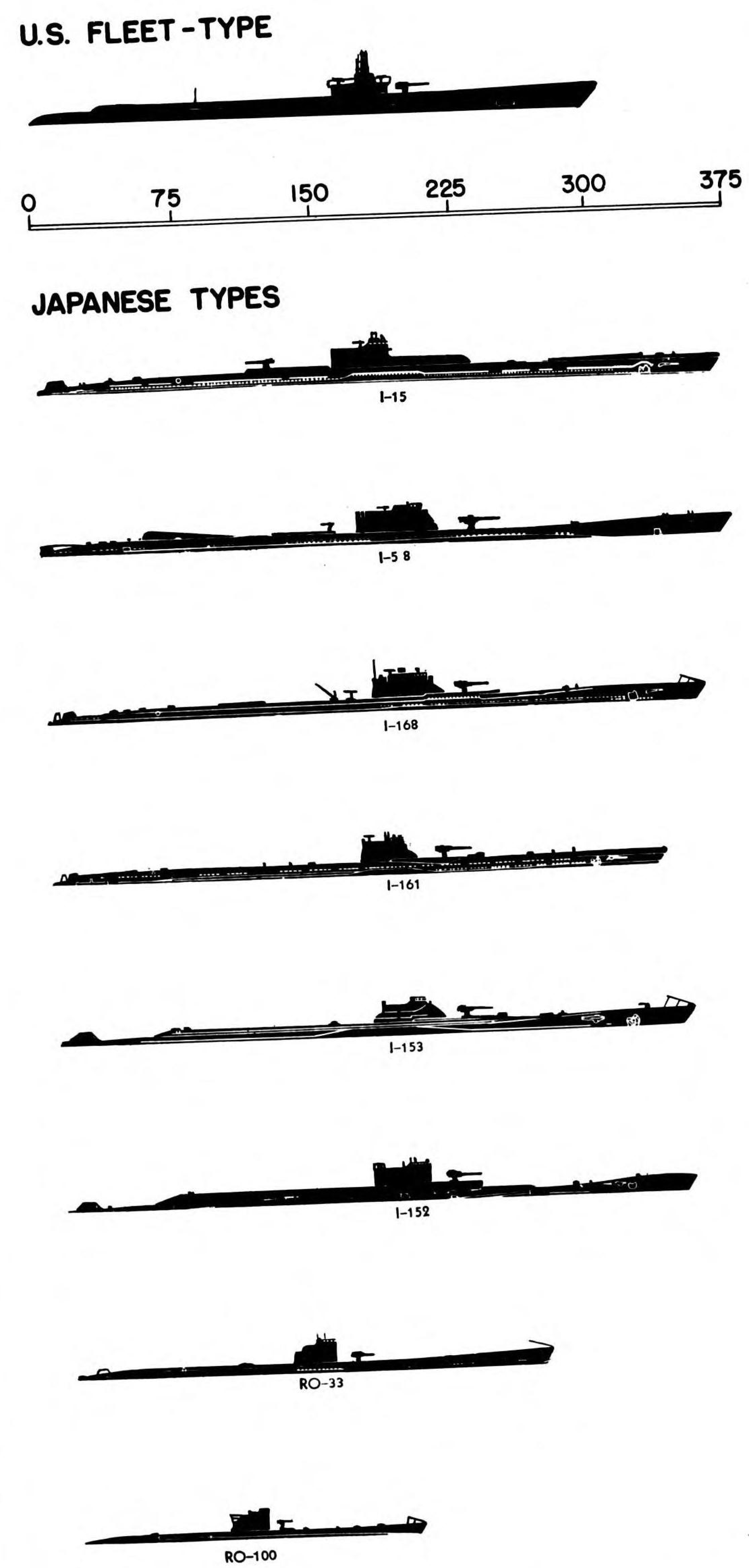
"U. S. Fleet-type submarines have unencumbered decks; a Japanese submarine may have a bulky aircraft hangar and catapult, a nest of landing barges, a midget submarine or cargo tube, cargo containers, a maze of radio masts, or other gear breaking the smooth line of the deck.

British Submarines

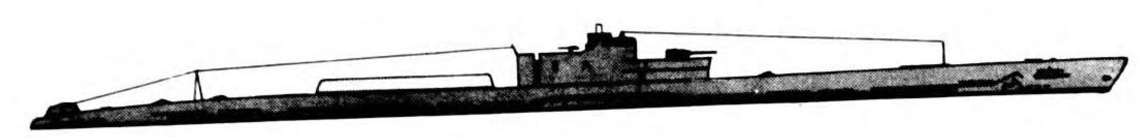
"In the Indian Ocean currently and perhaps soon in other Asiatic areas, British submarines may be encountered. Although they are less easy to distinguish from Japanese submarines than is the American Fleet-type, having whale-bows, centered conning towers, and, in the large type, enclosed splinter screens resembling the I–15 deck gun mount, visual recognition is possible. Distinguishing features include prominent 'gallows' type periscope shears (wider spaced than on U. S. submarines), very narrow deck on broad pressure hull, and decklines broken short of the stern. For the most part in areas where British, Dutch, American and Japanese submarines are operating, it is apparent that visual recognition will be much aided by thorough preliminary briefing of types and nationalities of submarines to be expected in the particular area concerned.

