

WORLD WAR II COMBAT OPERATIONS

Less than four months after she was commissioned at Portsmouth, New Hampshire, the *Bowfin* began combat operations halfway around the world in the South China Sea. She sailed from the East Coast early in July, made a brief stop in Panama, and then headed across the Pacific to Brisbane, Australia. In Brisbane she went alongside the submarine tender *Fulton* for post-voyage repairs and fitting out. A couple of days were spent in gunnery training and practice dives, planned to take her to deep submergence fast, a necessary maneuver in avoiding enemy depth charge attack.

On 19 August 1943 the *Bowfin* sailed from Brisbane and headed north, around Australia to Darwin, where she refueled. Darwin was hundreds of miles closer to submarine patrol areas than either Brisbane or Fremantle, on the east and west coasts of Australia, but lacked any facilities needed for base operations. All it was good for was to serve as a handy place to stop in and say "Fill her up." That done, *Bowfin* got underway again on 25 August, for her first patrol.

War Patrol No. 1

The *Bowfin* left Darwin the morning of 25 August, and on 2 September she entered the Mindanao Sea. For nearly a month the *Bowfin* sighted no major vessels. Fishing boats were seen frequently, and a few aircraft were picked up on radar, but none of them detected the submarine. It was noted that coastal villages on islands they passed were not blacked out, but showed lights at night.

On 24 September the *Bowfin* joined up with the submarine *Billfish*. The next morning a convoy of six ships was sighted and the submarines began tracking it. After about five hours, the *Bowfin* reached a position where she fired four torpedoes at a cargo ship and two more at a transport next astern of her. Through the periscope three torpedoes were seen to hit the first ship and two were seen to hit the second ship. The *Bowfin* then reversed course, so her stern was toward the convoy, and fired four torpedoes from her stern tubes at a third ship, a tanker. The explosions of these torpedoes were heard, but not seen.

As soon as the torpedo explosions were seen by the Japanese ships, they discovered the *Bowfin*'s periscope and two of them began firing at it. As the *Bowfin* submerged to avoid gunfire, the cargo ship (identified after the war as the *Kirishima Maru*, 8,120 tons) could be seen settling in the water, the transport was sinking stern first, and the tanker was on fire.

An hour or so later the *Bowfin* came up for periscope observation and saw a tremendous column of smoke which continued for over an hour. About three hours later one of the ships remaining from the convoy again fired on the *Bowfin*, from a distance of about five miles, and she submerged. Later torpedo explosions were heard—evidently the *Billfish* was attacking the convoy.

During the night *Bowfin* tracked the remnants of the convoy until finally the ships were lost at a range of ten miles. The next morning, while making a radar search, an enemy aircraft was detected. The plane was also equipped with radar, as indicated by interference on the *Bowfin's* radar screen, so she submerged for the day.

On 27 September the *Bowfin* picked up a contact which was identified as an inter-island steamer of about 1,500 tons. After chasing the ship for about three hours, the submarine reached a firing position and fired three torpedoes. One torpedo ran for a little over a minute, then its propellers were heard to stop. The others missed the target and were heard to explode when they stopped running and hit the bottom of the shallow sea.

On 30 September the *Bowfin* left the Mindanao area. At dawn that morning, in a driving rain, a small diesel barge was sighted. It had a Japanese flag painted on the bow, and was deck-loaded with about a hundred Japanese soldiers. Such small targets were not worth the cost of a torpedo, so it was customary to sink them with gunfire when possible. The *Bowfin* closed to about two miles, surfaced, and opened fire on the barge with her 4-inch deck gun. When the barge replied with machine gun fire, the *Bowfin* also opened up with her 20mm guns. The twentieth 4-inch shell fired hit the barge which practically disintegrated and sank instantly.

The next contact, made off Balikpapan, in the Makassar Strait, was a small two-masted schooner, sighted the evening of 2 October. Two shots fired across her bow failed to stop her so two more rounds were put into her and she sank.

Two days later *Bowfin* headed south out of the patrol area, en route to Fremantle, West Australia, where she arrived on 10 October. Since leaving Brisbane, she had sailed 14,430 miles in 55 days. She had attacked and damaged at least three large ships and destroyed two small craft.

War Patrol No. 2

This patrol was from Fremantle to the South China Sea. A week out, *Bowfin* sighted a group of five small schooners and began tracking them. Japanese aircraft were patrolling in the area and made several attacks on the submarine, but she managed to sink three of the schooners with her 4-inch gun before air attack forced her to submerge long enough for the remaining craft to escape. However, when she surfaced that night, another large schooner was sighted; this one was sent to the bottom with only two 4-inch shots.

Two days later *Bowfin* was off the entrance to Tawi Tawi Bay (the tip of Borneo between the Celebes Sea and Sulu Sea) when two small coastal steamers were sighted heading for the bay. The *Bowfin* ran ahead of them while submerged, then waited for them, surfaced, and set them both afire with gunfire. They were still burning when the *Bowfin* had left the wreckage twenty miles behind.

On the morning of 26 November, while the *Bowfin* was off the coast of Indo-China (now Viet Nam), near Saigon, she was running on the surface in a heavy rainstorm when she suddenly was surrounded by ships—she had sailed into the middle of a convoy and had to back all engines to avoid hitting a tanker. After tracking the convoy for an hour or so, *Bowfin* fired a spread of torpedoes and sank the *Ogirosan Maru*, a 5,069-ton tanker. While that ship was still sinking, the *Bowfin* maneuvered to fire

more torpedoes, and got the *Tainan Maru*, a 5,407-ton cargo ship. She then had to pull out of the immediate area to reload torpedoes. In a couple of hours she was after the convoy again and put four torpedoes into a small French coastal steamer, the 691-ton *Van Vollenhoven*.

The following day the *Bowfin* torpedoed a very small transport-type ship and then joined up with the *Billfish* again. On 28 November the two submarines met a large convoy, and in a short period the *Bowfin* torpedoed the *Sydney Maru*, a 5,425-ton cargo ship, and the *Tonan Maru*, a 9,866-ton tanker. While she was concentrating on the tanker, another ship in the convoy fired on the *Bowfin*, making some hits which resulted in leaks through the starboard main induction line.

At dawn the next morning the submarine surfaced while men worked topside to plug holes—but they still leaked. The patrol was cut short and the submarine headed back to Australia. En route, she sank a small yacht-sized ship on 2 December, again using the deck gun. She arrived in Fremantle on 9 December 1943, having been underway for 39 days and sailing 10,023 miles.

War Patrol No. 3

This patrol took the *Bowfin* into the Netherlands East Indies area. Her first action came on 16 January, in Makassar Strait, when a small schooner

was sighted. As soon as the submarine surfaced, the crew of the schooner jumped overboard. A couple of 4-inch shots sank the craft.

The next morning, in the same area, a freighter and two escort ships appeared. The *Bowfin* should have got all three, but faulty torpedoes ruined the day. First she fired four torpedoes from her bow tubes, at a close range of 1,200 yards. Only one torpedo made a hit. Then she swung around and fired two torpedoes from her stern tubes. Both of them exploded prematurely. With the enemy ship dead in the water, *Bowfin* had to pull out of the area to reload torpedoes. The next morning she returned and found the ship still afloat, with her escorts standing by. This time four good hits finished off the ship, the 4,408-ton *Shoyu Maru*. At least two hits were made on the smaller escort ship.

With her torpedoes expended, the *Bowfin* then returned to Darwin for a reload. She also took on a high-ranking passenger for a submarine, Rear Admiral R. W. Christie, who rode the boat for the rest of the patrol, to observe the performance of torpedoes about which there were many complaints—they ran too deep, exploded prematurely, or didn't explode at all.

The second day out, a small freighter-type ship was sighted, tracked down, and sunk with three torpedoes. On 28 January the *Bowfin* sighted a large tanker early in the morning and spent fourteen hours chasing it in order to get into good firing position. Finally, about eight that night, she surfaced only 300 yards from the tanker and fired all six bow torpedo tubes. But the tanker changed course at that exact moment and all six torpedoes missed. The submarine's crew hurriedly reloaded, and six more torpedoes were fired. This time two hits sent columns of fire and smoke up out of the ship, but she refused to sink. As *Bowfin* moved in for another attack, the tanker opened up on her with machine guns and deck guns.

After twenty minutes of dodging gunfire, *Bowfin* fired two more torpedoes. Both missed. Then she fired two more. Both hit. The tanker still refused to sink. *Bowfin* fired another torpedo. That one missed. Then she fired one more, for a hit. The tanker in turn opened up again with all her guns, so the *Bowfin* submerged. Then she heard a tremendous explosion, but when she surfaced to see what had happened the tanker still had not sunk. In fact, she was underway again. When daylight came, the *Bowfin* searched for the ship but could not find it. However, she could not claim the ship as sunk, as no one had seen the ship sink and she had not found any debris or survivors to show that the ship actually did sink.

Next, on 29 January, the *Bowfin* laid a string of mines in Makassar Strait the only time during the war she did so, and then headed back for Fremantle. The next day she sank two small schooners with her deck gun. She reached Fremantle on 5 February, completing a 28 day patrol in which she sailed 7,949 miles.

War Patrol No. 4

This patrol was in the Celebes Sea, and again the *Bowfin* ran out of torpedoes and had to return to Darwin for a reload. Her first contact was made on 10 March, when a convoy of four ships and two escorts was sighted. *Bowfin* fired six torpedoes, but four of them exploded prematurely. Enemy aircraft drove the submarine down and she was unable to observe whether the other two torpedoes exploded or not. The escorting ships took turns dropping depth charges. The *Bowfin* submerged to 350 feet to avoid the attack. Once a chain could be heard dragging across the hull of the submarine as the escorts searched for her. In all, they dropped twenty-four depth charges; the submarine was shaken up, but undamaged.

When *Bowfin* was able to surface again, one of the cargo ships could be seen down by the stern while other ships were trying to take her in tow. Five aircraft were patrolling around the convoy, as the group of ships got underway. *Bowfin* fired torpedoes at one of the escorts, and at the ship towing the damaged freighter, but was unable to observe results as one of her own torpedoes turned back toward her and she went deep to avoid it. The next morning she found the damaged ship again, fired more torpedoes at it, but was forced down by attacking escorts. When the submarine came up for periscope observation again, the freighter was unprotected. This time *Bowfin* got off four torpedoes before she had to dive to avoid another air attack. When she came up again for a look, the 4,470-ton *Tsukikawa Maru* had gone down, leaving the sea littered with lifeboats and floating debris.

Late that night *Bowfin* caught up with the rest of the convoy and fired her last four torpedoes. One was a miss, the others exploded prematurely. She then had to return to Darwin to reload, which was done on 14 March. She was underway again the next day, and on 18 March attacked a small convoy. Again the torpedoes were troublesome. Four of them fired at the short range of 900 yards all ran under the target, the next two missed. The escorts dropped sixteen depth charges but they also missed. That afternoon *Bowfin* again fired four torpedoes at the ship she'd missed that morning. All four missed.

On 24 March, in the Celebes Sea, the *Bowfin* sighted a convoy of five ships and trailed them for several hours. Then in a night surface attack, she fired at three ships and made hits on all of them. The *Shinkyō Maru* (5,139 tons) and *Bengal Maru* (5,399 tons), were sunk. The third ship was set on fire but refused to sink, and *Bowfin* was out of torpedoes again, so she returned to Fremantle. During her 36 day patrol she had steamed 9,272 miles.

War Patrol No. 5

This was next to the longest war patrol any boat made, in length of time, and the longest in miles steamed. She sailed to the Palau area, where targets were scarce; the sub was on patrol for a month before an enemy convoy was sighted. On 14 May she got two hits on a freighter, but

although it appeared to be damaged, it was not seen to sink. As she continued to trail other ships in the convoy, and prepared to make an attack on one, it blew up—another U.S. submarine had beat her to the punch. The rest of the patrol was uneventful. *Bowfin* left the patrol area for a brief stop at Midway and then went to Pearl Harbor for post-voyage repairs. She had steamed 15,013 miles in 58 days, and was not credited with a single ship.

War Patrol No. 6

On this patrol *Bowfin* hunted in "Empire" waters, off the southern islands of Japan proper. Her first action came on 10 August when she spotted three small ships entering a harbor at Minami Daito. She followed them into the harbor, waited until they had moored, then torpedoed all three. One was damaged and two blew up. A torpedo that missed the ships blew up a dock and a bus standing on it.

On 22 August, off the Tokara Islands, she followed and attacked a convoy and made hits on several ships, although only one, the 6,754-ton *Tsushima Maru*, was definitely sunk. About a week later, after wasting four torpedoes on a small trawler—all were misses—the *Bowfin* surfaced and set the craft afire with her deck gun.

By that time her torpedoes had all been fired, so she headed back to Midway. When a floating mine was spotted, the submarine blew it up with 20mm fire. Sailors were amazed when the mine exploded—pieces of it spread out in a circle six hundred yards across. Despite having no torpedoes, the *Bowfin* still managed to sink one more small ship by using her guns. This time she picked up two survivors for questioning; the Japanese were unloaded in Midway before the boat went on to Pearl Harbor, where she arrived on 13 September.

From Pearl Harbor the *Bowfin* sailed to the Mare Island Navy Yard for overhaul, which lasted from 21 September to 16 December 1944. She was back in Hawaii early in 1945, and soon ready for her next patrol.

War Patrol No. 7

The entire patrol was spent in waters off Japan, where the *Bowfin* was assigned lifeguard duty for carrier raids and B-29 strikes on the Japanese Islands. On earlier patrols enemy aircraft had frequently been seen, but on this patrol the *Bowfin* saw only American planes—hundreds of them. At times she worked with air cover supplied by U.S. carrier fighters. Her only real surface action came on 17 February when she contacted two Japanese destroyers. Two torpedo hits were made on one, later determined to be a 750-ton frigate, which sank. The other ship then attacked the *Bowfin* and dropped twenty-six depth charges, none of which did any damage.

Three small craft were sunk, one by torpedo and two by gunfire, while on lifeguard station. On 19 March the *Bowfin* rescued the crew of a torpedo bomber that went down about five miles away. The pilot, Lieuten-

Daito Maru No. 3. The *Bowfin* returned to Guam on 15 May, having completed the shortest patrol—23 days and only 5,649 miles—of her combat career.

War Patrol No. 9

This patrol began in Guam and took the sub to the Sea of Japan. Shipping was scarce; the *Bowfin* entered several harbors and found them empty of targets. Only two ship contacts were made, and both times *Bowfin* scored a kill. On 11 June she found a cargo ship, sailing unescorted, and hit her with four torpedoes. The ship was the 1,898-ton *Shinyo Maru* which sank in three minutes. Four days later the *Bowfin* torpedoed and sank the *Akiura Maru*, a small, 887-ton freighter. The submarine returned to Pearl Harbor on 4 July for post-voyage repairs.

In August the *Bowfin* was headed for Guam to train for her tenth patrol when the Japanese agreed to surrender. She turned around and returned to Pearl Harbor. On 29 August she left Hawaii and headed for Panama and the east coast of the United States. She served with the Atlantic Fleet until January 1947, when she was placed in reserve. She was recommissioned in 1951.

COMMANDING OFFICERS

CDR Joseph H. Willingham—1 May 1943—26 October 1943
Navy Cross

LCDR Walter T. Griffith—26 October 1943—15 April 1944
Navy Cross, Gold Star in lieu of 2nd Navy Cross, and Silver Star

CDR John Corbus—15 April 1944—16 December 1944
Navy Cross

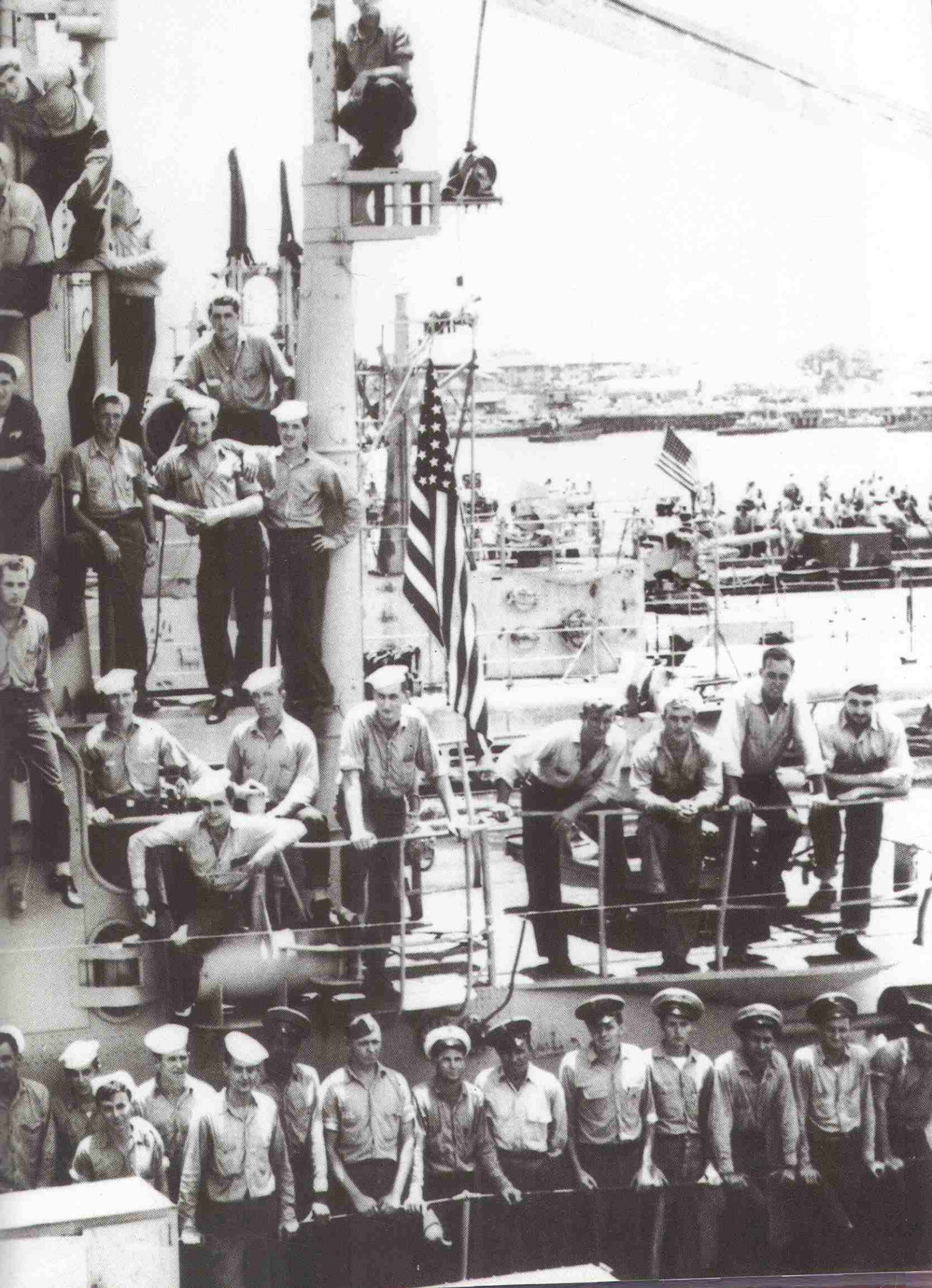
CDR Alexander K. Tyree—16 December 1944—12 February 1947
Navy Cross, Gold Star in lieu of 2nd Navy Cross

LCDR Charles C. Wilbur—27 July 1951—October 1953

COMMISSIONING CREW, USS *BOWFIN*, 1 MAY 1943

Joseph H. Willingham, Jr., CDR	Thomas W. Kimbrell, TM3c
William C. Thompson, Jr., LT	Eugene A. Knoche, F3c
Richard P. Nicholson, LT	John P. Kulik, TM2c
Davis Cone, LT	Charles Kurzentaites, TM1c
Howard E. Clark, ENS	Joseph N. Lamothe, S2c
Romolo Cousins, ENS	Maurice E. Langfeldt, TM3c
John R. Bertrand, ENS	Vernon E. Lewis, MM1c
Clyde E. Barnhill, CCSTD	Thomas A. Malley, MoMM2c
Robert M. Beal, GM3c	Donald F. Marple, MoMM2c
Thomas W. Belanger, SC3c	Ralph A. Martin, CRM
Blake M. Boynton, S2c	Vincent P. McCaffrey, SC3c
Melvin C. Briggs, S2c	John D. McCarron, F3c
James S. Bruyn, F3c	Jack M. McKenzie, MoMM1c
Osmind L. Carlson, F1c	George J. McKnight, MoMM1c
Arthur L. Carter, FC(M)3c	Francis L. Miller, S2c
Chester Crawford, BM1c	Wayne I. Mitchell, Y2c
Charles A. Darrah, TM3c	Jack L. Moore, QM2c
Robert E. Dietrich, F1c	Steve E. Mosley, CK3c
Anthony Fantazzo, EM3c	Dale L. Olmsted, PhM1c
George H. Friendlander, F3c	William H. Parker, MM1c
Eugene Gaito, MoMM2c	Jones Patterson, StM2c
Ray H. George, CEM	Robert G. Patterson, EM2c
Norlin S. Hamlin, EM1c	Wayne M. Pierce, EM2c
Lawrence C. Hansen, EM1c	John R. Rancourt, MoMM2c
Allen W. Hess, S2c	Warren L. Ritchie, MoMM1c
Ervin P. Hickman, MM1c	William G. Robinson, GM1c
Robert W. Holmquist, RT2c	Walter J. Schrader, S2c
Clarence P. Hoover, CSM	William E. Short, TM2c
Cleland D. Hudson, RM3c	Adolph Sivik, F2c
Walter Hurst, CTM	Kenneth P. Smith, TM1c
Earl R. Jackson, S2c	Wendell B. Taylor, TM2c
Joseph W. Jones, EM2c	Paul J. Terandy, S2c
Frederick A. Judd, Jr., S2c	Lafayette Vandergriff, Jr., RM2c
Dale L. Kersh, S2c	Kenneth A. Waddell, EM3c
Gerald Kestecher, EM3c	Robert D. Winton, MoMM2c





GENERAL DATA

<i>Name</i>	BOWFIN	<i>Displacement:</i>	1,525 tons (designed)
<i>Hull Number</i>	SS-287		1,810 tons (diving trim)
<i>Builder</i>	Portsmouth Navy Yard, Portsmouth, N.H.		2,415 tons (submerged)
<i>Laid Down</i>	23 July 1942	<i>Dimensions:</i>	311' 8" Length Overall
<i>Launched</i>	7 December 1942		27' 3" Maximum Beam
<i>Commissioned</i>	1 May 1943		15' 3" Mean Draft (diving trim)
<i>Disposition</i>	Arrived in Pearl Harbor for use as a War Memorial 1974.		12' 5" Freeboard @ bow (diving trim)
			3' 11" Freeboard @ Stern (diving trim)
			16' 0 $\frac{3}{8}$ " Dia. Pressure Hull (max.)
			12' 0" From Keel to \odot of Hull

ARMAMENT

Torpedo Tubes—Ten 21", six bow and four stern (MK39) 24 torpedoes carried
Guns:

(May 1943)	1—4"/50 (MK12), 2—20mm (MK5)
(Nov. 1944)	1—4"/50 (MK12), 2—20mm (MK10)
(Nov. 1944)	1—4"/50 (MK12), 1—40mm (MK3), 1—20mm (MK10)
(May 1945)	1—5"/25 (MK40), 1—40mm (MK3), 1—20mm (MK10)
(Postwar)	1—5"/25 (MK40), 1—20mm (MK10)
(Postwar)	1—5"/25 (MK40), 1—20mm (MK10)
(NRT)	None

MACHINERY

Main Engines: FOUR General Motors Model 16-278A diesel engines, 16-cylinder V-type, 2-cycle, 8 $\frac{3}{4}$ bore x 10 $\frac{1}{2}$ stroke, 1,600 BHP developed @ 750 RPM (stbd. RH rot., Port LH rot.)