Conclusion

"Reduced to its simplest terms, submarine recognition in most Pacific operating areas, with proper briefing, consists in recognizing as friendly a single type, the 1500-ton U. S. Fleet submarine, and setting down all others as Japanese or enemy."



Below: New Japanese cruiser submarines may have forward deck gun housed in splinter screen.



U. S. FLEET-TYPE SUBMARINES

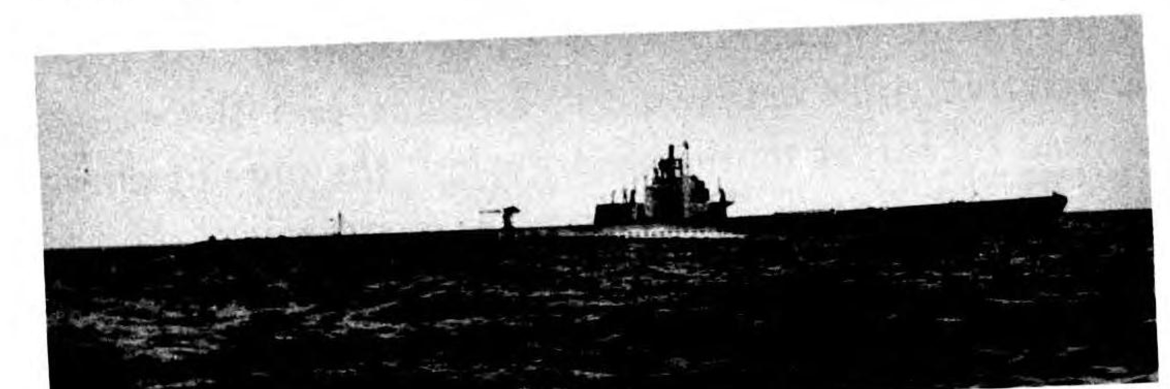
1500 tons, 308′–312′ length, 27′ beam.
Small conning tower with low AA steps forward and aft.
Conning tower well forward of amidships.
Heavy periscope shears above conning tower.
Clean deck, with one large gun, usually forward.

JAPANESE SUBMARINES

I-type: 1400–2400 tons, 320′–373′ length, 27′–31′ beam.
Bulky, flat conning tower amidships.
No periscope shears.
Net cutter forward, vertical fin aft.
Bulging whale bow.
Red ball painted on deck on conning tower.
Broad yellow stripes painted across deck.
Radio masts, aircraft hangar, large gun, and other gear on deck.
RO-type: 500–900 tons, 180′–250′ length, 20′–24′ beam.
Same general recognition characteristics as the I-type.
Note: Above characteristics are typical rather than universal and no single Japanese submarine will exhibit all of them.

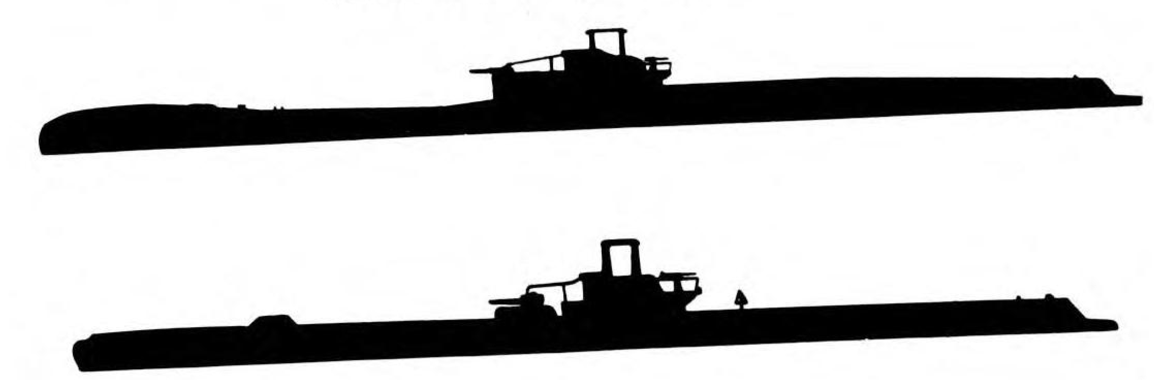
BRITISH SUBMARINES

Prominent "goal-post" type periscope shears on conning tower.
Guns mounted forward of tower in enclosed splinter shield.
Deck much narrower than pressure hull when seen from above.
Deckline broken short of stern, visible when submarine is surfaced.
Whale bow.



Note relative differences in conning towers of U. S. Fleet-type submarine (above) and Japanese I-type (below).

British types (below) have "goal-post" periscope shears as distinctive recognition feature.



AIRCRAFT NIGHT ATTACK WITH SEARCHLIGHTS

Operational reports received in the past have indicated that many searchlight attacks on submarines failed because of difficulty in picking up the target in the searchlight and in maneuvering into proper dropping position. In an effort to lessen these difficulties, an article entitled "Radar Searchlight Approaches" was published on page 35 of the August 1944 *U. S. Fleet Anti-Submarine Bulletin* suggesting tentative procedures to be used pending results of tests being conducted by ASDevLant. These tests have been completed and, as a result, the collision course approach described herein is now considered the most suitable.

Development of Approach Methods

The first successful searchlight bombing attacks on submarines were made by the British using what is now termed the Direct Homing Approach. This is the simplest of all methods of intercepting a target, and as the name implies consists of maneuvering so that the radar indicates the target dead ahead at all times. The path of the airplane is a curve of pursuit. If there is relative drift between the airplane and the target caused by target motion or by wind, the pursuit curve becomes sharper as the target is approached. If the airplane is being turned radically at the time the searchlight is switched on, the probability of finding the target in the beam is reduced. The ever-tightening curve to the target, furthermore, becomes impossible to follow when relative drift is large and the attacking airplane finds itself irrevocably downwind from the target when the tracks cross.

With increased experience in searchlight tactics, it became the practice of some pilots to set the gyro to zero when the radar first indicated the target dead ahead. Subsequent corrections to heading then accumulated on the gyro and indicated to the pilot the amount and direction of relative drift. Where the rate of change was large, it was the practice to over-correct in the early stages of the approach. The elements of a Collision Course Approach were embodied in this practice. The method, however, was known as "direct homing, leading the target."

A simplified method of setting up an interception or collision heading as early as possible in the attack led to the proposal of the Double-Drift Approach. By this procedure the airplane is put on the target line of bearing at a distance of ten or 12 miles from the target, if possible, and held steadily on that heading until one-half of the distance is closed. The displacement (drift) of the target in degrees is then observed on the radar screen and the plane heading is changed toward and beyond the target by an amount double the observed drift. The new track will intercept the target approximately. Since relatively long distances are involved, the airplane heading must be flown precisely, and very accurate radar bearings must be obtained. In essence the Double-Drift Approach is an attempt to set up a Collision Course Approach in a single instead of a multiple approximation.

The deficiencies of the Direct Homing Approach were easily recognized but there was still the question of determining the most practicable method of setting up an interception course under conditions of moderate to extreme drift. Tests were conducted by ASDevLant to determine the answer to this question.

Results and Conclusions

Many runs were made using the Double-Drift Approach and the Collision Course Approach. It was determined that current radar scopes do not permit taking the accurate readings required by the Double-Drift method for the course change at the halfway point. This reading was found to be at least three degrees in error, thus making numerous course corrections necessary during the last half of the approach. In effect this meant that the last half of the approach developed into a collision approach, with the attendant disadvantage of proceeding halfway to the target before attempting to establish a collision course. Where the total drift angle is small, the two become practically identical because the target distance will be about halved before a conclusive radar indication of bearing change will be obtained. It was also found that, where the total drift angle is three degrees or less, the Collision Course method becomes identical with the Direct Homing method. If the target is picked up at ranges of four miles or less, the Collision Course Approach will approximate the Direct Homing Approach for lack of time.

Collision Approach Advantages

The Collision Course Approach has the advantage of requiring no radical maneuvers, even under relatively bad conditions. It is flexible, allowing for changes in wind, drift, and target course and speed. It has the disadvantage of being somewhat more difficult to perform than the Direct Homing method. Use of this method with proper equipment and crew training, however, will give consistently good results. In conditions of medium or high relative drift, an approach of six miles or more is easier to make than shorter approaches. This is because the trial and error nature of the approach consumes both time and distance and it often takes several miles of travel to get the target bearing to remain constant. In cases of moderate or low relative drift, the problem is much easier and requires less time.

The radar operator must be able to read the bearing of the target in degrees in order to make this system work. APS–2, APS–3, APS–4, and APS–15 radar are suitable for this. ASB radar cannot be used with this system.

Since there is normally only a small correction in course to be made after the target has been picked up by the searchlight on this type of approach, illumination of the target can usually be withheld even in the larger planes until the plane reaches the one-half mile range. Illumination on Direct Homing Approaches normally would have to be made at three-fourths or one mile.