Main Generators: FOUR General Electric 1,100 kw machines
2,650 amps/415 volts (propulsion rating)
3,600 amps/296 volts (battery charging rating)

Main Motors: FOUR General Electric 1,375 HP machines.

Two-wire, direct-current, compensated compound/shunt, series and commutating field windings.

Gears: Combining and reduction type/reverse by reversing input.

2—1,375 HP @ 1,300 RPM inputs
1—2,740 HP @ 280 RPM output

Batteries: TWO—Exide 126-cell type.

Shaft Horsepower: 5,480

Max. Speed: 20.25 knots (surface)
8.75 knots (submerged)

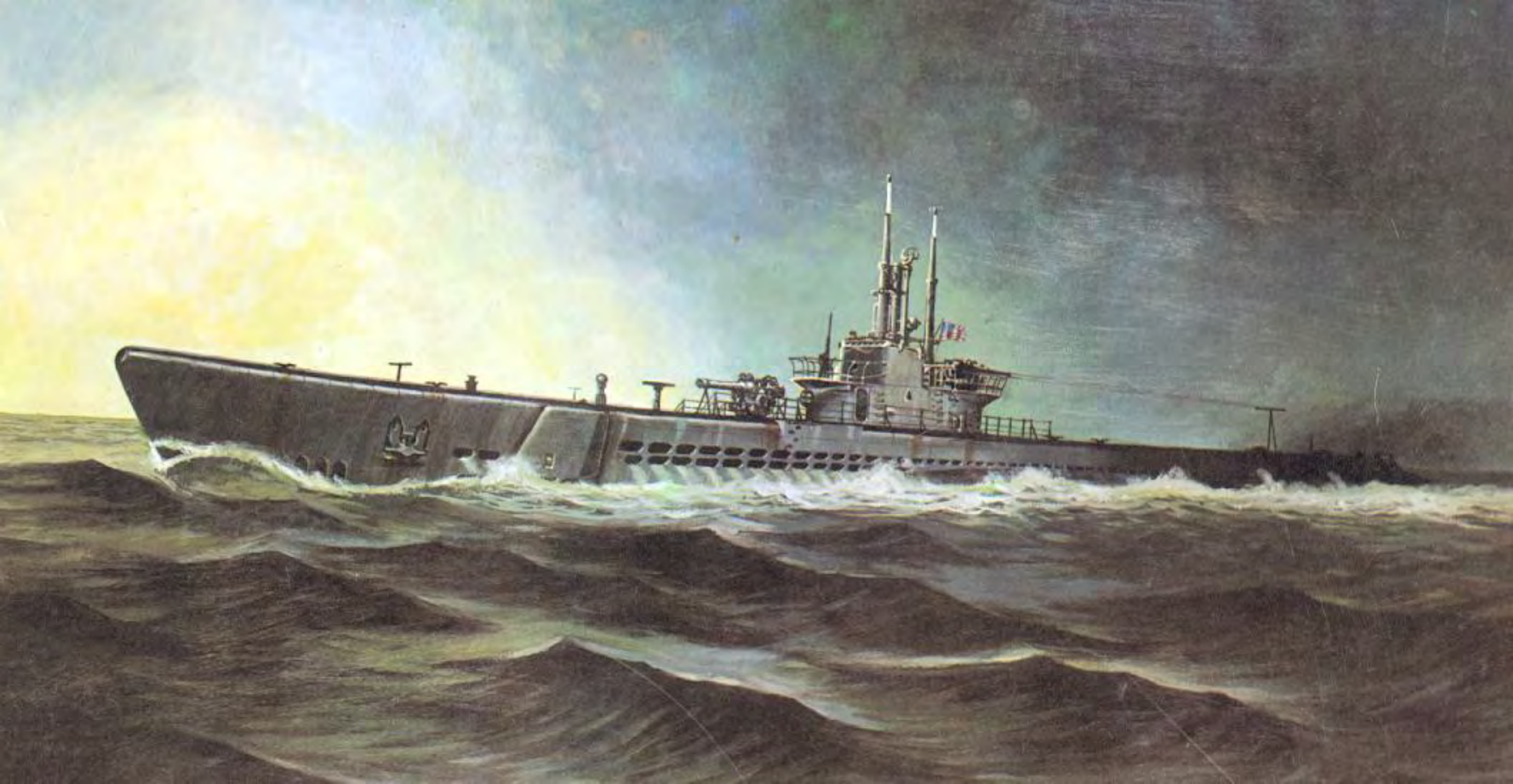
Auxiliary Generator: ONE—300 kw General Electric by ONE General Motors Model 8-268A diesel engine.

Propellers: TWO—Four-bladed 8' dia.

Rudder: ONE—balanced streamlined type. Train limits 38° to port and starboard.

Fuel Oil: 54,000 gals. (normal)
116,000 gals. (emergency)

COMPLEMENT: 80 (10 officers/70 enlisted)





The USS Bowfin (SS287) leaving Portsmouth, New Hampshire on 13 May 1943 for her first diving operation and trials.

USS BOWFIN (SS287)

by Arnold S. Lott, LCDR, USN (Ret.) and Robert F. Sumrall, HTC, USNR

Technical Research by Robert S. Egan

The USS *Bowfin* (SS287) was ordered built by the Portsmouth, New Hampshire, Navy Yard on 15 December 1941. Congress covered this action on 23 December by passing an act which, among other warship construction, authorized the building of twenty-three submarines (SS285–307).

All of the submarines were given fish names, most of which had been used before. Seven (SS285–291) were ordered built at Portsmouth and four (SS304–307) were ordered built at Mare Island Navy Yard, Vallejo, California. The need to produce still more submarines resulted in contracts to the Electric Boat Co., Groton, Connecticut; Manitowoc Shipbuilding Co., Manitowoc, Wisconsin and the forming of a new company to operate the old Cramp Shipyard in North Philadelphia, Pennsylvania which had closed in 1927.

Those submarines built at Manitowoc (SS361–378) had to be floated by barge through the Illinois Waterways and down the Mississippi River, to reach the open sea.

Most of the boats begun by Cramp (SS292–303, 425–428), were not commissioned until 1944 or 1945 and four had to be completed at Navy Yards. The group built by Electric Boat (SS308–352) experienced no major production problems or delays.

The Portsmouth Navy Yard, where *Bowfin* was built, is on an island in the Piscataqua River between Maine and New Hampshire. Originally two islands, later joined into one, it is on the Maine side of the river just off Kittery. Technically, the yard could more appropriately be called the *Kittery Navy Yard*.

Fleet Submarines

The concept of the fleet submarine originated with the Royal Navy early in World War I when the British Admiralty responded to incorrect reports that the Germans were producing such submarines.

In this concept, a fleet-type submarine had to be fast enough to operate with the advanced screen of the Grand Fleet. Upon sighting an enemy



The Navy Yard at Portsmouth, New Hampshire where Bowfin was built. The yard, on an island in the Piscataqua River, is just off Kittery, Maine. The shipways, which are covered, are just to the right of the graving dock in the center of the island.

force, these submarines were to move rapidly into position, dive and attack, rather than make lone-wolf attacks on naval and merchant ships as most submarines did.

The important point was that the submarine had to be very fast on the surface. Battleships could make 21 knots, and this was usually the speed aimed for by the submarine designers. Neither American nor British marine engineering had reached the state of the art at that time to enable them to build the compact, high-powered diesel engines required to attain this desired speed. At the end of World War I, therefore, all the principal naval powers pounced hungrily on the German U-boats surrendered in 1918, to discover the secrets of their superb diesel engines.

The United States received the U-111 which was operated and analyzed by the Marine Engineering Laboratory at Annapolis, Maryland. Doubtless, it was realized even then that 21 knots would be inadequate; 30 knots would be more practical. A considerable margin of speed was required

to enable a submarine to chase and overtake a target in order to reach a favorable firing position (known as the "end around" technique). In order to utilize the high speed to the fullest, these preliminary movements would have to be made on the surface. In addition, the submarine would require a low, inconspicuous silhouette, since an enemy could be expected to turn away from a submarine once it was sighted.

The British did this at Dogger Bank in World War I when it was thought that a periscope had been sighted. The turn-away completely disrupted the chase of the German battle cruisers. If the Germans had actually used fleet submarines in that action, they could not have hoped for a greater effect.

During the battle cruiser action at Jutland, 28-knot British destroyers could not work ahead into position to fire torpedoes for lack of a sufficient margin of speed. A fleet-type submarine would have had the same problem.

A fact, not generally known at the time, was that Japan had forged ahead of other navies in developing useful fleet submarines in the 1920s and 30s. Their huge "I" boats reached 24 knots but unfortunately (or fortunately) their targets, the battleships, also increased their speeds to 28 or 30 knots during the same time period.

The fleet submarine remained a chimera, ardently pursued by several navies. Nevertheless the name was given to the 21-knot submarines developed by the United States Navy in the late 1930s. Though actually incorrect, the designation stuck and is still used to describe the magnificent United States submarines of World War II.

Submarines and Submersibles

Technically, the fleet submarine was a "submersible" instead of a "submarine". These distinctions, in common use at the turn of the century, are seldom used now. However, they accurately describe two quite different types of undersea craft. The submarine was intended for submerged operation and could come up as needed, while the submersible was a surface ship which could submerge as required.

In submersibles, whenever surface and submerged performance characteristics came into conflict, the design was developed to favor the surface conditions. These boats were noted for long, narrow hulls with sharp bows, high reserve buoyancy and freeboard, large decks, guns, and relatively spacious bridges.

In contrast, submarines had short, stubby hulls with rounded or pointed nose, very low reserve buoyancy and freeboard, almost no flat deck, no guns, and a bare minimum bridge (like Holland's early submarines or the modern "body of revolution" hull shapes of nuclear boats). Submerged speed was equal to, or greater than, surface speed.

The fleet submarine was predominantly a surface ship. Its speed was reduced by over 50 per cent when operating submerged. In this mode it

was entirely dependent on its batteries and the state of their charge for propulsion, therefore, endurance and performance suffered drastically.

The Balao Class

In most respects, the design of the *Balao* (SS285) class was a duplicate of the preceding *Gato* (SS212) class with some minor rearrangements. The one major difference was that the pressure hull plating and ring stiffeners were constructed of high tensile steel (HTS) instead of the mild steel in general use prior to that time.

The result was that the new class (SS285), was capable of operating at a depth of 400 feet while the original design (SS212), could only submerge to 300 feet. The maximum explosion depth of Japanese depth charges was 90 meters, or 295 feet, and this added depth capability provided greater protection for the new (SS285-class) boats. This also provided a much greater percentage of hull strength available to resist depth charges at any depth as compared to the *Gato*-class. A depth charge takes a certain time to sink to explosion depth, therefore, the deeper a submarine could dive the more time it had to take evasive action after hearing the attacking ship pass overhead—the point at which depth charges were usually dropped.

The ring stiffeners, or frames, had to be enlarged considerably to hold the steel to its intended shape under the higher pressure which the new plating could resist at the deeper diving depth. The weight required by this increase in hull structure was made available, without increasing displacement, by stringent weight-saving. Frame spacing was 24 inches except over critical areas like the main machinery room where it was eighteen inches.

Additional boats of the SS285-class design were ordered as rapidly as the shipyards could handle them. Eventually this class included all submarines numbered 285 through 416, however, only 122 boats of this basic design were produced. Hull numbers 353 through 360 and 379–380 were not built and numbers 361 through 364, assigned to Manitowoc were completed to the SS212-class design. Due to material availability and production difficulties, Manitowoc could not make the change over to HTS until SS365 without delaying completion of the earlier boats. An additional 34 boats of the slightly improved SS417-class were also completed.

Basically, all of the *Balao*-class were similar, internally and externally. Starting with the contract design prepared by the Bureau of Ships in Washington, the Portsmouth Navy Yard and the Electric Boat Company each prepared working drawings which differed in several details. From the exterior, a Portsmouth or Electric Boat design could be easily determined by the location of the anchor: port side for the Portsmouth-built boats and starboard for the Electric Boat design. Mare Island and Cramp used the Portsmouth plans and Manitowoc used the Electric Boat drawings.

The following description is typical of the class, but minor variations



400' ———— MAXIMUM OPERATING DEPTH



Maximum operating depth for the SS285-class was 400 feet. Japanese depth charges had a maximum explosion depth of 90 meters, or 295 feet, which gave the class greater protection and more time for evasive action.

existed in individual boats, especially those which received post-war alterations.

Diving Depth

It is important to understand the limited submerged operational capability of these boats. *They could not dive very much deeper than their own length.* The SS285-class was designed to operate at 400 feet maximum depth with a safety factor of 1.5. The "collapse depth," at which depth the pressure hull was designed to fail, was 400 x 1.5 or 600 feet. If a boat got out of control during a steep crash dive, or while being depth charged, in only a minute or less it could pass from 400 feet and safety to 600 feet and probable disaster. Most boats were trimmed light during deep submergence operations to make it easy to "pull out" if required. Safe submergence required a sensitive means of depth control and rather slow changes in depth. These boats were not designed to maneuver like modern nuclear submarines, which behave somewhat like an aircraft.

WAY CHART, PORTSMOUTH NAVY YARD Portsmouth, New Hampshire



LINES REPRESENT INTERVAL ON WAYS FROM KEEL LAYING TO LAUNCHING
 YTTs ARE 165 x 55 TORPEDO TESTING BARGES, NON SELF-PROPELLED, INTRODUCED INTO THE HIGH PRIORITY SUBMARINE PROGRAM BECAUSE OF THE URGENT NEED TO IMPROVE U.S. TORPEDOES
 CANCELLED: 3-27-45—SS548-550; 8-12-45: SS491-515; SUSPENDED: 8-12-45—SS490 (VOLADOR)

Compartmentation

The internal arrangement for United States submarines, developed in the 1930s, was standard for many subsequent designs. The exceptions were machinery spaces and the number of torpedo tubes, which varied from six in *Dolphin* (SS169 [1932]), to eight in *Shark* (SS174 [1935]), to ten in *Tambor* (SS198 [1939]). The total compartmentation consisted of eight watertight compartments with six hatches for crew use and two for loading torpedoes.

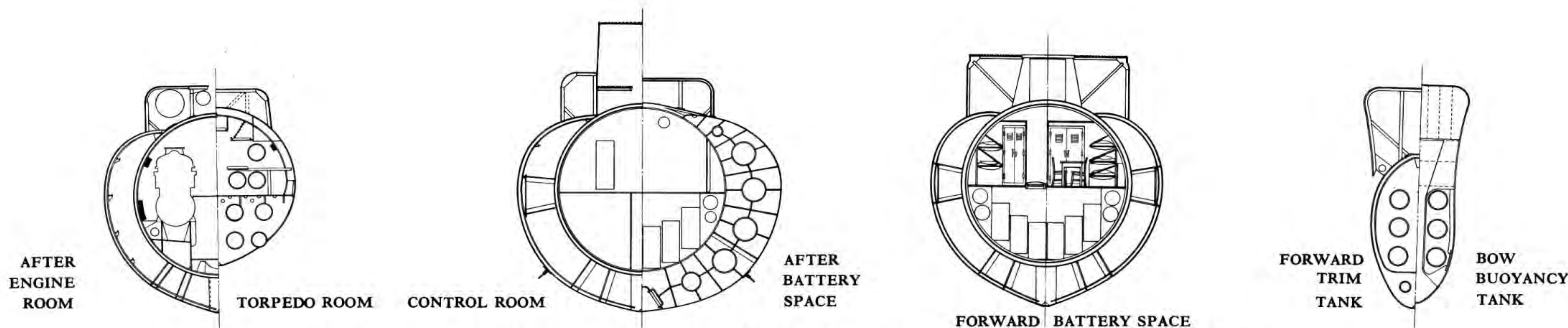
The pressure hull was divided into three sections; the forward, central and aft sections. The central portion, approximately 174 feet long and 16 feet in diameter (pressure hull) was double-hulled on the sides and bottom to accommodate many of the fuel and ballast tanks. The outer hull in this area is not pressure proof and has a water compensation system to equalize the pressure inside the tanks with that on the outside. The forward and aft sections were single-hulled where the exterior hull was too narrow to allow tankage outboard of the pressure hull. These end sections, especially forward, could not be perfectly circular in cross section due to the form required to drive the boat at high speed on the surface. Any change from the circular form greatly weakens such sections and thus requires considerable structural reinforcement.

Forward Torpedo Room

The foremost compartment, which occupied all of the forward single-hulled portion, comprised the forward torpedo room. The breech end of the six bow torpedo tubes projected eight feet into the room through the forward bulkhead. The tubes were stacked three high on each side. The space aft of the tubes was used to store reload torpedoes, which were in racks where they could be inspected and maintained. Crew bunks and lockers surrounded the reloads and a small cubicle in the after starboard corner contained the officer's head. The forward access or escape trunk was located in the overhead, as was the torpedo loading hatch. The chain locker and forward trim tank were around the tubes. The chain locker was outside the pressure hull while the forward trim tank was a "hard" tank forming the pressure hull boundary. Below the deck of the torpedo room was a small a WRT (water-round-torpedo) tank, the large MBT No. 1 (main ballast tank) and a sanitary tank. A small oval-shaped door in the pressure bulkhead at the after end of this space opened into the upper level of the first compartment of the double hull section.

Forward Battery Compartment

A deck divided this second compartment (and the two following) in half. The upper level consisted of accommodations for officers and CPOs



Typical sections of SS285-class boats. For further details and compartmentation, see pages 14, 15, 18 and 19.

(Chief Petty Officers). Going aft, on the starboard side was a shower, a stateroom for four officers, one for the commanding officer and the boat's office. The officer's pantry was on the port side, and aft of that, the wardroom which contained two berths outboard. A folding table took up most of the wardroom space; two curtained openings in the passageway allowed access to both sides of the table. Next aft was a stateroom for three officers, then one for five CPOs. There the two-foot wide centerline passageway angled to starboard and the next space aft.