If the target submerges while a plane is flying a collision course, the plane should turn at once directly toward the last reported position of the target and attempt to make contact from that point.

Collision Approach Explained

Based on the results of the test, it was recommended by ASDevLant that the Collision Course Approach be adopted as standard. ComAirLant has concurred in this recommendation.

The Collision Course Approach is described as follows:

Begin the approach with the target dead ahead and the plane on a steady course, preferably at least six miles from the target.

Hold this course until the target moves away from dead ahead.

Check that the change in bearing is not due to an inadvertent change of course or an inaccurate bearing.

As soon as a definite change of target bearing is apparent, turn the plane toward the target and over-correct by about five degrees for the drift that was indicated. For example, if the target moved from dead ahead to three degrees starboard the plane should turn eight degrees starboard thereby making the target bear five degrees port. Then fly a steady course.

As the approach progresses, alter course to port or starboard as necessary to get the target bearing to remain constant. For example, in the case above, if the target starts to move toward dead ahead, alter course to bring the target to bear eight degrees or ten degrees port. When the proper course correction has been found, the target bearing will remain constant as the plane approaches on a steady course. The correct allowance then will have been made for wind and target movement and the plane will track directly over the target. The target normally will not be dead ahead of the plane when the bomb release is pressed.

In making the course alterations described above, the following rules govern:

1. *The course is correct* if the target bearing remains constant. Be on the alert to recognize the need for further changes in course due to changes in the target's course, errors in radar readings and course errors.
2. *The course correction is too small* when the target moves back toward dead ahead. Increase the correction.
3. *The course correction is too great* when the target moves farther away from dead ahead. Decrease the correction.

The following observations have been made by experienced searchlight pilots:

Radar bearings are likely to have an error ± two degrees.

Pilot's courses are likely to have an error ± two degrees.

At night the surface wind velocity will not normally be known to a greater degree of accuracy than ten degrees and five knots.

The Collision Course Approach was devised primarily for searchlight attacks on submarines. However it is considered equally applicable and most suitable for any radar approach for attacks on surface craft or other targets under conditions of low visibility or for low altitude "blind" attacks using a radar-type bombsight.

MODIFIED RETIRING SEARCH PLANS FOR OPERATIONS NEAR SHORE LINES

Articles 1131–1161 of FTP 223A present retiring search plans for use against submarines in the open ocean. In these plans it is assumed that the submarine is free to attempt to escape in any direction. Cases may occur, however, in which this assumption is not warranted. For example, a submarine which has torpedoed a ship of an amphibious force off a beach-head is restricted in its choice of course by the proximity of land. In such cases it becomes desirable to modify the retiring search plans to take advantage of this fact.

By use of a principle of reflection the plans of FTP 223A can be modified for use near shore lines. This modification does not require any change in the "time tables" which are the essence of the plans; it merely requires that certain special turns be made in a manner shortly to be described, the turns required by the table being made at the time listed in the table.

To illustrate the method, consider *Figure 1*. Let O represent the point of last contact with the submarine off the beach-head. Draw the reference line XY beyond which it is not desired to search because of shallow water, mines, and so forth.

The search should be oriented so that the largest possible portion of the plan can be completed before one of its legs intersects the reference line. It is assumed in *Figure 1* that leg 4 is the first leg which can not be completed without proceeding beyond the reference line.

Let A be the point where leg 4 intersects the reference line. From the initial point O draw the *radial line* OA intersecting the interrupted leg with angle of *incidence* θ. The reflection principle will be employed at point A with respect to this radial line.

Lay off AB with angle of *reflection* θ as shown. The length of AB is determined by the time remaining for leg four after the search group reaches point A.

Proceed on AB for this remaining time and at point B make the turn *at the time required in the table but in the opposite direction.*

Continue according to plan until another leg intersects the reference line as at C. At point C apply again the reflection principle used before but this time about the radial line OC.

It remains to consider why the reflection principle is valid and to emphasize certain practical features associated with its application.

Demonstration of Principle

It can be seen why the reflection principle is valid. The essential consideration in any retiring search is that at any given time the searching ships should be at the proper distance from the initial point O, this distance being determined by the elapsed time since lost contact. But observe *Figure 2* which is a detail of *Figure 1* in the vicinity of point A.

A ship which would have steamed from A to P will steam, in the same time, to P′. Hence AP = AP′. But the angles OAP and OAP′ are equal, each being 180° − θ. Hence triangles OAP and OAP′ are equal and therefore OP = OP′ as required.

In the design of the retiring searches time was allowed to make turns. That is not true of the additional turns required by this modification, it being assumed that turns such as at point A are "pin-point" turns. This assumption of course introduces a slight error which may be compensated for by a small increase in speed when steaming from A to B.

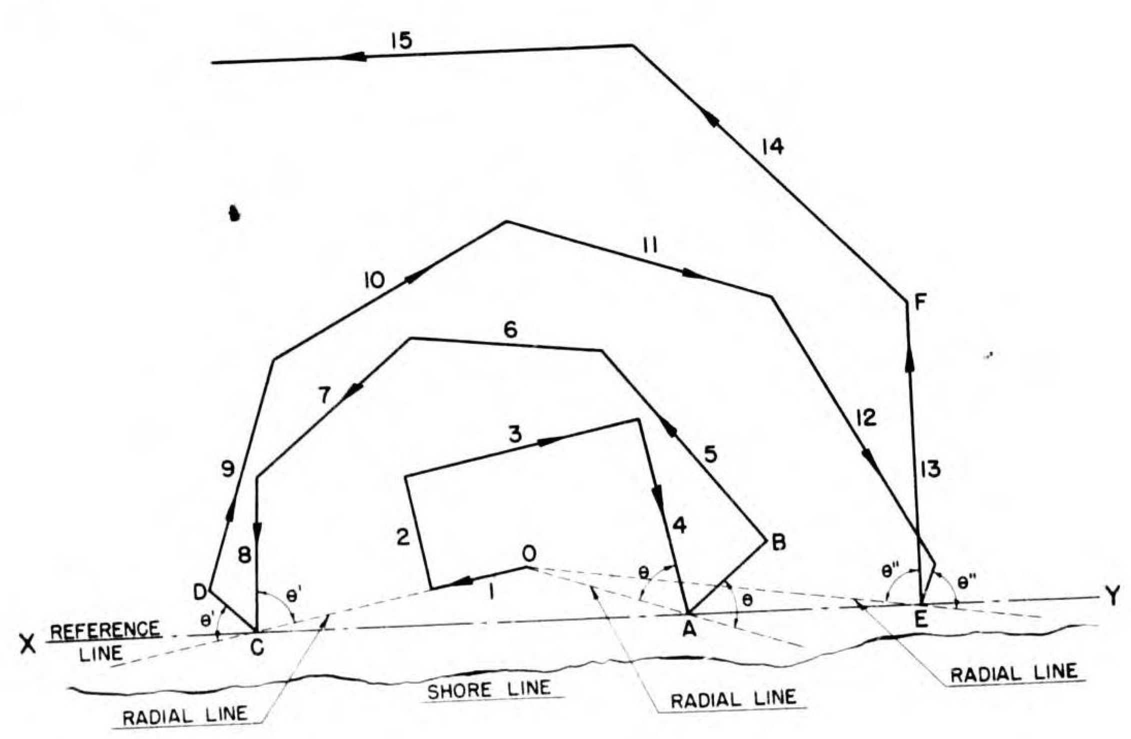


Figure 1

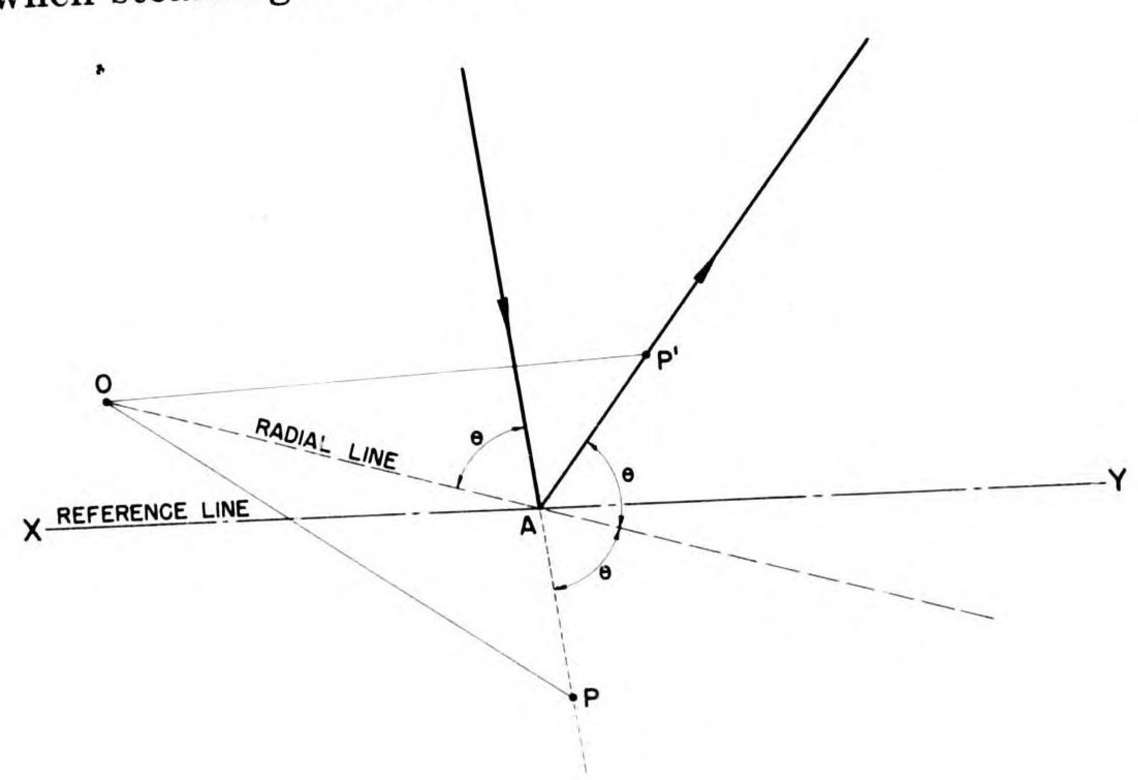


Figure 2

An important practical fact which should be observed from *Figure 2* is that the *course change is 2θ.* Hence it is necessary that the OTC, anticipating the turn at A, compute (on the DRT for example) the angle of incidence θ, double it, and from this value 2θ determine the new course.

One should be careful to note that θ is taken with respect to the *radial line*, not with respect to the reference line.

The preceding discussion has assumed that point A did not coincide with the end of a leg of the search. If point A does coincide with the end of a leg, then the course change can be determined by adding to 2θ the turn required by the tables (always either 90 degrees or 45 degrees). However, the total course change obtained by this addition may be so large as to make the turn impracticable. Consideration should be given to this point when the OTC orients the plan at the initial point O. It is also desirable that the special turns obtained by reflection do not occur too soon before or after one of the turns required by the table. Hence the statement previously made about the desirability of orienting the search so as to complete as much of it as possible before reaching point A is subject to these two reservations.

Method of Making Turns

Figures 1 and *2* have been drawn for one ship. Since several ships usually will be involved it is desirable to examine the type of echelon turn required at a point such as A.