Two manholes in the deck provided access into the forward battery well. There were one hundred twenty-six battery cells arranged in six fore-and-aft rows of twenty-one cells. A hard rubber deck ran across the top of the center row of cells. Battery water tanks were built outboard of the cells against the pressure hull and two fresh water tanks were located against the forward bulkhead. One of the most vital parts of the boat was the battery ventilation system which carried off the highly explosive hydrogen gas produced by the cells while charging or on open circuit. Several hydrogen detectors were installed in the boat to continually monitor the amount of gas. The purpose of the hard rubber deck directly above the cells was to minimize the possibility of explosion from sparks during access to the space.

Control Room

The upper level of the third compartment contained the control room. The diving station, on the port side, had two large handwheels to control the bow and stern planes. Above these, a gage board indicated whether the various openings in the pressure hull were open or closed by the display of red or green lights, its appearance giving rise to its popular name of "Christmas Tree." The port side was known as the "wet" side with the trim and hydraulic manifolds, flushing water, etc. running down that side while the starboard side was known as the "dry" side with the electrical cabling running through on that side. Along the center portion were located the helm, gun access hatch, chart table, gyro compass, hatch and ladder to the

conning tower, hatch down to the pump room, and the two periscope wells. Radar displays and plotting board were along the starboard side. The air manifold and electrical control panels for power, interior communications and the gyro switchboard bounded the fore-and-aft passageway. The space was continuously manned and was the captain's normal station except when the boat was on the surface and he was conning the boat from the bridge or when the boat was attacking and he manned the periscope in the conning tower.

The lower level held the pump room containing the periscope wells, air compressors, hydraulic plant, drain pump, trim pump, ice machine, and other small machinery items. At the aft end of the space were fresh water tanks on each side and a storeroom with access from a hatch in the deck outside the radio room.

After Battery Compartment

On the upper level, the forward half of the fourth compartment contained the galley, crew's mess and scullery. Next were accommodations for thirty-six of the crew, a laundry, head and washroom facilities. A ladder at the aft end of the crew's mess provided access to the main deck just aft of the fairwater.

In the forward portion of the lower level were three storerooms, two of them refrigerated, a magazine for the deck guns and small arms, and the ordnance storeroom. Access was gained through hatches in the crew mess deck. When the deck guns were removed in post-war alterations, this area was rearranged on many boats. The after part of the lower level of this compartment contained the after battery room, identical to the forward room, housing one hundred twenty-six cells. Behind the cells against the after bulkhead, a sanitary tank serviced the crew's facilities above.

Forward and After Engine Rooms

The identical fifth and sixth compartments each housed two 1,350-hp. diesel generator sets, one on each side. These spaces were not divided into

upper and lower levels, since the main engines occupied all of the vertical space. A grating was placed at the normal deck level to provide continuity of access fore-and-aft with adjacent spaces. An access hatch to the main deck was located in the after engine room.

The forward engine room also housed the vapor compression distillers, the standby fuel oil and lube oil pumps, an engine air inboard induction hull valve, and various starting and stopping controls for the main engines.

In addition, the after engine room contained the auxiliary diesel generator, fuel oil and lube oil purifiers, and an engine air inboard induction hull valve.

Maneuvering Room

The seventh compartment, where the main propulsion system was controlled, was a short one. The upper level of this compartment contained the maneuvering control stand with its indicators, gauges, remote controls for engine shutdown and auxiliary switchboard. A crew's head and lathe were also crowded into this small area.

Below, in the motor room, four very compact electric motors drove the two propeller shafts through directly-connected reduction gears. It was necessary to bulge the pressure hull slightly in order to fit the four motors into the decreasing circumference of the space. This altered the circular hull form in a manner similar to that forward.

After Torpedo Room

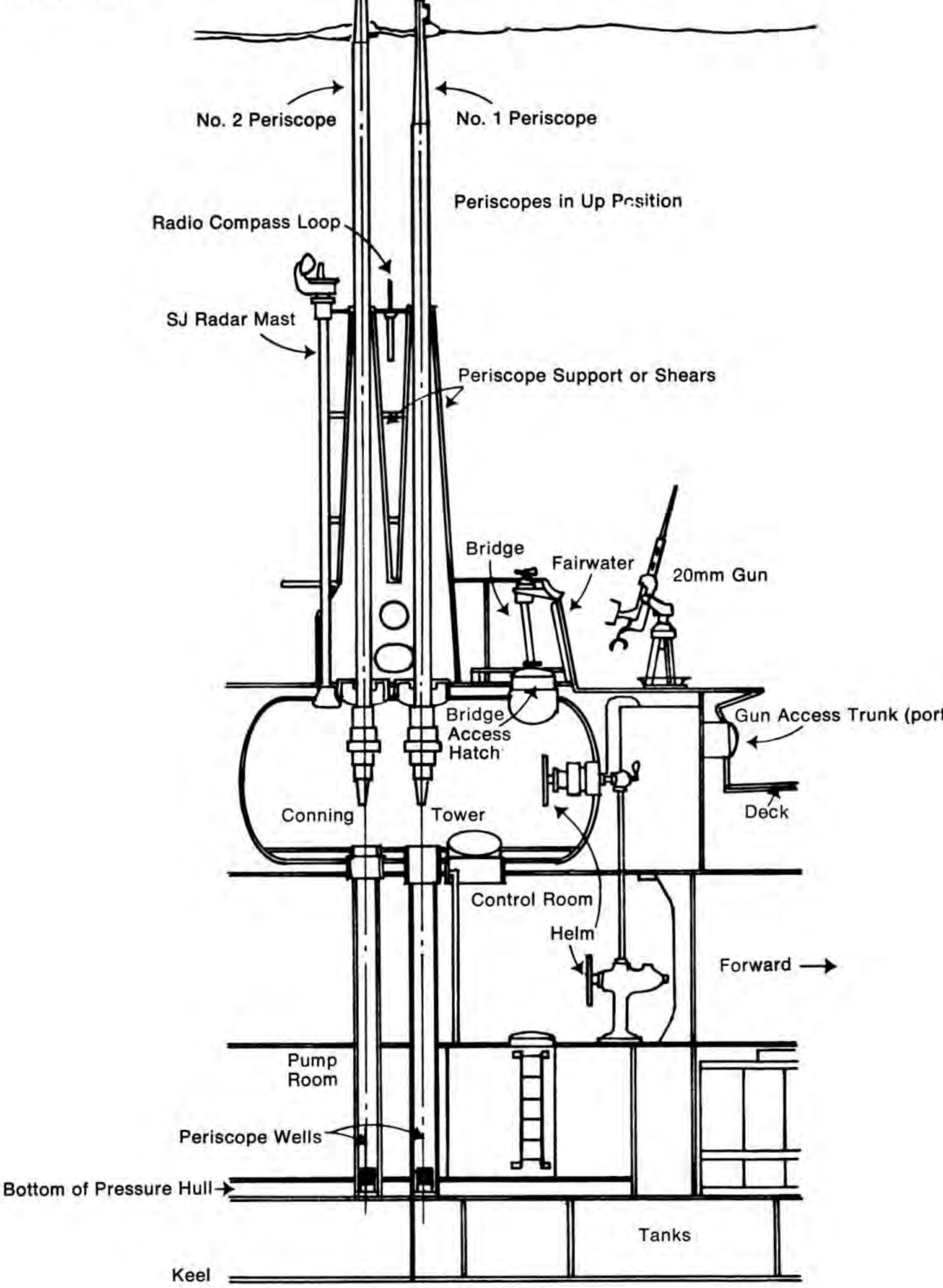
The after torpedo room and crews's quarters was the eighth and last compartment. It was rigged similarly to the forward torpedo room, but carried only four torpedo tubes. Two hatches were in the overhead, one for access to the main deck (not an escape trunk) and one for loading torpedoes. A crew's head was in the forward end of the compartment, to port, and the after trim tank was built in around the torpedo tubes. The deck of this compartment was formed by the big MBT No. 7, a WRT tank, and an engine lube-oil tank.

Conning Tower

The conning tower consisted of a cylinder, eight feet in diameter, with external stiffeners. It was seventeen feet, six inches long, and constructed of protective steel plate; the only such area on the boat. While not visible from the exterior, it was completely above the surface trim line and was thus exposed to gun fire and splinters, since the superstructure and fairwater, which covered it from view, offered no significant resistance to even light shells.

The tower was supported by brackets off the pressure hull frames and connected to it by a circular hatch trunk leading to the control room. The periscope wells (cylinders) also connected the conning tower with the pressure hull, running from the top of the periscope shears down through

Partial inboard profile at periscope depth showing periscope arrangement.



the control room to the pump room below. These wells were omitted in the conning tower. The periscope eyepiece was about four feet, nine inches above deck level in the conning tower when the periscope was fully raised.

The periscope eyepiece had to be placed as high as possible in the boat, in order to keep the hull and fairwater submerged while running at periscope depth. This requirement made the conning tower a desired feature of submarine design.

A hatch and ladder led up from the tower to the covered front portion of the bridge. A helm was mounted on the forward bulkhead. A tube housing the radar mast extended up from the overhead aft. Periscope hoists were also mounted in the tower.

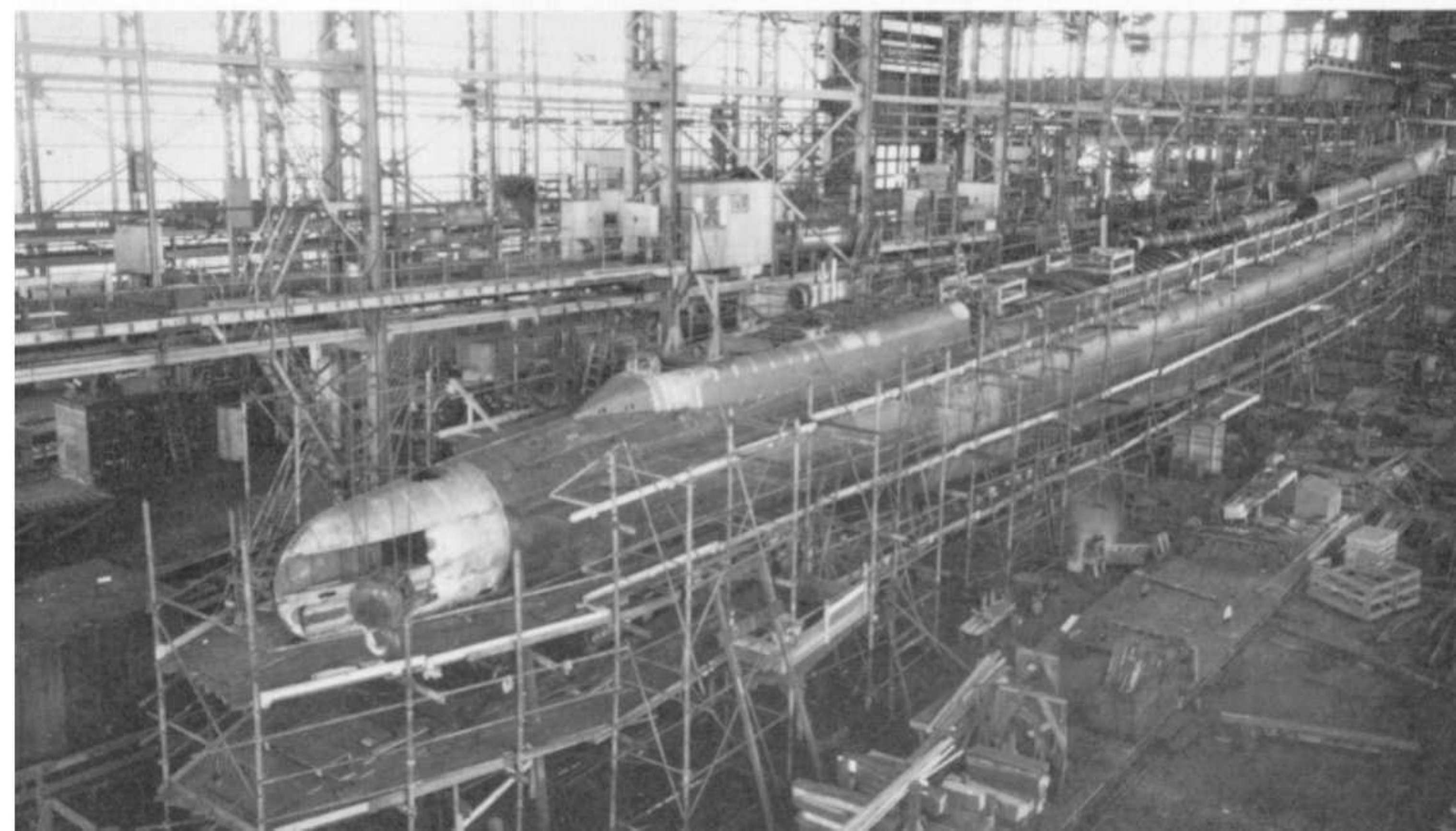
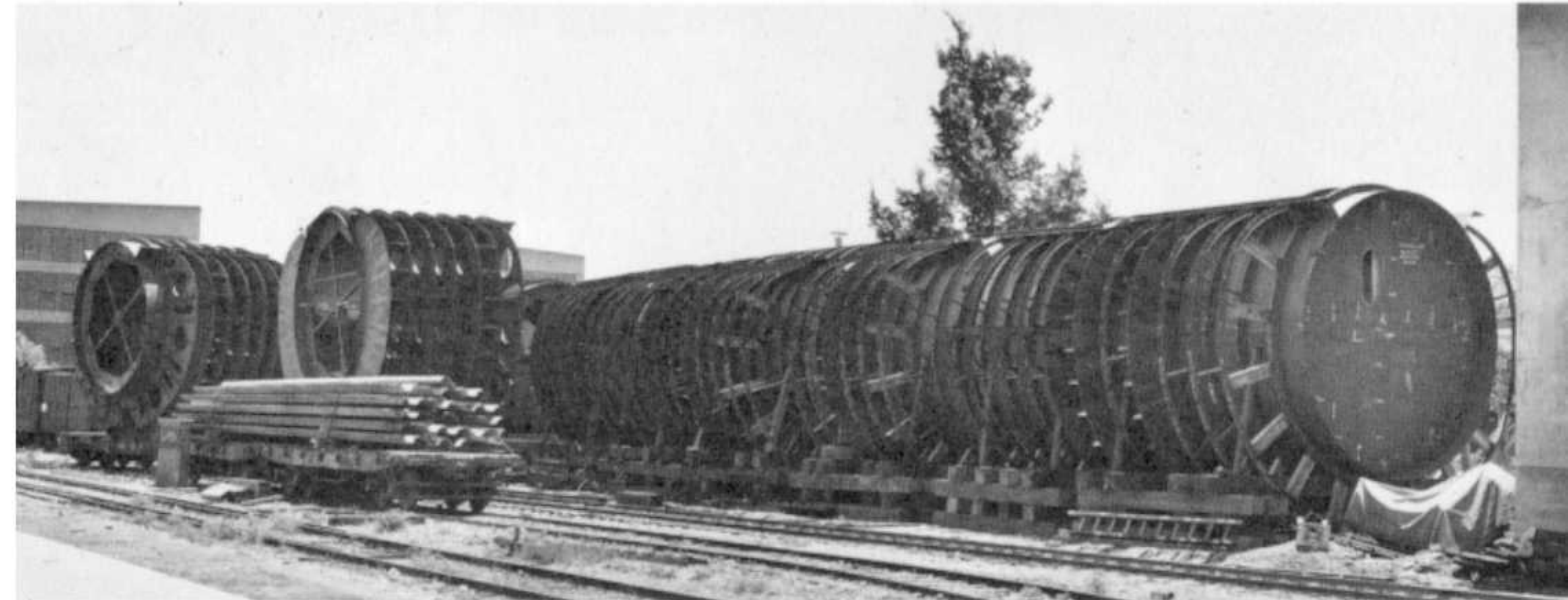
Principally, the tower served as the attack center of the boat. This crowded space was manned by several men, including the captain, torpedo officer and helmsman.

Outer Hull and Superstructure

The outer hull was generally of light all-welded construction, equivalent to that of a surface ship. An exception was in the way of the forward and after trim, forward and after WRT tanks, auxiliary, safety and negative tanks which had to withstand full submergence pressure. The area of the fuel oil ballast tanks at maximum beam, just below the waterline was strengthened to resist the bumps of piers or of other submarines nested alongside. Bilge keels 15 inches deep were fitted, another concession to surface operation; since submarines have inherently small transverse metacentric height, they are fast rollers. This rolling condition is aggravated by the considerable tumble-home of the sides above water.

The upper end of the outer hull curved over sharply to join the pressure hull at right angles. This allowed access for making the welds and avoided a narrow area of tank that would be inaccessible for inspection and maintenance; however, it formed a water trap on top of the pressure hull between the ballast tank tops. This "crown" area of the pressure hull was thus subject to severe corrosion, being alternately exposed to water and air as the boat rolled on the surface.

The superstructure consisted of a raised deck, several feet above the pressure hull, and side plating. The deck was formed of 2½-inch wide wooden planks, with a ¾-inch gap between planks, laid on the superstructure framing. It was possible to look down through the deck and see the crown of the pressure hull. The lower sides of the superstructure were either kept clear of the pressure hull or pierced with numerous free flooding openings, or limber holes.



(Top and Center) Inner hull assemblies for USS Wahoo (SS238) stored outside fabricating shop at the Mare Island Navy Yard, 24 June 1941, awaiting erection and installation on building ways. Method of forming pressure hull and framing exterior tanks is clearly shown. (Bottom) USS Volador (SS490) on covered ways at the Portsmouth Navy Yard, 31 January 1946. Bowfin was built here.



Close-up of USS Hardhead (SS365) showing port side of bridge in April 1944 configuration.

Obviously, there were many times when it was vital to be able to “pull the plug” and submerge very rapidly. To do this it was necessary, among other things, to flood the superstructure as quickly as possible. The water had to be taken in fast and, equally important, the air had to be able to get out just as fast. This was one reason for the gaps between the deck planking; another being that boarding seas vanished down between the planks eliminating much wetness at the bridge. In fact, on many boats the flooding openings were multiplied or enlarged, especially forward, to flood more rapidly. This made the forward end heavy, trimming the bow down and enabling the thrust of the screws to help drive the hull under quickly.

Care must be taken to avoid a dive angle which is too steep so as not to lift the screws out of the water and slow down the dive. The deck was widened in way of the two deck gun areas, forward and aft of the fairwater, to allow sufficient working room for the gun crews. Portable rails could be rigged around the main deck for safety while in port.

Bridge

To fair, or smooth, the flow of water past the conning tower, which protruded above the main deck level, a free-flooding fairwater of very light

steel plating and framework was built up from the pressure hull. Plating extended upward from the main deck level, its top forming the bridge deck. The main air intakes were located in this area; under the bridge deck, as high and as protected a location as could be found to keep waves and spray out of the air supply piping. To assist in rapid diving, a large arch without a door was cut in the port side of the fairwater just forward of the conning tower in way of the hatch in the gun access trunk. The entire bridge deck was covered over with planking, similar to the main deck.

Above the tower a support structure for the periscope tubes was built. This structure, the periscope shears, was constructed to provide support to as high a point as possible; preventing the slender periscopes from vibrating excessively under the water forces produced at maximum submerged speed.

On the forward end of the fairwater was a platform and mounting for a 20mm. gun. The platform was circular and extended over the forward end and sides of the fairwater forming a working circle for the gun crew. A pipe railing, angled outward, protected the gunners when manning this station.

In the center of the fairwater the plating extended above the bridge deck to form a high bulwark for spray protection for bridge personnel. The forward end was bent over to form a small roof for shelter, spray protection, reading of charts and writing in logbooks, and to keep spray from coming down the open hatch into the conning tower. It also helped prevent the red glow of the night lighting system in the tower from being visible to aircraft. Platforms and railings for lookouts were mounted on the periscope shears. Radar masts were supported by brackets from the aft end of the shears followed by a target bearing transmitter mounted on a high pedestal from the bridge deck. This instrument acted as a target designator for surface attacks only, feeding the target bearing to the torpedo data computer in the control room. A great deal of thought and planning was given to the design of this area and to make it possible for bridge personnel to make a quick exit down into the conning tower when an emergency dive was required. With practice, it could be done quickly without injury.

Another gun platform was located on the aft end of the fairwater. Its configuration was similar to the forward gun platform. A 20mm. gun was mounted in this position when first commissioned. The 20mm. was replaced by a 40mm. gun in 1944 when this new weapon became available, requiring enlargement of the gun platform on each side to allow sufficient working room. The 40mm. mount improved the boats' meager anti-aircraft and surface firing capabilities considerably.

The original design of the fairwater was quite long with a high bulwark extending its full length with the front end covered over and air ports fitted to light the interior. Most of the *Gato*-class completed with this large fairwater had it cut back in 1942 and 1943. This modification reduced the silhouette, and formed an open deck, fore-and-aft of the bridge, on which



Original bridge design for early fleet-type boats is shown in this 6 April 1942 view of USS Trigger (SS237). Original 3"/50 deck gun proved too light for surface targets.