Figure 3 shows the situation for two ships. Let Ship 1 be the first ship to turn, then Ship 2 can determine when to turn by observing the bearing change of Ship 1. Let α be the bearing change of Ship 1 up to the instant Ship 2 must alter course. This angle α is given by the relation:

$$\alpha + 90° + 2\theta + 90° = 360°$$

or

$$\alpha = 180° - 2\theta.$$

Hence if the amount by which course is to be altered be subtracted from 180 degrees, the result is the *change* in bearing of the adjacent ship which must take place before the next ship alters course.

If θ is small, the first ship may proceed to the opposite quarter before the second ship turns.

The above rule for turning includes as special cases the two well known rules of FTP 223A for the 45-degree and 90-degree echelon turns.

Another practical point for the OTC to observe is that if it is desired that no ship of the search group go beyond the reference line (for navigational safety for example), then it is necessary to carry forward the track of the *outboard* ship until it crosses the *reference* line and calculate back the time for the first, or inboard, ship to turn. This is necessary, for otherwise the turn point of the outboard ship on the *radial* line may be beyond the reference line. In *Figure 3* the outboard ship is represented by 2 and 2′.

The time for the inboard ship to turn is easily computed as is seen from *Figure 3*. Its time to turn precedes that of the outboard ship by the time required to steam from M to A.

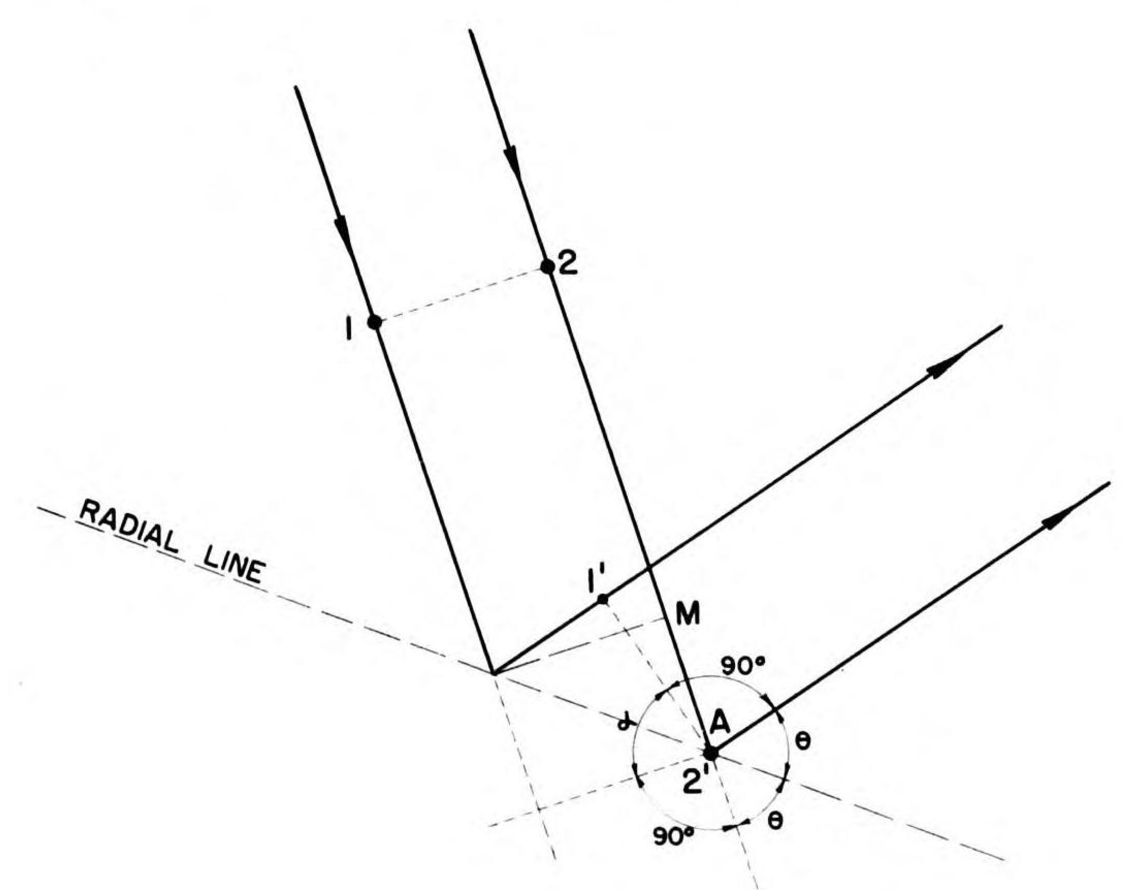


Figure 3

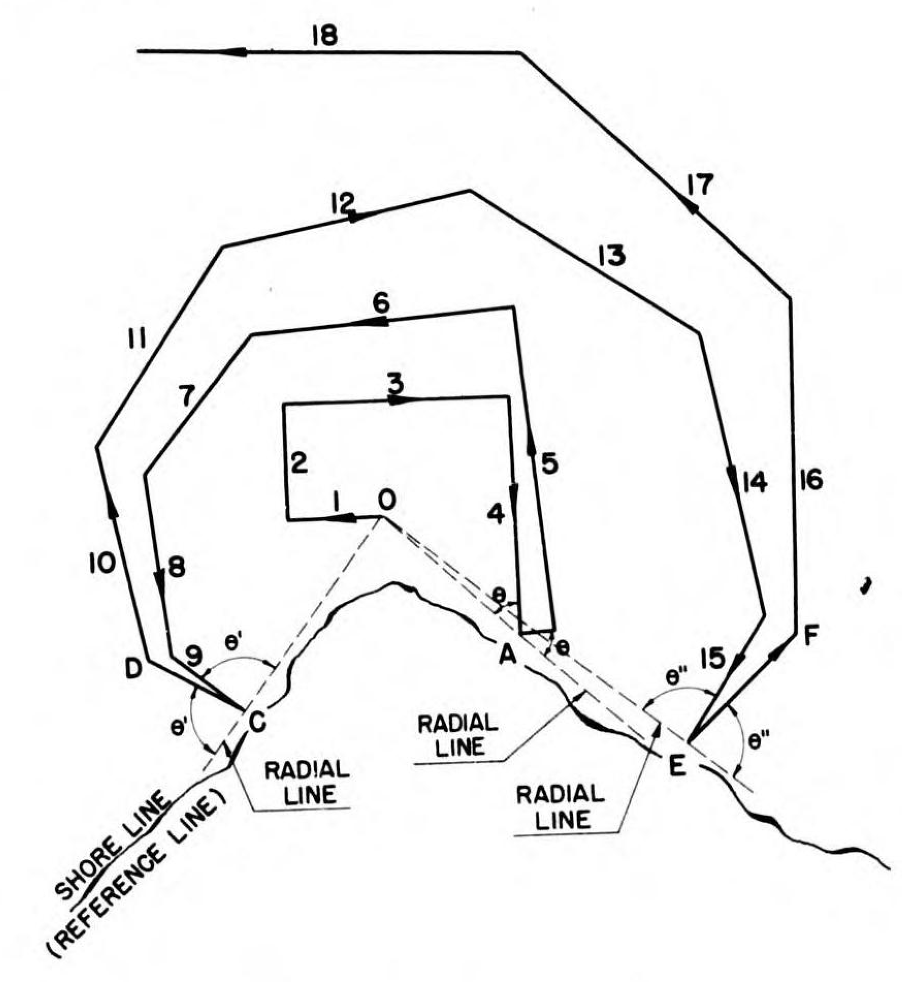


Figure 4

Turns required at points such as E (*Figure 1*) in the vicinity of other turns required by the original plan may lead to such confusion as to be entirely impractical. In such cases it may be advisable for the turns to be made by simultaneous turns or column movements, then re-orienting and adjusting speed on the new course so as to arrive at the proper time at the proper geographical location for turns required by the tables.