(Above) This view of USS Wahoo (SS238) taken 14 July 1943 shows the first major bridge alteration given to the early fleet-type submarines. A heavier 4"/50 deck gun has been mounted forward and a 20mm has been mounted on the forward and aft bridge platforms (barrels are removed). (Below) Most fleet-type boats finished the war outfitted similar to this 20 July 1945 shot of USS Mingo (SS261), mounting a 5"/25 aft, 40mm on the bridge platforms and in many boats a 20mm was placed over the main gun foundation forward.



antiaircraft guns could be mounted. After these areas were rebuilt, a configuration similar to the new design resulted. In the area of the periscope shears, however, all excess plating was removed leaving it a skeleton structure. Platforms and railings for the lookouts were built on each side of the shears and a target bearing transmitter was mounted, as in later boats.

The after end of the bridge was the only safe spot for the men to come topside and smoke while underway, thus it became known as the "cigarette deck".

In the *Balao*-class the bridge was redesigned incorporating these requirements and all of the class was completed to the new fairwater design. The modifications to the *Gato*-class and the redesign of the *Balao*-class in this area accounts for so many differences in appearance of World War II fleet submarines.

Tanks

It was the many and varied tanks which made a submarine able to act as such. After the war many submarines were reconstructed and the arrangement of their tanks was changed. The *Bowfin* still remains very similar to the original design.

Main Ballast Tanks (MBT)

These tanks were designed to bring the boat from the surfaced condition "rigged for dive" to the fully submerged condition with neutral buoyancy. To achieve neutral buoyancy, neither rising nor sinking, in one minute the MBTs had to flood at the rate of 900 tons per minute. During the war, modifications were made to reduce the time to 40 seconds. The principal modification was the enlargement of the flooding openings for the forward tanks, and a decrease in the flooding rate of the after MBT. Once a down-angle on the boat was achieved and the bow planes were submerged, the boat was well on its way down.

There were four groups of MBTs; Nos. 1 and 7 were inside the pressure hull in the forward and after torpedo rooms, respectively. Nos. 2 and 6 were in the outer hull, divided into four tanks each, two port and two starboard, with suffixes A and C to starboard and B and D to port.

No valves were fitted to enable closing the flooding openings, which were located in the outer hull adjacent to the keel. While surfaced, the tanks were kept empty by the closed vents which trapped the air inside them. There was a little water in the bottom of each MBT, up to a level just above the flooding opening. Thus the boat was always "riding the vents"—opening them would immediately flood the tanks.

For maximum reserve buoyancy and freeboard, the boat was operated in "diving trim" with MBTs, safety, bow buoyancy, and negative tanks empty. To be ready to dive more rapidly, the negative and safety tanks were sometimes flooded at the discretion of the commanding officer. This put the boat in the condition "rigged for dive." As the boat reached the desired depth the negative tank would be blown and the bow brought up with the bow planes. Any tendency to rise or sink would be overcome with

the stern planes until the variable ballast could be adjusted by flooding or pumping water into or out of the auxiliary or trim tanks. A perfect balance could not be achieved. It was considered satisfactory if the planesman could control the depth easily.

To surface, the MBTs and bow buoyancy tanks were blown. Actually the blowing of the MBTs was only started, using the HP blower and compressed air stowed in long curved HP air flasks, which were mounted within the MBTs. To conserve this air, as soon as the main deck was awash and the conning tower hatch could be opened to admit outside air, the HP blower was secured and the blow finished using the LP blower and the outside air. The compressors could then be started to replenish the air flasks and a battery charge begun to bring them up to full charge.

Fuel Ballast Tanks (FBT)

These tanks were identical to the MBTs (except the flood ports had oval hatches that could be shut) and carried fuel to give the long-range operating capability required for operations in the Pacific. As fuel was burned it was automatically replaced with sea water. If the extra fuel capacity was not needed, the FBTs were used as regular MBTs. Tanks numbered 3A, 4A, and 5A (starboard) and 3B, 4B, and 5B (port) were FBTs.

Normal Fuel Tanks (NFOT)

Oil for the boats's engines was stored in the four NFOTs between the inner and outer hull. When submerged, these tanks were open to sea pressure through the compensating system which admitted sea water to compensate for fuel consumed. The changes in volume caused by variations in temperature were compensated for in the same manner; thus the tanks were kept full of liquid at all times.

Collecting and Expansion Tanks

Special tanks for expansion and collecting fuel oil were fitted abeam of the after engine room, between the MBTs and NFOTs. The collecting tank on the starboard side was used as a settling tank to allow fuel oil to separate from the water introduced through the compensating system. Oil was transferred from this tank to the clean fuel oil tanks inside the engine room for subsequent use by the engines. The port expansion tank was an overflow tank to accommodate fuel expansion caused by temperature variations, thus avoiding possible tank rupture.

Trim System

The trim system was employed primarily to correct unequal distribution of weights in the boat. The tanks in this system were all variable ballast tanks. The trim tanks were located forward and aft around the torpedo tubes, the water round torpedo (WRT) tanks were located on the bottom of the hull just toward the center of the boat from the trim tanks, and the auxiliary tanks were located one on each side in the outer hull near the fore and aft center of buoyancy. These were all "hard tanks" designed to resist full submergence pressure.

Proper daily compensation for weights, to keep the boat from getting too heavy or too light, would keep the boat always ready to dive by just flooding the MBTs. Operating situations have occurred where boats have sunk like a rock with negative buoyancy after filling the MBTs, or have refused to go under because flooding the MBTs did not add enough weight to completely submerge the boat.

To keep the boat in proper fore-and-aft balance, some of the compensation water could be shifted to the forward or after trim tanks by using the trim pump and trim manifold. The auxiliary tanks, located near the fore-and-aft center of buoyancy did not require trimming the boat when water was added or removed.

Trim Tanks

The trim tanks were used to provide for fore and aft compensation. Water was transferred to the trim tanks from the WRT tanks after torpedoes had been fired to maintain the boat at a constant weight and trim.

Water Round Torpedo Tanks (WRT)

The function of the WRT tanks was to provide water for flooding the remaining volume of the torpedo tubes after loading and to receive the water drained from the torpedo tubes after firing, without changing the amount of compensation water. A sizable weight loss occurs whether a submarine fires a single torpedo or a "spread" (salvo). The WRT system compensated for this loss of weight and thus prevented the loss of depth control in the boat. Some of the small early submarines became so light after firing torpedoes that they popped to the surface—no way to behave in the presence of an enemy. (*A description of the operation of the WRT tanks is given under TORPEDO TUBES*).

Auxiliary Tanks

There were two auxiliary tanks, one on each side, located in the outer hull around the forward part of the after battery compartment and near the fore-and-aft center of buoyancy. These "hard tanks" were designed to resist full submergence pressure. To compensate for the loss of fuel burned, ammunition expended and other consumable supplies used, sea water was added to these tanks. Allowance for the variations in water density was also made in these tanks.

Safety Tank

The safety tank, was located near the fore-and-aft center of buoyancy, and was originally designed to compensate for the conning tower being flooded due to collision when submerged. This tank, when blown, would quickly bring the boat to the surface with enough positive buoyancy to leave the conning tower out of the water and the main deck awash. This was particularly useful in tactical situations when it was necessary to embark or disembark personnel without exposing any more of the boat than necessary. Normally filled, this safety tank could be blown quickly at any depth to bring the boat to the surface.

Negative Tank

This small hard tank was located in MBTs No. 2A and B under the conning tower, well forward of amidships. Its purpose was to make the boat heavy forward, when diving, to get the bow down and submerge the forward diving planes quickly. With the leading edge of these planes depressed, the boat's speed would help to drive her under. When the MBTs had flooded, the additional water in the negative tank created a negative buoyancy and enabled the boat to sink quickly. As the boat approached the desired depth, the negative tank was blown empty. The negative tank was normally carried empty at depth.

Bow Buoyancy Tank

To prevent the boat from burying her bow in large waves which could sweep over her, a portion of the above-water outer hull was made tight at the bow. Free flooding openings, or limber holes, were cut in the sides of the hull along the bottom edge of this tank and two vent valves were fitted in its top near the main deck. When water rose at the forward end and covered the flooding openings, the air inside was trapped. The buoyancy created by this trapped air caused the bow to rise and follow the waves. The tank was also useful when submerged; closing the vents and blowing the water out while surfacing helped bring the bow up first, which allowed the screws to help drive the boat to the surface. Conversely, a steep dive could be stopped by closing the vents and blowing bow buoyancy. It was also used to bring the bow up whenever needed.

Sanitary Tanks

Two sanitary tanks were fitted to take waste discharge from the heads, washrooms, laundry, galley, scullery, etc. They could be blown out while the submarine was surfaced or at periscope depth.

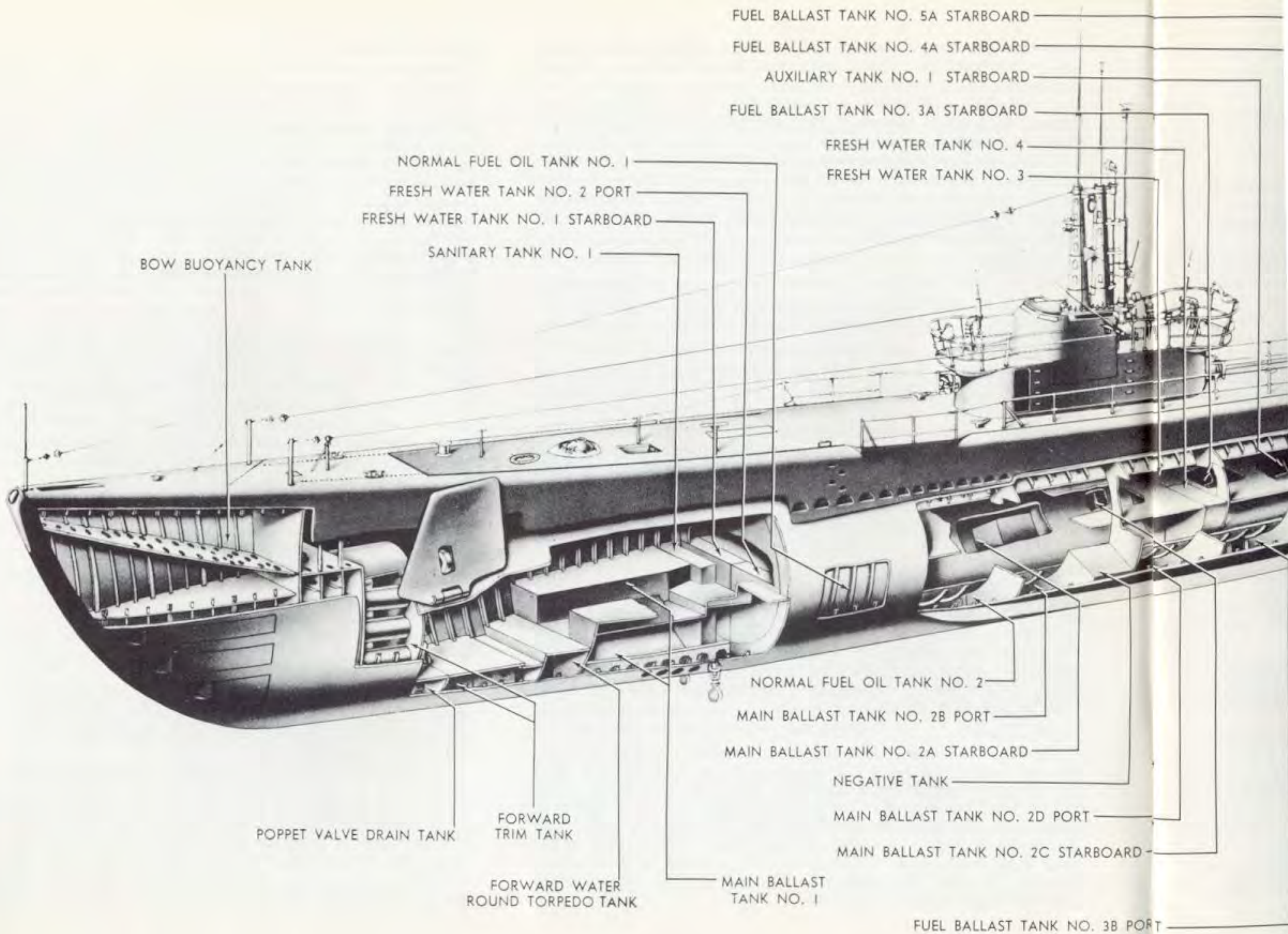
Bow and Stern Planes

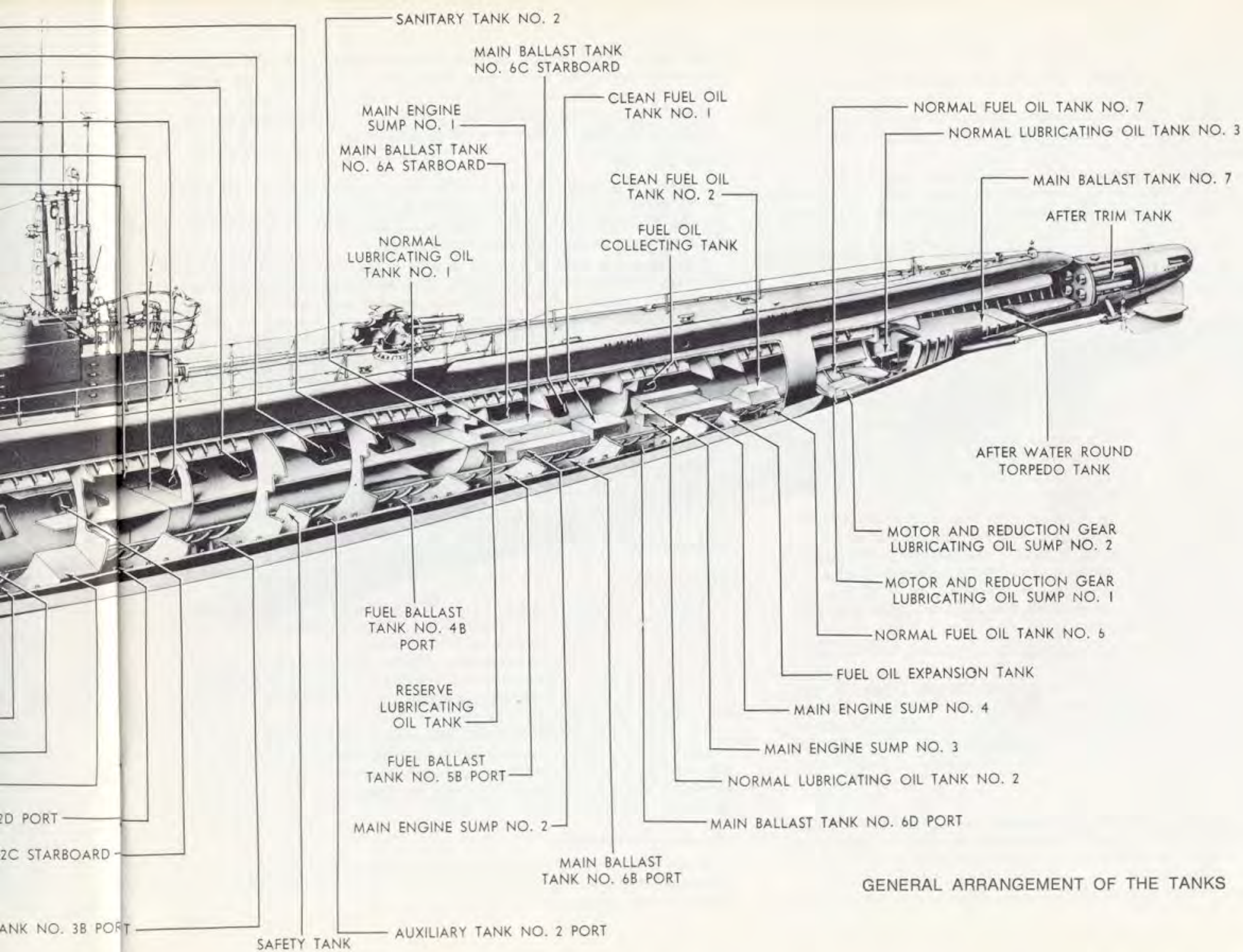
The stern planes controlled the angle of the boat, bringing the bow up or down. The bow planes controlled the depth, up or down, without change of angle. They required the boat to be moving to develop enough lift force to make them effective.

To avoid slamming in waves, the bow planes were made to fold up vertically against the side of the outer hull. Each plane was carried on a separate shaft with their operating mechanisms mounted in the pressure hull above the torpedo tubes.

The stern planes were less subject to slamming damage and were mounted low on the rudder support structure just aft of the screws. This position took advantage of the higher water velocity in the propeller race for increased efficiency. The short shaft for the stern planes was keyed to a tiller with its operating gear located in the after torpedo room.

The angle of the planes was controlled by two large handwheels at the diving station on the port side of the control room. The handwheels actuated electrically-driven hydraulic systems to move the planes.





GENERAL ARRANGEMENT OF THE TANKS

Rudder

The boat was equipped with a semi-balanced type rudder actuated by hydraulic power. This system, powered by an electric motor, was completely independent of the main hydraulic system. If this system failed, emergency steering could be accomplished by switching to the main hydraulic system.

The main control units were located in the steering stand of the helm in the control room; the conning tower helm was connected to the control room steering stand through a long shaft, making it basically a repeater unit.

When the boat was rigged for silent running, to avoid detection by enemy craft, the steering system motors were shut down. While operating in this mode the system was hand operated; the hydraulic power being developed by the manual efforts of the helmsman while turning the wheel.

In either case, the hydraulic power always moved the rudder, the only difference being the manner in which the power was developed.

Engineering Plant

The main propulsion plant and the auxiliary machinery were the two basic groups of machinery that comprised the engineering plant. The main propulsion plant furnished the power to move the boat, charge the batteries and generate electrical power. In turn, this electrical power ran the various motors, pumps, blowers, compressors and other miscellaneous equipment of the auxiliary machinery group.

The need for more powerful diesel engines became apparent with the development of the fleet-type submarine. The three engines that seemed to fulfill these requirements were the Winton V-type, known as the General Motors engine; the Fairbanks-Morse opposed piston type; and the Hooven-Owen-Rentschler double-acting type engine. Of these, the HOR was later removed from submarines in favor of the GM or F-M engines which became the two standard submarine engines.

Main motors, main generators, and auxiliary generators were manufactured by General Electric, Allis-Chalmers, Elliott, and Westinghouse. Main control cubicles were manufactured by General Electric, Cutler-Hammer, and Westinghouse. Installations were usually paired as follows: General Electric motors, generators, and controls; Westinghouse motors, generators, and controls; Allis-Chalmers motors and generators and Cutler-Hammer controls; Elliott motors and generators and Westinghouse controls.

Main Propulsion Plant

The main propulsion plant for the fleet-type submarine was a conventional diesel-electric drive. Principal components of the drive train were: four 1,100 kw diesel generator sets, (each set consisting of a 1,600 HP diesel engine direct-coupled with a 415-volt DC generator), four 1,375 HP DC motors, two combining and reduction gears, twin propeller shafts

(one direct-coupled to each gearbox) and two propellers. Snorkel installations were not operational during World War II, therefore, the diesel generators were not used while submerged. Power was supplied to the motors from the two 126-cell batteries which were charged during surface operations by either the main or auxiliary generators.

Main Engines

Four General Motors Model 16-278A diesel engines were the primary source of power to generate electricity for the main motors and for charging the batteries. Each engine developed 1,600 BHP. Two each were mounted in the forward and after engine rooms.

The engines received a constant flow of air (5,630 cfm), drawn from the main induction system by a blower. This air, mixed with the fuel from the CFOT (clean fuel oil tank), was metered and injected into the cylinders. After combustion the exhaust gases were removed or "scavenged" by another blower which forced them out through the exhaust system.

Engines were direct-coupled to the main generators with a flexible coupling which allowed for minor misalignment due to vibration, shock loads and other causes.

Main Generators

Each of the four main generators produced 1,100 kw of electrical power for the main motors. *Bowfin's* machines were the two-wire direct-current type separately excited, totally enclosed, and self-ventilated. The manufacturer, General Electric, rated them at 2,650 amps and 415 volts for propulsion and 3,600 amps at 296 volts while charging batteries.

Main Motors

Bowfin was propelled by four 1,375 HP motors, also of General Electric manufacture, of the two-wire, direct-current, compensated compound type with shunt, series, and commutating field windings.

Two motors were used to drive each propeller through a combining and reduction gear. Each input pinion was supplied a maximum of 1,375 HP @ 1,300 rpm. through a planetary reduction gear which delivered 2,740 HP to the propeller shaft @ 280 rpm.

The motors were totally enclosed and speed control was accomplished by controlling the generator speed and shunt field, which varied the voltage supplied for surface operations, and the motor shunt field when submerged. Reversing was accomplished by reversing the direction of the current flow in the motor armature circuit.

Auxiliary Generator

Powered by a General Motors Model 8-268A diesel engine, the auxiliary generator was rated at 300 kw. It was used to furnish current to the ship's service system and for battery charging.



Main Storage Batteries

Bowfin had two main storage batteries located in the forward and after battery compartments. A battery consisted of one hundred twenty-six cells; each cell, in its hard rubber case, weighed 1650 pounds and measured 21½ inches wide, 15 inches long and 54 inches high. They were *Sargo*-type cells, so-called for their first use on that submarine. The cells were a secondary-type made by Exide, using two different types of lead immersed in electrolyte (sulphuric acid).

Armament

The main offensive and defensive weapon of the fleet type submarine was the torpedo tube. Ten 21" tubes were mounted, six forward and four aft.

The *Balao* (SS285) class was designed to carry two deck guns, one forward and one aft of the fairwater, but in most cases only one was fitted. The early boats carried a 3"/50 aft or a 4"/50 forward but most finished the war with a 5"/25 mounted forward. A few of the class did carry two 5"/25s toward the end of the war. It was possible to shift the gun to either foundation, depending on the captain's preference and the mission requirements. Such shifts could readily be made by a tender; they involved a shift of lead ballast in the opposite direction to maintain the balance of the boat. The magazine was under the mess hall; shells were handed up from the lower level and passed up the ladder to the main deck just aft of the fairwater if the gun was aft. Some boats had an inclined ammunition passing scuttle from the mess hall direct to the main deck. If the gun was mounted forward, a chain of ammunition passers moved the shells forward past the galley and radio room, through the control room, and up the gun access trunk where a scuttle on the forward side of the trunk allowed the gun crew to receive the ammunition. Pressure-proof ready-service ammunition lockers were built into the ends of the fairwater for immediate availability of ammunition to the gun crews.

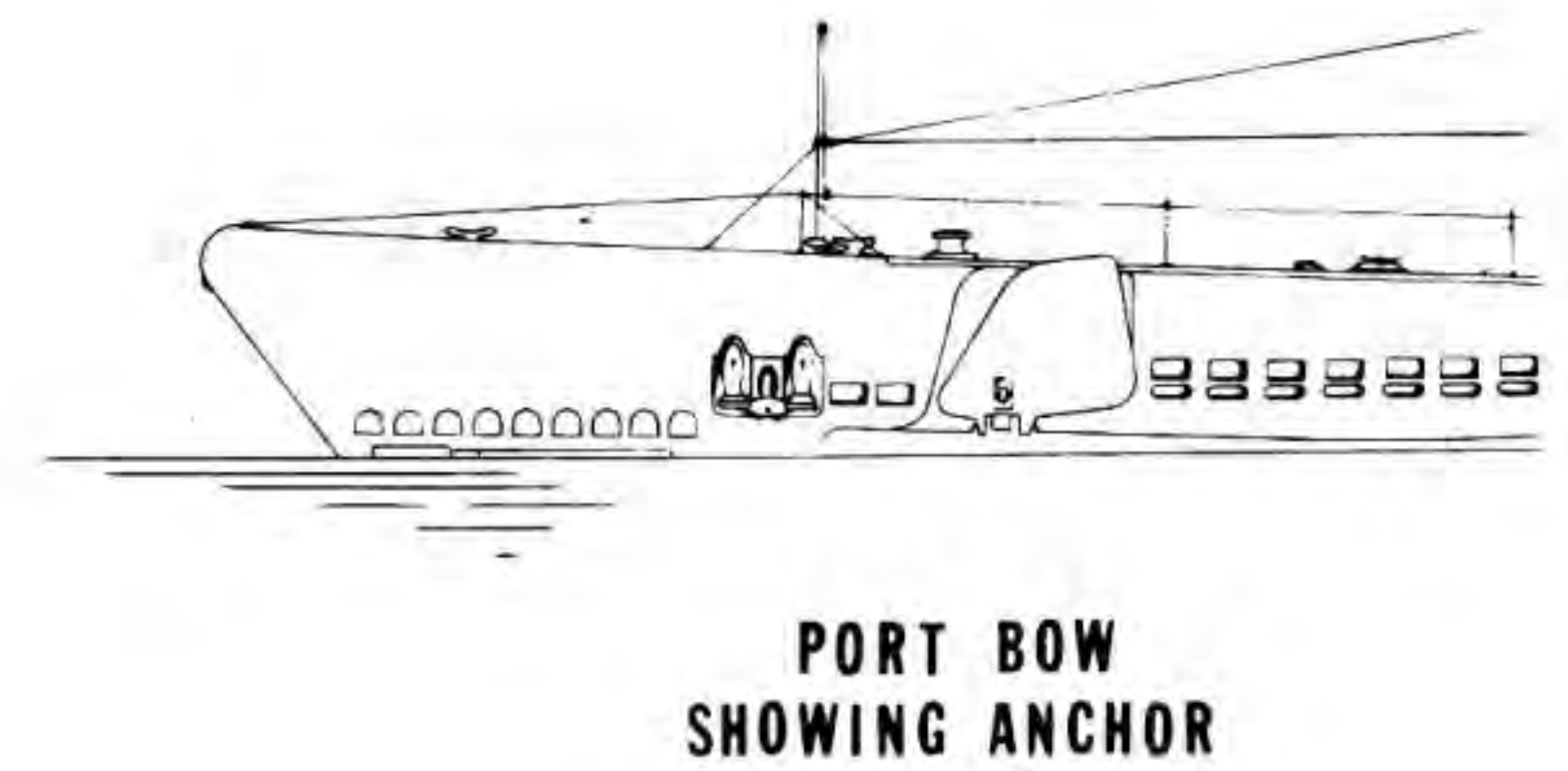
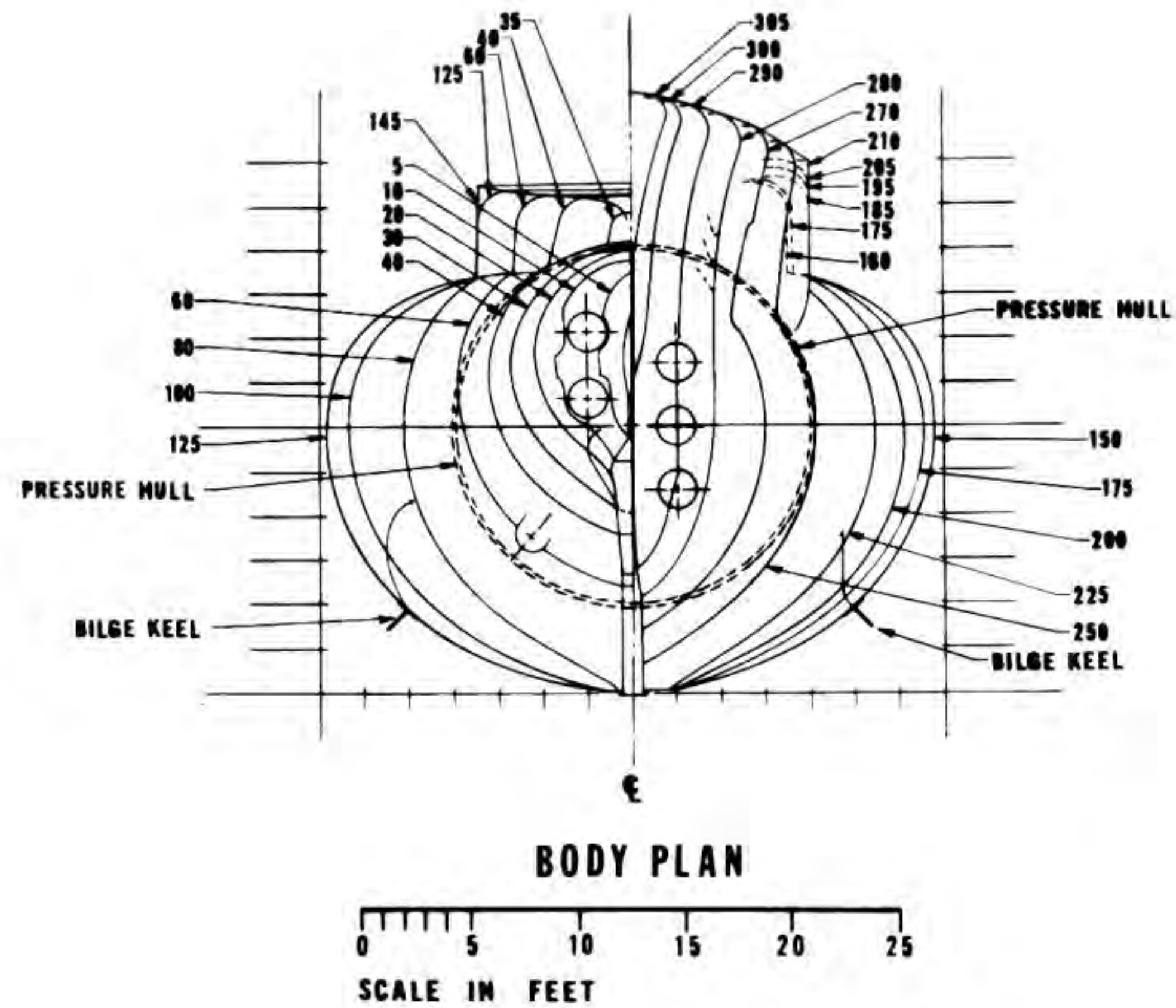
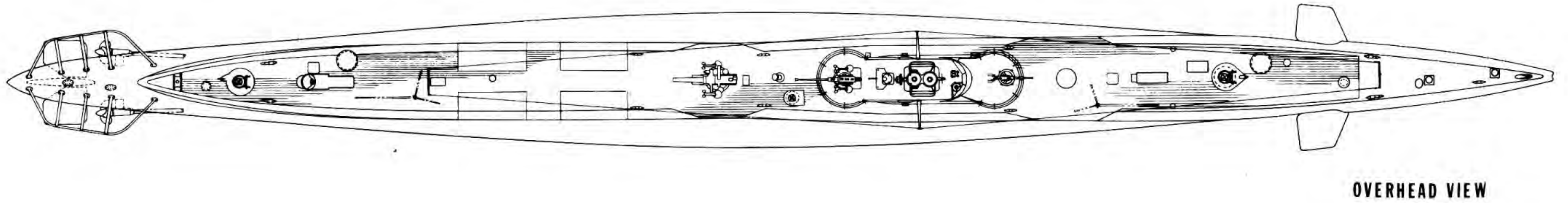
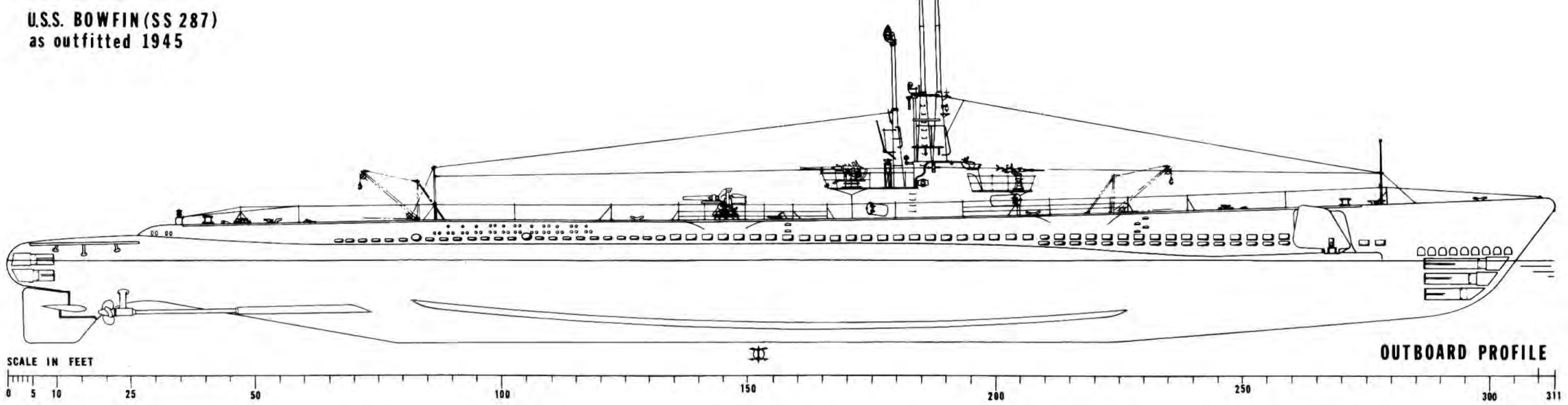
Antiaircraft armament varied widely. In the first boats commissioned, two single 20mm mounts were fitted at each end of the bridge deck. These mounts had splinter shields which were soon removed to reduce underwater resistance and vibration. As the 40mm single mount became available during 1944, this new gun replaced the after 20mm mount in many boats and by the end of the war a great number had both 20mms replaced by the 40mms. In a few cases, twin 20mm mounts were installed as this type mount came into more general use in the last year of the war.

During 1945 a rather typical gun arrangement for fleet submarines was one 5"/25 aft, one single 20mm on the forward bridge deck, and one single 40mm on the after bridge deck.



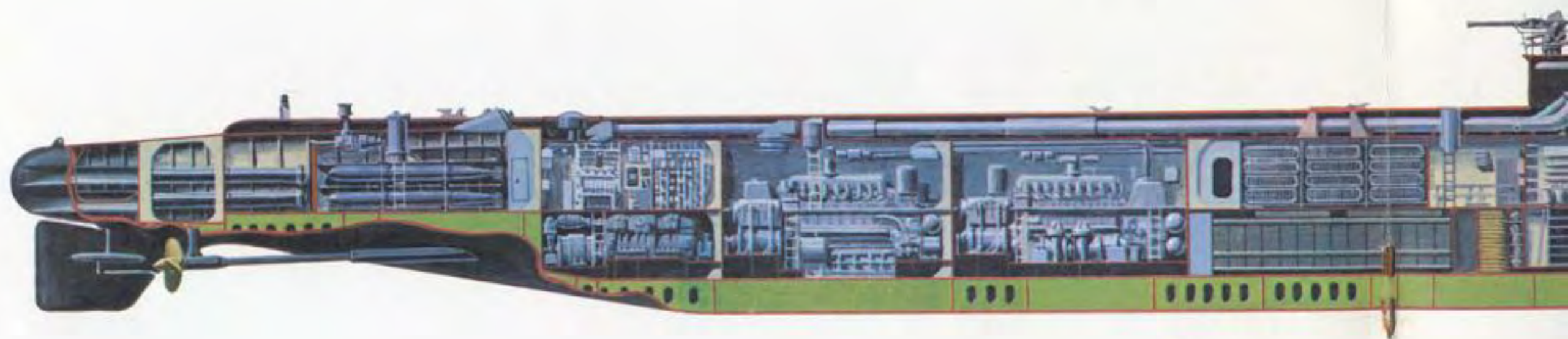
(Left) These photos taken 28 November 1944 at Mare Island show alterations made to *Bowfin* during the overhaul between her 6th and 7th War Patrols.

U.S.S. BOWFIN (SS 287)
as outfitted 1945



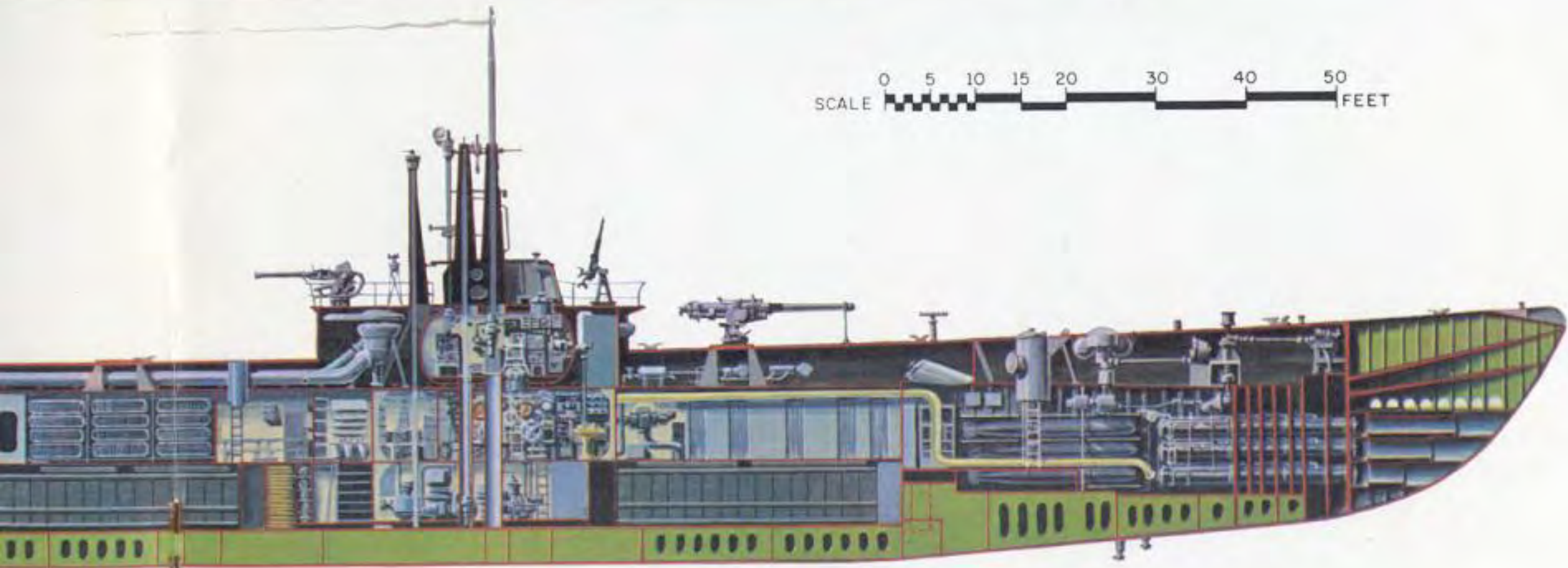
USS BOWFIN (SS287)

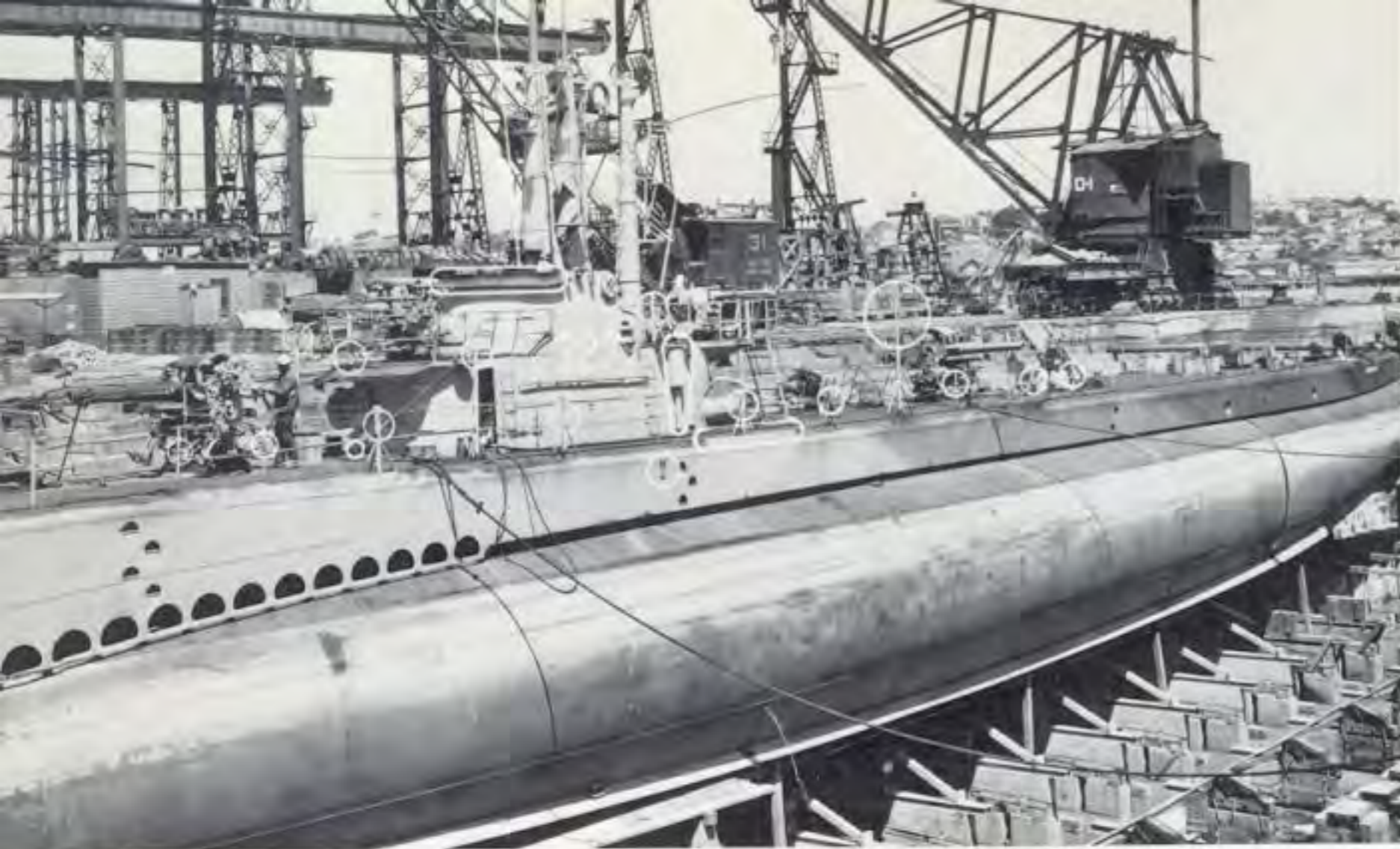
Bowfin as outfitted during her overhaul at the Mare Island Navy Yard, November, 1944.