This principle of reflection causes certain points of the search to fall closer together than is theoretically necessary as can be seen in *Figure 1*. For example, the turn from leg 3 into leg 4 is quite near to a point on leg 5 where the searching ships arrive much later than when at the turn into leg 4. It is clear that the submarine would have traveled more than the distance between these points in the time available. But there is no real contradiction, for the original plans are designed using a *circumscribing* spiral which contracts in submarine space, hence the corner points depart more from the theoretical than any other points on the plan.

Figure 4 shows how the reflection principle may be used with a shore line which is not straight. The reference line need not be continuous. Thus the plan may be used when searching around capes or into bays.

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TRAINING FILM ON A/S MEASURES IS NOW AVAILABLE

In the past a number of training films have been available showing various limited aspects of anti-submarine operations such as the technique of the depth charge attack, operation of the range recorder, maintenance of sonar gear, and so forth. There is now available at training aids libraries a new film of much broader scope dealing with all aspects of anti-submarine measures, the unifying concept being the tactical employment of the various weapons. This film is MN 1452f, "Anti-Submarine Measures—A Survey."

The film begins by showing how a planned battle is fought in terms of disposition of convoy routes, "killer" groups, air forces, and so forth, under the control of CominCh, Sea Frontier and Fleet Commanders.

Details of anti-submarine operations are shown by taking a typical convoy from its formation until its arrival at its destination. Harbor defense, the masters' conference, and the escort commanders' conference are displayed. The use of blimps in convoy formation is illustrated. Methods of screening by surface craft and basic concepts such as torpedo danger zone, angle of submerged approach, and the tracking band are shown in animation with suitable comment. Excellent shots of a night attack on a convoy, and escort carrier groups in operation are included. The principal ideas in coördinated surface craft attack and retiring search are shown in animation. The use of sono-buoys and magnetic airborne detector are shown and tactical concepts such as the distinction between urgent and deliberate attacks are explained. Air and surface coördination is stressed. The film is confidential and has a running time of approximately one hour.

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NOMENCLATURE OF BRITISH ASDIC FREQUENCIES

In referring to asdic frequencies, the Royal Navy uses a code system for security purposes. Existing Admiralty instructions prohibit asdic operators from expressing their sonar frequencies other than by use of this code. When U. S. Navy and Royal Navy ships have operated together, occasions have arisen where considerable confusion on the part of the U. S. ships occurred because they were ignorant of the above situation. The British code is printed below for the information of all ships who may operate with the Royal Navy. Attention is directed to the secret classification of this information.

Frequency	*Symbol*	*Frequency*	*Symbol*	*Frequency*	*Symbol*
10 KC =	X	27 KC =	N	44 KC =	FK
11 KC =	U	28 KC =	P	45 KC =	FL
12 KC =	V	29 KC =	R	46 KC =	FM
13 KC =	W	30 KC =	S	47 KC =	FN
14 KC =	Y	31 KC =	FU	48 KC =	FP
15 KC =	A	32 KC =	FV	49 KC =	FR
16 KC =	B	33 KC =	FW	50 KC =	SF
17 KC =	C	34 KC =	FY	51 KC =	SG
18 KC =	D	35 KC =	FA	52 KC =	SH
19 KC =	E	36 KC =	FB	53 KC =	SJ
20 KC =	F	37 KC =	FC	54 KC =	SK
21 KC =	G	38 KC =	FD	55 KC =	SL
22 KC =	H	39 KC =	FE	56 KC =	SM
23 KC =	J	40 KC =	FF	57 KC =	SN
24 KC =	K	41 KC =	FG	58 KC =	SP
25 KC =	L	42 KC =	FH	59 KC =	SR
26 KC =	M	43 KC =	FJ	60 KC =	SS

The symbols "O" and "Q" have been omitted to avoid confusion between them and the "Q" attachment.

For oscillators the frequencies of which are not a whole number the frequencies are indicated by the fraction (expressed as a decimal) being added as a suffix to the nearest lower frequency symbol. Thus, in the case of the asdic type 147B oscillators the frequency of 50.1 kc/s becomes SF.1 and the "Q" oscillator frequency of 38.5 kc/s becomes FD.5.