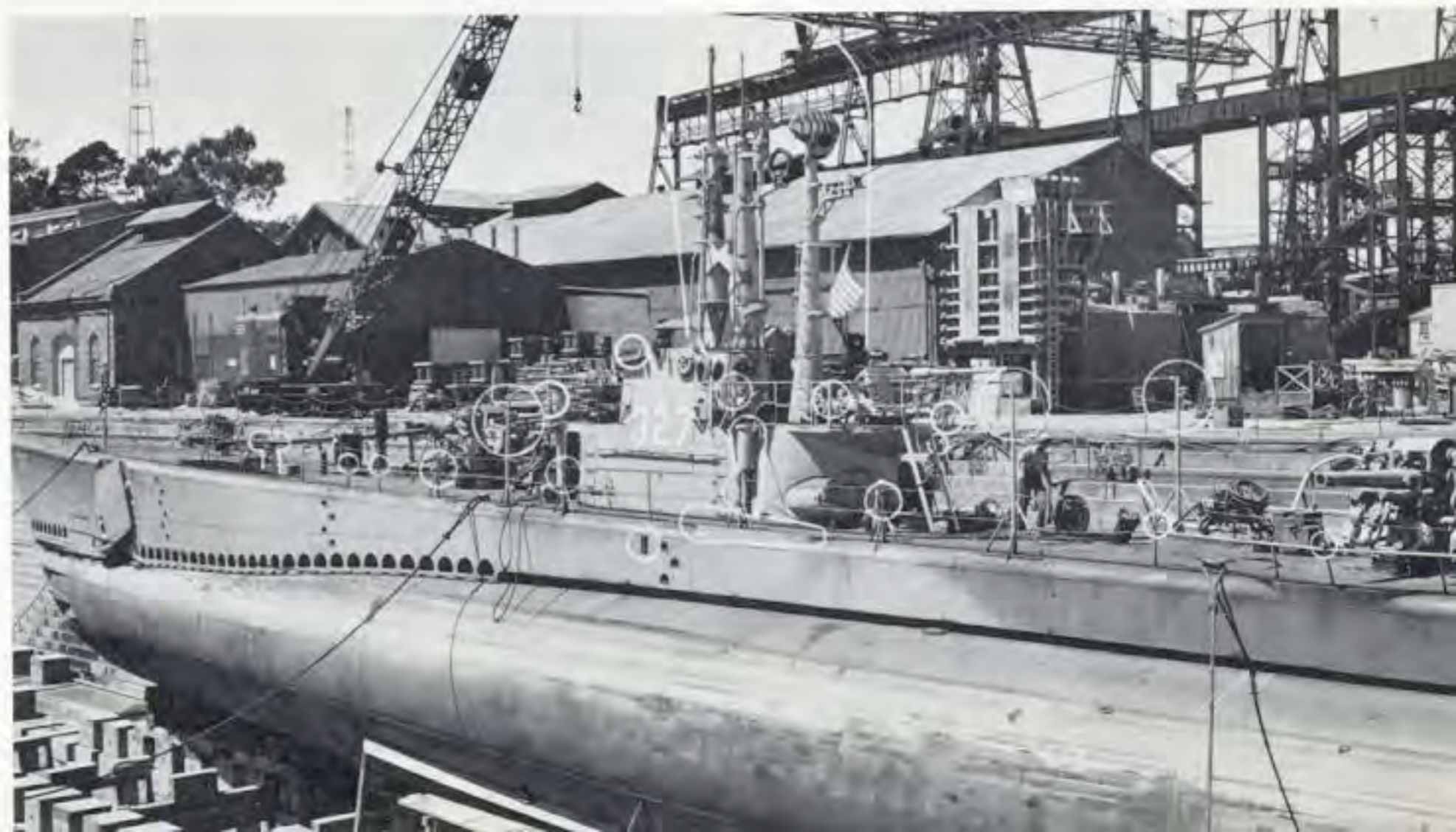


SCALE 0 5 10 15 20 30 40 50 FEET





Built by Electric Boat Co., Boarfish displays the full length of her bilge keel and armament is the heaviest used on fleet type boats. Note the method of free flooding the superstructure and how it differs from the Portsmouth designed boats.



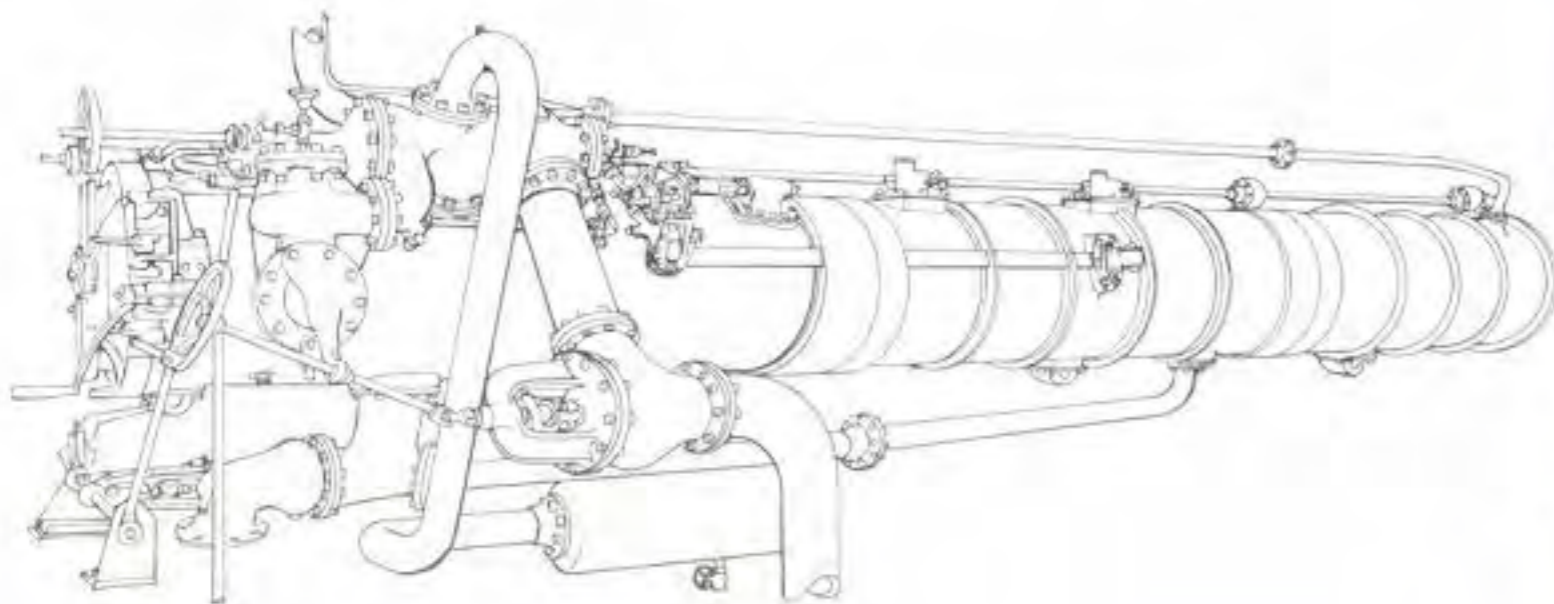
USS Boarfish [SS327] in drydock at Mare Island Naval Shipyard 19 August 1946. External features of the hull show clearly including the shutter doors for the forward torpedo tubes.

Torpedo Tubes

A submarine torpedo tube is essentially a large naval gun consisting of a barrel with breech and muzzle ends. The tube fired a torpedo rather than a shell, using compressed air to expel the torpedo in the same manner that a gun uses an explosive charge.

The firing operation is basically a simple procedure: the torpedo is loaded into the tube and the breech door is closed, the muzzle door is opened to the sea and a shot of compressed air ejects the torpedo from the tube. The muzzle door is then closed and the sea water which entered the tube is drained off. As firing continues the procedure is repeated.

Actually the operation of firing a torpedo is somewhat more complex. An interlock prevents the possibility of the breech and muzzle doors being open at the same time, thus when the breech is open for loading the muzzle doors must resist full sea pressure. After loading the tube the remaining volume of air is displaced with water from the WRT tank and vented into the submarine. Each tube is equipped with an equalizing line, which when vented to the sea, equalizes the pressure inside the tube with that of the sea water outside the boat. Now the muzzle door can be opened and the torpedo fired. The shot of compressed air which expels the torpedo from the tube is not large enough to fill the tube completely and is vented off inside the boat before it has a chance to escape and betray the position of the submarine. As the torpedo leaves the tube, outside sea water floods the cavity and assists in the venting off of the firing air. The muzzle door can now be closed. The water in the tube is drained to the WRT tank with the excess volume overflowing into the trim tank (each WRT tank had enough capacity to flood three tubes after they were loaded, and boats always began patrols with these tanks full). A torpedo had approximately neutral buoyancy, therefore, the weight of the boat before and after the firing of torpedoes remained the same.



(Left) Perspective view of a 21" submerged torpedo tube (MK32-39). (Above) This corrosion-resisting steel torpedo tube was fabricated by the Midvale Steel Co. The massive size of a submarine torpedo tube is evident from the workman standing alongside.



The MK14 Torpedo had four sections; warhead, air flask section, after body and tail. It measured 21" in diameter and 20 feet 6 inches overall length (see BALLISTIC DATA table for statistics).

Torpedoes

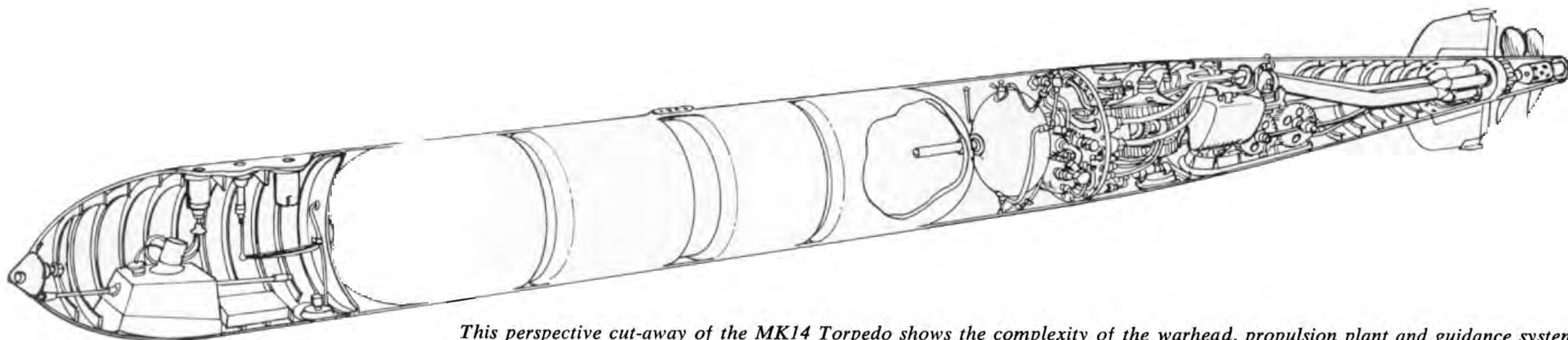
During the first two years of the war, the torpedoes used by U.S. submariners revealed a myriad of problems. To summarize the complaints of the operating forces: "they ran too deep, didn't explode on impact with target, exploded too soon, and didn't pack enough punch when they did explode." The boys were not happy with the "fish" to say the least.

The reasons for inadequate torpedoes were understandable, but hardly acceptable to the men who took the risks of bringing an undersea war to the enemy. The years between the wars were plagued with stringent economy measures, ultimately resulting in a poor scientific approach to torpedo development and an inadequate test program. Early combat operations immediately began to reveal one defect after another. Correction of the defects was energetically undertaken, but progress was slow because of the cunning way in which one defect seemed to conceal another. The situation was further complicated by conflicting reports from the operational forces.

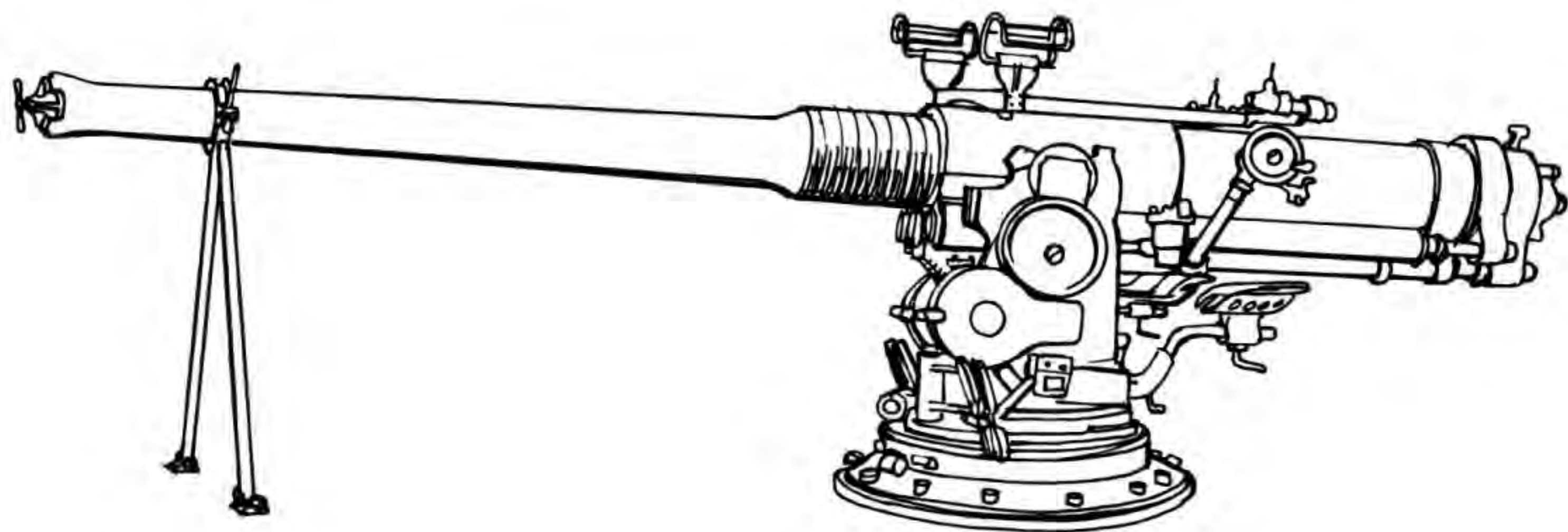
Work continued ceaselessly to correct the various faults encountered which were primarily: deep running, faulty detonators, too great an arming distance, undependable magnetic exploders, weak firing springs, and insufficient explosive charges.

By 1944 reasonably dependable torpedoes were being supplied to the submarine forces. In spite of all of the problems encountered, some five million tons of enemy shipping was destroyed and another two and one half million tons was damaged by the submarine's principal weapon.

Basically, three torpedoes were used by U.S. submarines during World War II—the Mark 10, 14 and 18, of which the Mark 14 was the most widely used. Although some older models were converted early in the war, and a few new models were introduced near the end, none were used sufficiently to make realistic evaluations possible. (See BALLISTIC DATA table for torpedo data).



This perspective cut-away of the MK14 Torpedo shows the complexity of the warhead, propulsion plant and guidance system.



The 4"/50 cal. MK12 deck gun mount (see BALLISTIC DATA table for complete data).

Deck Guns

The first fleet-type submarine *Gato* (SS212) class was designed to carry a 3"/50 gun aft of the fairwater. Although an excellent weapon with a dual-purpose capability, it was a rather light gun against surface targets. Surface operations for submarines were usually confined to night running for recharging batteries and only for emergencies during daylight hours. On occasion they would surface to dispose of a smaller enemy, not considered worth a torpedo, but only if there were no unfriendly aircraft in the area. Such were the operational modes until 1945. Early in 1942 it was recognized that small surface targets must be done away with as quickly as possible for many of them carried small deck guns, depth charges, and communications equipment which could give advanced fleet positions away.

Considering this and other factors, it was decided to equip the fleet boats with the 4"/50 Mark 12 gun. The reasons for this selection are self-evident: it was an excellent weapon (having proven itself on the "four piper" destroyers), it packed a much greater wallop, a wet kit, making the gun suitable for immersion, could be easily and quickly installed, it was abundant in the Navy's arsenal, and operating philosophy dictated that fights with aircraft were to be avoided. The gun was usually mounted forward of the fairwater.

In 1944 a new dimension was added to the mission requirements of the fleet submarines: every attempt had to be made to rescue or recover all downed airmen, regardless of their location. Submarines were the only means available to pick up those who were in areas of enemy surface and air control. (Through the end of the war a total of 504 airmen were rescued by submarines.) At this point attention turned again to a dual-purpose gun and finally the adoption of the 5"/25 Mark 40 gun.

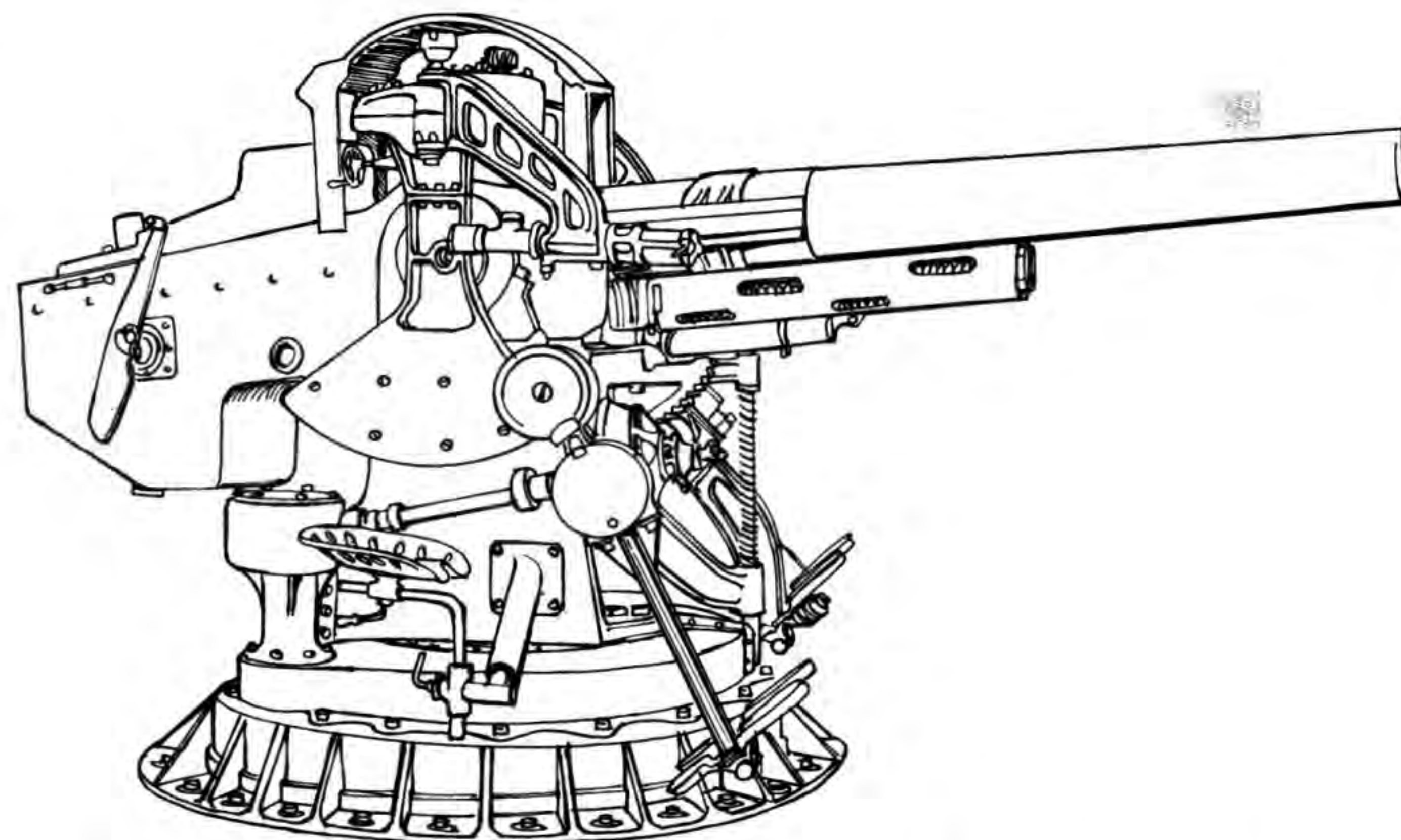
As with the selection of the 4"/50 over the 3"/50, the reasons for moving up to the 5"/25 were all quite sound: it was an excellent weapon (well proven on BBs, CAs and CLs), it was a heavier weapon, a wet kit was no problem, it was in abundant supply, and now, since contact with unfriendly aircraft would have to be accepted, the 5"/25 could fire a shell carrying a VT fuze. In addition to the devastating fragmentation effect on aircraft, the VT fuze enabled the submariners to annihilate gun crews and bridge personnel of the small craft they had to battle on the surface.

Antiaircraft Battery

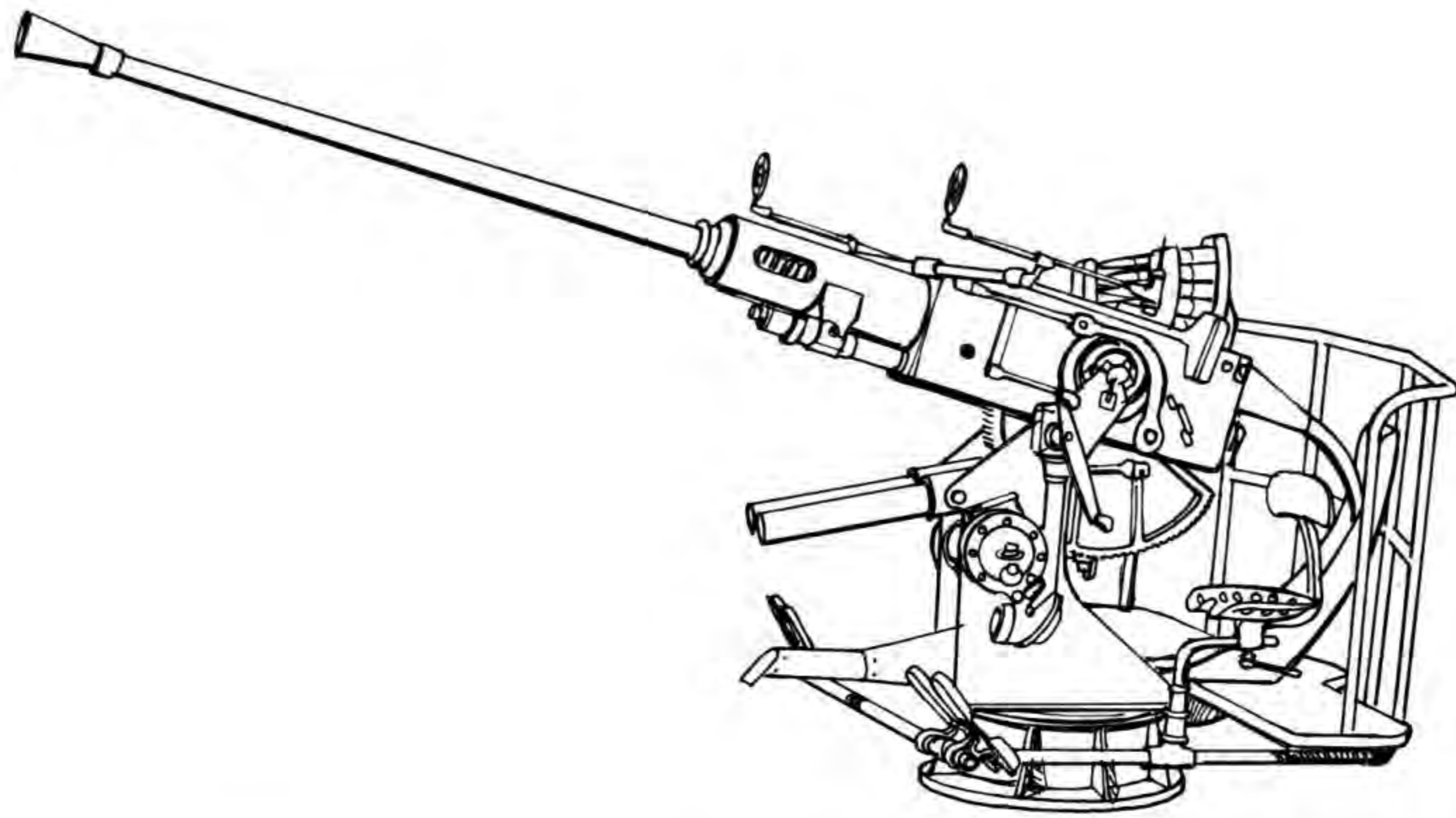
The new fairwater design was created primarily for the purpose of mounting antiaircraft weapons (see *Bridge section*). By the time the first of the *Balao* (SS285) class were outfitting, the 20mm gun was readily available in several different Marks.

Originally developed by the Oerlikon Machine Tool Works of Zurich, Switzerland, this gun was first manufactured in the U.S. for the British under Lend-Lease agreement. It was later adapted for general use by the U.S. Navy.

When first commissioned, *Bowfin* had two single 20mm Mark 5 mounts installed forward and aft on her bridge deck. The Mark 5s had a heavy cast pedestal base and were replaced during the November 1944 refit with a 20mm Mark 10 forward and a 40mm Mark 4 aft. The Mark 10 was an open pedestal tripod design saving over seven hundred pounds which



The 5"/25 cal. MK40 deck gun mount (see BALLISTIC DATA table for complete data).



The 40mm MK3 machine gun mount (see BALLISTIC DATA table for complete data).

partially compensated for the added weight of the newly installed 40mm.

With their high rate of fire, the 20mms provided an excellent close-in defensive capability against aircraft and they could also be used at short range against surface targets.

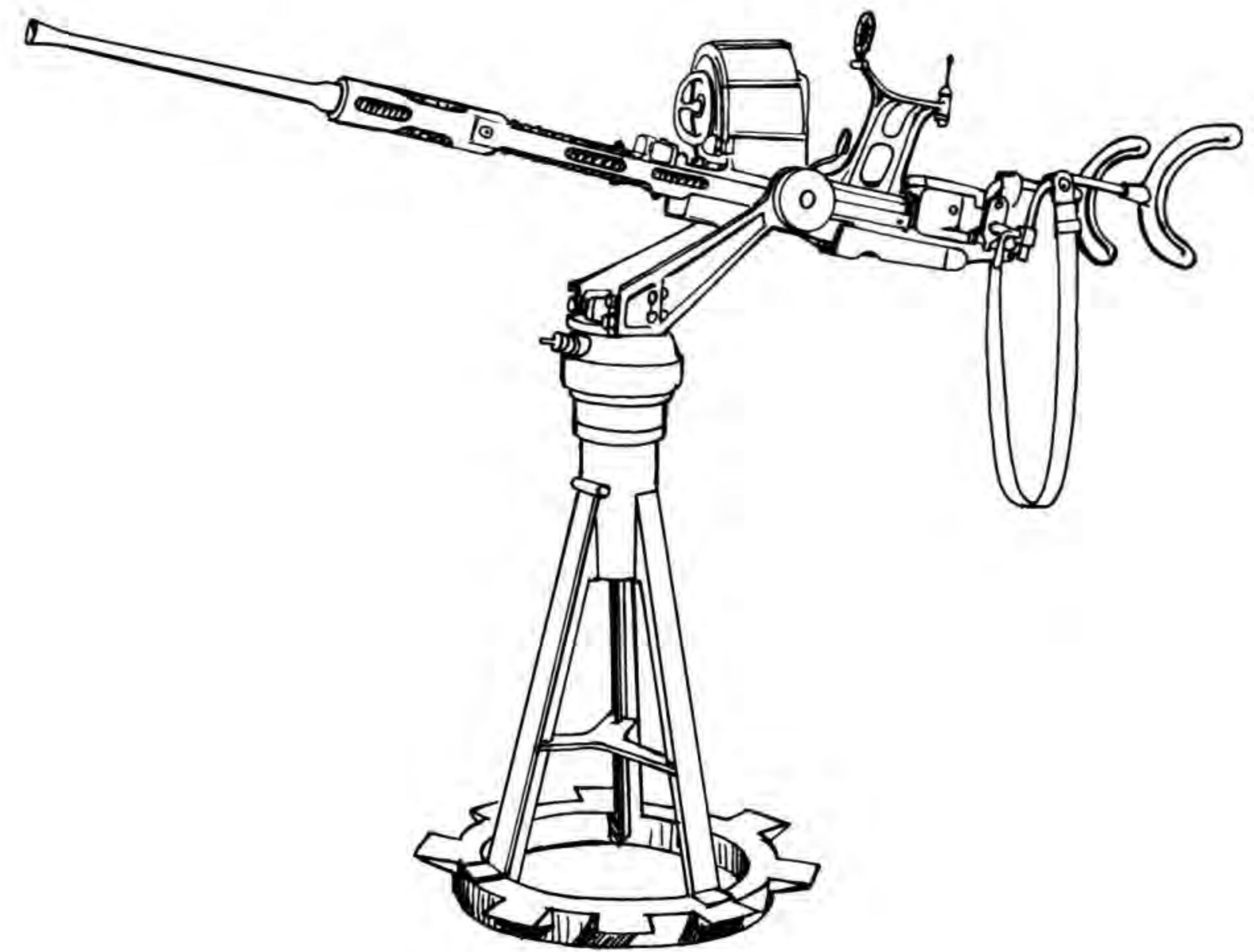
The 40mm was also of foreign design, originating at the Krupp Works in Germany just after World War I. The Versailles Treaty prohibited manufacturing guns in Germany and the works were moved to Stockholm, Sweden after Otto Krupp obtained a sizable portion of the Bofors Co.

Mounted on the aft bridge deck, the single 40mm Mark 3 gave the class a well-rounded defensive capability. It was a medium range weapon which performed well against air and surface targets. Many of the boats late in the war were equipped with the Mark 3 in both the forward and aft position on the bridge deck. (See BALLISTICS DATA table for gun data).

Anti-Fouling Rig

In order to avoid snagging a mine cable and pulling a mine into the submarine, several clearance cables were carried which could be rigged if the boat was to operate in areas that were known to be mined. They were intended to smooth out the reentrant angles of the boats form, especially in the plan view. These gave the mine cable a smooth surface to slide aft on, to prevent fouling external installations.

One cable could be attached to the lower hull on center line under the aft torpedo room and run to the forward lower corner of the rudder. Two other cables could be attached to the sides of the bow buoyancy tank and run to the forward corners of the bow planes. The propeller guards served



The 20mm MK10 machine gun mount (see BALLISTIC DATA table for complete data).

to prevent hang-ups on the propellers and stern planes. The guards were removable, as were the cables, to lessen underwater resistance and noise. Both cables and guards could be easily installed by the base or tender when required for a mission.

Acknowledgments . . .

We would like to thank the Public Affairs Office, 13th Naval District and the Submarine Force Library and Museum, New London, Connecticut for their assistance with photographs; Dr. Allard and Mrs. Lloyd of the Operational Archives Branch, Naval History Division for their research assistance; and especially CDR W. Earle Smith, Jr., USN, Assistant Dean, United States Naval Academy and former commanding officer USS Remora (SS487), for his technical assistance.

WAR PATROL RECORD

No.	Dates and Areas	Miles	Ships Sunk (tons)
1	16 Aug.—10 Oct. 1943 (Brisbane to Darwin to South China Sea, to Fremantle)	14,430	<i>Kirishima Maru</i> (8,120) plus 2 small craft
2	1 Nov.—9 Dec. 1943 (Fremantle to South China Sea to Fremantle)	10,023	<i>Ogurosan Maru</i> (5,069), <i>Tainan Maru</i> (5,407), <i>Van Vollenhoven</i> (691), <i>Sydney Maru</i> (5,425), <i>Tonan Maru</i> (9,866) plus 8 small craft
3	8 Jan.—5 Feb. 1944 (Fremantle to Makassar Strait to Darwin, to Java Sea to Fremantle)	7,949	<i>Shoyu Maru</i> (4,408) plus 4 small craft
4	28 Feb.—1 April 1944 (Fremantle to Celebes Sea to Fremantle)	9,272	<i>Tsukikawa Maru</i> (4,470), <i>Shinkyō Maru</i> (5,139), <i>Bengal Maru</i> (5,399)
5	25 April—21 June 1944 (Fremantle to Palau area to Midway Island to Pearl Harbor)	15,013	1 claimed but not verified.
6	16 July—13 Sept. 1944 (Pearl Harbor to Sansei Shoto area to Midway to Pearl Harbor)	13,437	<i>Tsushima Maru</i> (6,754) plus 7 small craft
7	25 January—25 March 1945 (Pearl Harbor to Saipan to Nanpo Shoto to Guam)	14,325	<i>Frigate No. 56</i> (750) plus 1 small craft
8	23 April—15 May 1945 (Guam to Honshu-Hokkaido area to Guam)	5,649	<i>Chowa Maru</i> (2,719), <i>Daito Maru No. 3</i> (880)
9	29 May—4 July 1945 (Guam to Sea of Japan to Midway to Pearl Harbor)	8,559	<i>Shinyo Maru</i> (1,898), <i>Akiura Maru</i> (887)

TOTAL MILES STEAMED: 98,668

SHIPS SUNK (Verified): 16 (67,882 tons) plus 22 small craft.

COMMANDING OFFICERS

CDR Joseph H. Willingham—1 May 1943—26 October 1943
Navy Cross

LCDR Walter T. Griffith—26 October 1943—15 April 1944
Navy Cross, Gold Star in lieu of 2nd Navy Cross, and Silver Star

CDR John Corbus—15 April 1944—16 December 1944
Navy Cross

CDR Alexander K. Tyree—16 December 1944—12 February 1947
Navy Cross, Gold Star in lieu of 2nd Navy Cross

LCDR Charles C. Wilbur—27 July 1951—October 1953

(Right) Launching of the *USS Bowfin (SS287)* at the Portsmouth Navy Yard, 7 December 1942.



COMMISSIONING CREW, USS *BOWFIN*, 1 MAY 1943

Joseph H. Willingham, Jr., CDR	Thomas W. Kimbrell, TM3c
William C. Thompson, Jr., LT	Eugene A. Knoche, F3c
Richard P. Nicholson, LT	John P. Kulik, TM2c
Davis Cone, LT	Charles Kurzentaites, TM1c
Howard E. Clark, ENS	Joseph N. Lamothe, S2c
Romolo Cousins, ENS	Maurice E. Langfeldt, TM3c
John R. Bertrand, ENS	Vernon E. Lewis, MM1c
Clyde E. Barnhill, CCSTD	Thomas A. Malley, MoMM2c
Robert M. Beal, GM3c	Donald F. Marple, MoMM2c
Thomas W. Belanger, SC3c	Ralph A. Martin, CRM
Blake M. Boynton, S2c	Vincent P. McCaffrey, SC3c
Melvin C. Briggs, S2c	John D. McCarron, F3c
James S. Bruyn, F3c	Jack M. McKenzie, MoMM1c
Osmond L. Carlson, F1c	George J. McKnight, MoMM1c
Arthur L. Carter, FC(M) 3c	Francis L. Miller, S2c
Chester Crawford, BM1c	Wayne I. Mitchell, Y2c
Charles A. Darrah, TM3c	Jack L. Moore, QM2c
Robert E. Dietrich, F1c	Steve E. Mosley, CK3c
Anthony Fantazzo, EM3c	Dale L. Olmsted, PhM1c
George H. Friendlander, F3c	William H. Parker, MM1c
Eugene Gaito, MoMM2c	Jones Patterson, StM2c
Ray H. George, CEM	Robert G. Patterson, EM2c
Norlin S. Hamlin, EM1c	Wayne M. Pierce, EM2c
Lawrence C. Hansen, EM1c	John R. Rancourt, MoMM2c
Allen W. Hess, S2c	Warren L. Ritchie, MoMM1c
Ervin P. Hickman, MM1c	William G. Robinson, GM1c
Robert W. Holmquist, RT2c	Walter J. Schrader, S2c
Clarence P. Hoover, CSM	William E. Short, TM2c
Cleland D. Hudson, RM3c	Adolph Sivik, F2c
Walter Hurst, CTM	Kenneth P. Smith, TM1c
Earl R. Jackson, S2c	Wendell B. Taylor, TM2c
Joseph W. Jones, EM2c	Paul J. Terandy, S2c
Frederick A. Judd, Jr., S2c	Lafayette Vandergriff, Jr., RM2c
Dale L. Kersh, S2c	Kenneth A. Waddell, EM3c
Gerald Kestecher, EM3c	Robert D. Winton, MoMM2c



At the commissioning ceremony on 1 May 1943, Commander Joseph H. Willingham, Jr. reads his orders and sets the first watch.

WORLD WAR II COMBAT OPERATIONS

Less than four months after she was commissioned at Portsmouth, New Hampshire, the *Bowfin* began combat operations halfway around the world in the South China Sea. She sailed from the East Coast early in July, made a brief stop in Panama, and then headed across the Pacific to Brisbane, Australia. In Brisbane she went alongside the submarine tender *Fulton* for post-voyage repairs and fitting out. A couple of days were spent in gunnery training and practice dives, planned to take her to deep submergence fast, a necessary maneuver in avoiding enemy depth charge attack.

On 19 August 1943 the *Bowfin* sailed from Brisbane and headed north, around Australia to Darwin, where she refueled. Darwin was hundreds of miles closer to submarine patrol areas than either Brisbane or Fremantle, on the east and west coasts of Australia, but lacked any facilities needed for base operations. All it was good for was to serve as a handy place to stop in and say "Fill her up." That done, *Bowfin* got underway again on 25 August, for her first patrol.

Bowfin standing out from Brisbane en route to Darwin and the beginning of her first War Patrol. She returned to Fremantle at the end of the patrol which was to be her base of operations for five War Patrols.



War Patrol No. 1

The *Bowfin* left Darwin the morning of 25 August, and on 2 September she entered the Mindanao Sea. For nearly a month the *Bowfin* sighted no major vessels. Fishing boats were seen frequently, and a few aircraft were picked up on radar, but none of them detected the submarine. It was noted that coastal villages on islands they passed were not blacked out, but showed lights at night.

On 24 September the *Bowfin* joined up with the submarine *Billfish*. The next morning a convoy of six ships was sighted and the submarines began tracking it. After about five hours, the *Bowfin* reached a position where she fired four torpedoes at a cargo ship and two more at a transport next astern of her. Through the periscope three torpedoes were seen to hit the first ship and two were seen to hit the second ship. The *Bowfin* then reversed course, so her stern was toward the convoy, and fired four torpedoes from her stern tubes at a third ship, a tanker. The explosions of these torpedoes were heard, but not seen.

As soon as the torpedo explosions were seen by the Japanese ships, they discovered the *Bowfin's* periscope and two of them began firing at it. As the *Bowfin* submerged to avoid gunfire, the cargo ship (identified after the war as the *Kirishima Maru*, 8,120 tons) could be seen settling in the water, the transport was sinking stern first, and the tanker was on fire.

An hour or so later the *Bowfin* came up for periscope observation and saw a tremendous column of smoke which continued for over an hour. About three hours later one of the ships remaining from the convoy again fired on the *Bowfin*, from a distance of about five miles, and she submerged. Later torpedo explosions were heard—evidently the *Billfish* was attacking the convoy.

During the night *Bowfin* tracked the remnants of the convoy until finally the ships were lost at a range of ten miles. The next morning, while making a radar search, an enemy aircraft was detected. The plane was also equipped with radar, as indicated by interference on the *Bowfin's* radar screen, so she submerged for the day.

On 27 September the *Bowfin* picked up a contact which was identified as an inter-island steamer of about 1,500 tons. After chasing the ship for about three hours, the submarine reached a firing position and fired three torpedoes. One torpedo ran for a little over a minute, then its propellers were heard to stop. The others missed the target and were heard to explode when they stopped running and hit the bottom of the shallow sea.

On 30 September the *Bowfin* left the Mindanao area. At dawn that morning, in a driving rain, a small diesel barge was sighted. It had a Japanese flag painted on the bow, and was deck-loaded with about a hundred Japanese soldiers. Such small targets were not worth the cost of a torpedo, so it was customary to sink them with gunfire when possible. The *Bowfin* closed to about two miles, surfaced, and opened fire on the barge with her 4-inch deck gun. When the barge replied with machine gun fire, the *Bowfin* also opened up with her 20mm guns. The twentieth 4-inch shell fired hit the barge which practically disintegrated and sank instantly.

The next contact, made off Balikpapan, in the Makassar Strait, was a small two-masted schooner, sighted the evening of 2 October. Two shots fired across her bow failed to stop her so two more rounds were put into her and she sank.

Two days later *Bowfin* headed south out of the patrol area, en route to Fremantle, West Australia, where she arrived on 10 October. Since leaving Brisbane, she had sailed 14,430 miles in 55 days. She had attacked and damaged at least three large ships and destroyed two small craft.



Bowfin's crew receiving the Presidential Unit Citation from Admiral Christie upon return from the second War Patrol. Bowfin is moored alongside USS Orion (AS18) in Fremantle, Australia.

The Presidential Unit Citation pennant is presented to Bowfin's captain, Commander John Corbus, by Fleet Admiral Chester W. Nimitz in July 1944. Although earned during the second War Patrol, the pennant was not presented to the boat until her return to Pearl Harbor after her fifth War Patrol.



War Patrol No. 2

This patrol was from Fremantle to the South China Sea. A week out, *Bowfin* sighted a group of five small schooners and began tracking them. Japanese aircraft were patrolling in the area and made several attacks on the submarine, but she managed to sink three of the schooners with her 4-inch gun before air attack forced her to submerge long enough for the remaining craft to escape. However, when she surfaced that night, another large schooner was sighted; this one was sent to the bottom with only two 4-inch shots.

Two days later *Bowfin* was off the entrance to Tawi Tawi Bay (the tip of Borneo between the Celebes Sea and Sulu Sea) when two small coastal steamers were sighted heading for the bay. The *Bowfin* ran ahead of them while submerged, then waited for them, surfaced, and set them both afire with gunfire. They were still burning when the *Bowfin* had left the wreckage twenty miles behind.

On the morning of 26 November, while the *Bowfin* was off the coast of Indo-China (now Viet Nam), near Saigon, she was running on the surface in a heavy rainstorm when she suddenly was surrounded by ships—she had sailed into the middle of a convoy and had to back all engines to avoid hitting a tanker. After tracking the convoy for an hour or so, *Bowfin* fired a spread of torpedoes and sank the *Ogurosan Maru*, a 5,069-ton tanker. While that ship was still sinking, the *Bowfin* maneuvered to fire

more torpedoes, and got the *Tainan Maru*, a 5,407-ton cargo ship. She then had to pull out of the immediate area to reload torpedoes. In a couple of hours she was after the convoy again and put four torpedoes into a small French coastal steamer, the 691-ton *Van Vollenhoven*.

The following day the *Bowfin* torpedoed a very small transport-type ship and then joined up with the *Billfish* again. On 28 November the two submarines met a large convoy, and in a short period the *Bowfin* torpedoed the *Sydney Maru*, a 5,425-ton cargo ship, and the *Tonan Maru*, a 9,866-ton tanker. While she was concentrating on the tanker, another ship in the convoy fired on the *Bowfin*, making some hits which resulted in leaks through the starboard main induction line.

At dawn the next morning the submarine surfaced while men worked topside to plug holes—but they still leaked. The patrol was cut short and the submarine headed back to Australia. En route, she sank a small yacht-sized ship on 2 December, again using the deck gun. She arrived in Fremantle on 9 December 1943, having been underway for 39 days and sailing 10,023 miles.

War Patrol No. 3

This patrol took the *Bowfin* into the Netherlands East Indies area. Her first action came on 16 January, in Makassar Strait, when a small schooner

was sighted. As soon as the submarine surfaced, the crew of the schooner jumped overboard. A couple of 4-inch shots sank the craft.

The next morning, in the same area, a freighter and two escort ships appeared. The *Bowfin* should have got all three, but faulty torpedoes ruined the day. First she fired four torpedoes from her bow tubes, at a close range of 1,200 yards. Only one torpedo made a hit. Then she swung around and fired two torpedoes from her stern tubes. Both of them exploded prematurely. With the enemy ship dead in the water, *Bowfin* had to pull out of the area to reload torpedoes. The next morning she returned and found the ship still afloat, with her escorts standing by. This time four good hits finished off the ship, the 4,408-ton *Shoyu Maru*. At least two hits were made on the smaller escort ship.

With her torpedoes expended, the *Bowfin* then returned to Darwin for a reload. She also took on a high-ranking passenger for a submarine, Rear Admiral R. W. Christie, who rode the boat for the rest of the patrol, to observe the performance of torpedoes about which there were many complaints—they ran too deep, exploded prematurely, or didn't explode at all.

The second day out, a small freighter-type ship was sighted, tracked down, and sunk with three torpedoes. On 28 January the *Bowfin* sighted a large tanker early in the morning and spent fourteen hours chasing it in order to get into good firing position. Finally, about eight that night, she surfaced only 300 yards from the tanker and fired all six bow torpedo tubes. But the tanker changed course at that exact moment and all six torpedoes missed. The submarine's crew hurriedly reloaded, and six more torpedoes were fired. This time two hits sent columns of fire and smoke up out of the ship, but she refused to sink. As *Bowfin* moved in for another attack, the tanker opened up on her with machine guns and deck guns.

After twenty minutes of dodging gunfire, *Bowfin* fired two more torpedoes. Both missed. Then she fired two more. Both hit. The tanker still refused to sink. *Bowfin* fired another torpedo. That one missed. Then she fired one more, for a hit. The tanker in turn opened up again with all her guns, so the *Bowfin* submerged. Then she heard a tremendous explosion, but when she surfaced to see what had happened the tanker still had not sunk. In fact, she was underway again. When daylight came, the *Bowfin* searched for the ship but could not find it. However, she could not claim the ship as sunk, as no one had seen the ship sink and she had not found any debris or survivors to show that the ship actually did sink.

Next, on 29 January, the *Bowfin* laid a string of mines in Makassar Strait the only time during the war she did so, and then headed back for Fremantle. The next day she sank two small schooners with her deck gun. She reached Fremantle on 5 February, completing a 28 day patrol in which she sailed 7,949 miles.



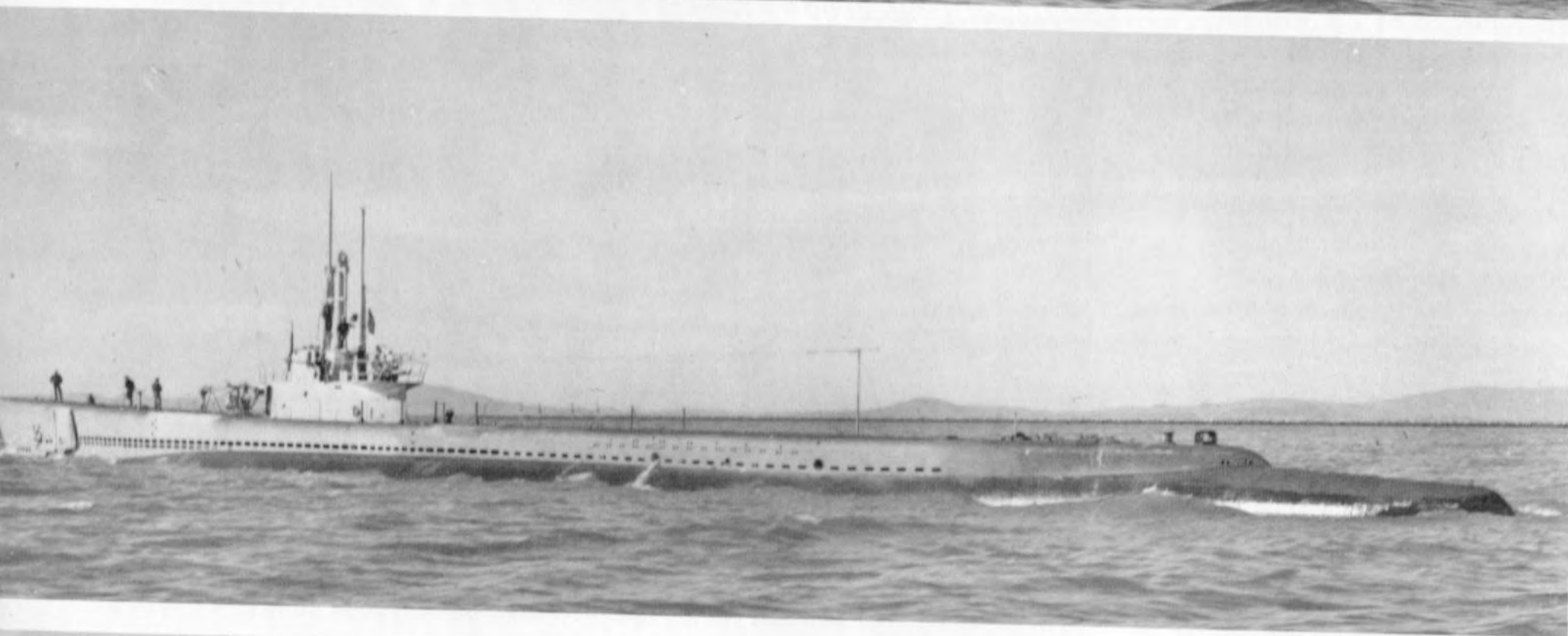
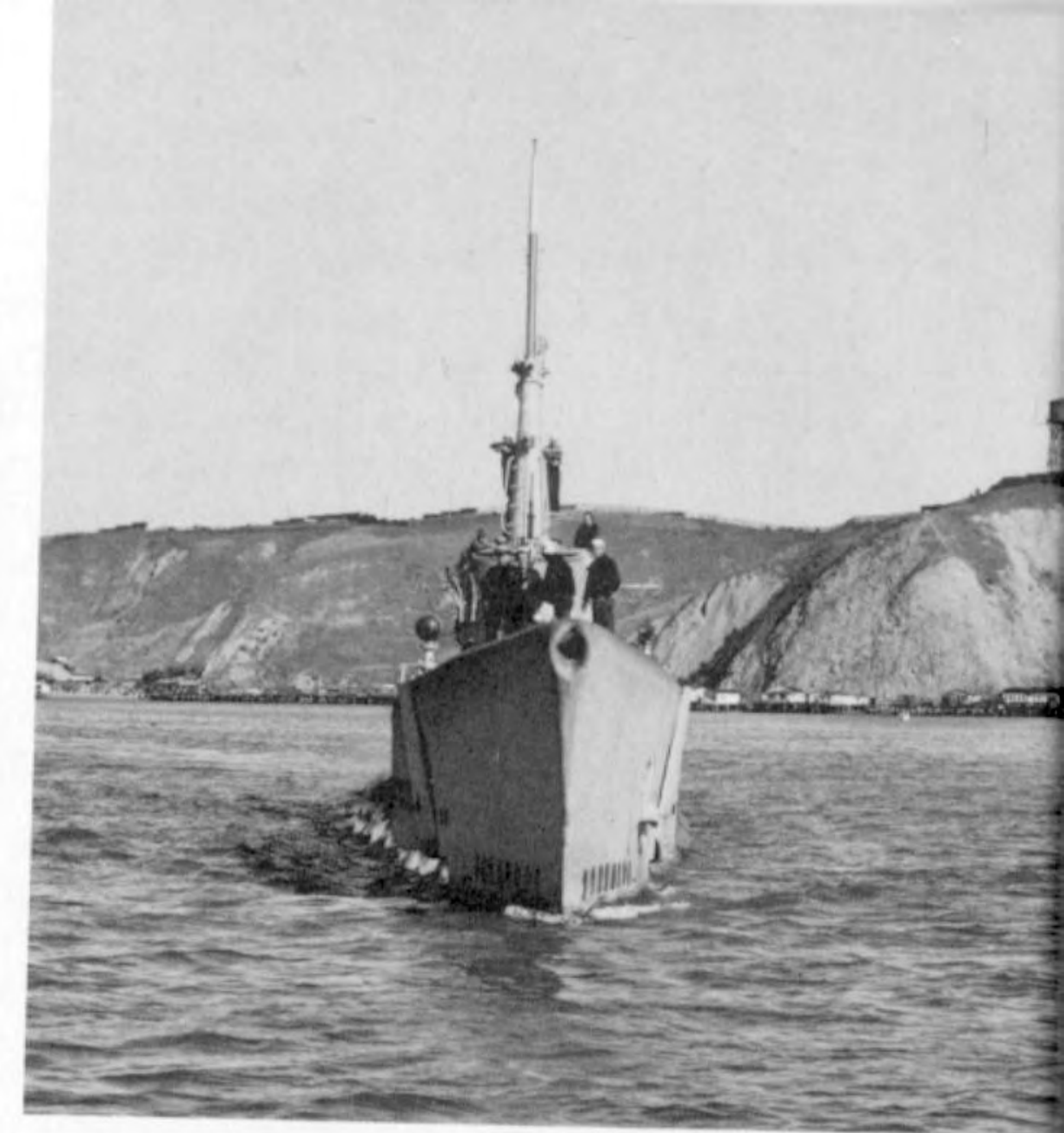
(Above) *The Tsukikawa Maru was the first victim of Bowfin's fourth War Patrol. This periscope photograph shows her settling after being torpedoed on 11 March 1944, position Lat. 01°30'N., Long. 128°17'E.*



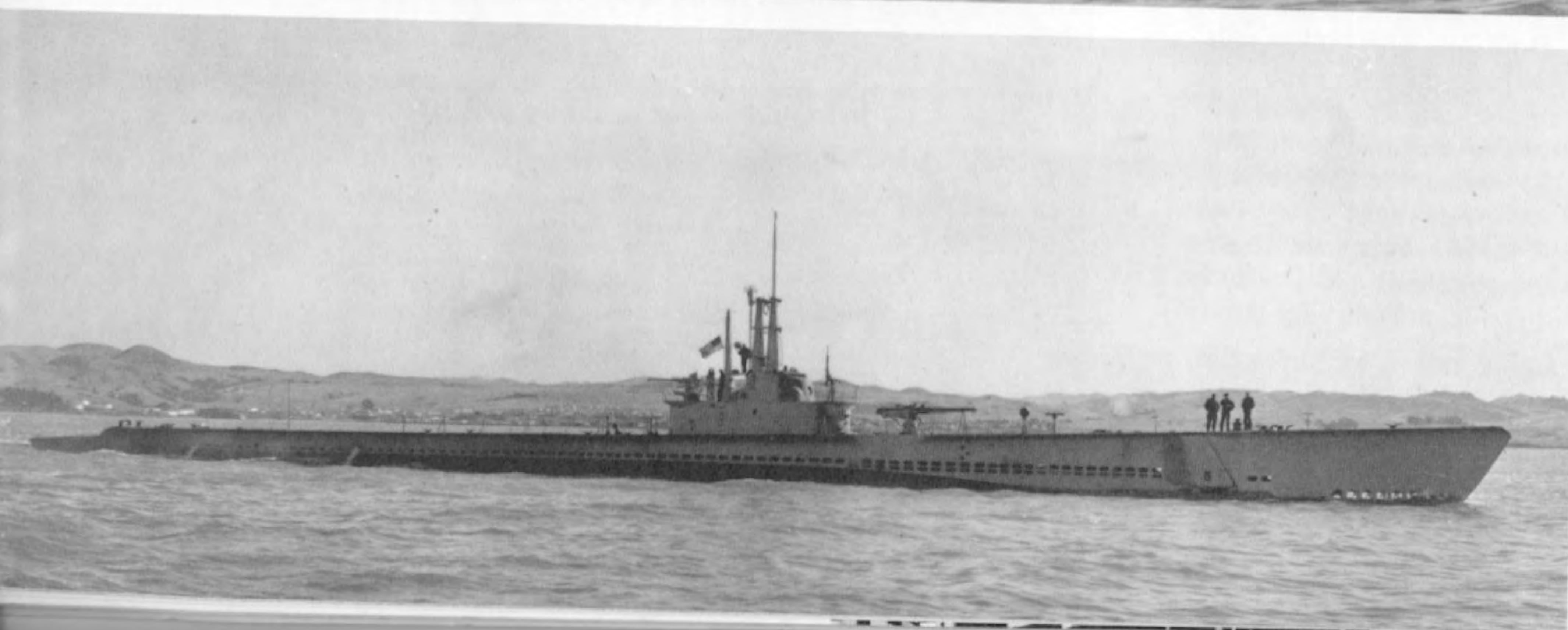
(Above) *Hunting on Bowfin's fifth War Patrol was poor with no known sinkings. An unidentified hospital ship was photographed through the periscope on her way back to Japan.*

(Below) *A sixth War Patrol kill, the Tsushima Maru, was photographed through Bowfin's periscope just before sinking at Lat. 26°08'N., Long. 128°54'E.*





On 24 November 1944, Bowfin was photographed off Mare Island in this 'round the ship sequence: port bow, port quarter, starboard bow, dead ahead and dead astern. She had just completed her first major overhaul after six War Patrols.



War Patrol No. 4

This patrol was in the Celebes Sea, and again the *Bowfin* ran out of torpedoes and had to return to Darwin for a reload. Her first contact was made on 10 March, when a convoy of four ships and two escorts was sighted. *Bowfin* fired six torpedoes, but four of them exploded prematurely. Enemy aircraft drove the submarine down and she was unable to observe whether the other two torpedoes exploded or not. The escorting ships took turns dropping depth charges. The *Bowfin* submerged to 350 feet to avoid the attack. Once a chain could be heard dragging across the hull of the submarine as the escorts searched for her. In all, they dropped twenty-four depth charges; the submarine was shaken up, but undamaged.

When *Bowfin* was able to surface again, one of the cargo ships could be seen down by the stern while other ships were trying to take her in tow. Five aircraft were patrolling around the convoy, as the group of ships got underway. *Bowfin* fired torpedoes at one of the escorts, and at the ship towing the damaged freighter, but was unable to observe results as one of her own torpedoes turned back toward her and she went deep to avoid it. The next morning she found the damaged ship again, fired more torpedoes at it, but was forced down by attacking escorts. When the submarine came up for periscope observation again, the freighter was unprotected. This time *Bowfin* got off four torpedoes before she had to dive to avoid another air attack. When she came up again for a look, the 4,470-ton *Tsukikawa Maru* had gone down, leaving the sea littered with lifeboats and floating debris.

Late that night *Bowfin* caught up with the rest of the convoy and fired her last four torpedoes. One was a miss, the others exploded prematurely. She then had to return to Darwin to reload, which was done on 14 March. She was underway again the next day, and on 18 March attacked a small convoy. Again the torpedoes were troublesome. Four of them fired at the short range of 900 yards all ran under the target, the next two missed. The escorts dropped sixteen depth charges but they also missed. That afternoon *Bowfin* again fired four torpedoes at the ship she'd missed that morning. All four missed.

On 24 March, in the Celebes Sea, the *Bowfin* sighted a convoy of five ships and trailed them for several hours. Then in a night surface attack, she fired at three ships and made hits on all of them. The *Shinkyō Maru* (5,139 tons) and *Bengal Maru* (5,399 tons), were sunk. The third ship was set on fire but refused to sink, and *Bowfin* was out of torpedoes again, so she returned to Fremantle. During her 36 day patrol she had steamed 9,272 miles.

War Patrol No. 5

This was next to the longest war patrol any boat made, in length of time, and the longest in miles steamed. She sailed to the Palau area, where targets were scarce; the sub was on patrol for a month before an enemy convoy was sighted. On 14 May she got two hits on a freighter, but

although it appeared to be damaged, it was not seen to sink. As she continued to trail other ships in the convoy, and prepared to make an attack on one, it blew up—another U.S. submarine had beat her to the punch. The rest of the patrol was uneventful. *Bowfin* left the patrol area for a brief stop at Midway and then went to Pearl Harbor for post-voyage repairs. She had steamed 15,013 miles in 58 days, and was not credited with a single ship.

War Patrol No. 6

On this patrol *Bowfin* hunted in "Empire" waters, off the southern islands of Japan proper. Her first action came on 10 August when she spotted three small ships entering a harbor at Minami Daito. She followed them into the harbor, waited until they had moored, then torpedoed all three. One was damaged and two blew up. A torpedo that missed the ships blew up a dock and a bus standing on it.

On 22 August, off the Tokara Islands, she followed and attacked a convoy and made hits on several ships, although only one, the 6,754-ton *Tsushima Maru*, was definitely sunk. About a week later, after wasting four torpedoes on a small trawler—all were misses—the *Bowfin* surfaced and set the craft afire with her deck gun.

By that time her torpedoes had all been fired, so she headed back to Midway. When a floating mine was spotted, the submarine blew it up with 20mm fire. Sailors were amazed when the mine exploded—pieces of it spread out in a circle six hundred yards across. Despite having no torpedoes, the *Bowfin* still managed to sink one more small ship by using her guns. This time she picked up two survivors for questioning; the Japanese were unloaded in Midway before the boat went on to Pearl Harbor, where she arrived on 13 September.

From Pearl Harbor the *Bowfin* sailed to the Mare Island Navy Yard for overhaul, which lasted from 21 September to 16 December 1944. She was back in Hawaii early in 1945, and soon ready for her next patrol.

War Patrol No. 7

The entire patrol was spent in waters off Japan, where the *Bowfin* was assigned lifeguard duty for carrier raids and B-29 strikes on the Japanese Islands. On earlier patrols enemy aircraft had frequently been seen, but on this patrol the *Bowfin* saw only American planes—hundreds of them. At times she worked with air cover supplied by U.S. carrier fighters. Her only real surface action came on 17 February when she contacted two Japanese destroyers. Two torpedo hits were made on one, later determined to be a 750-ton frigate, which sank. The other ship then attacked the *Bowfin* and dropped twenty-six depth charges, none of which did any damage.

Three small craft were sunk, one by torpedo and two by gunfire, while on lifeguard station. On 19 March the *Bowfin* rescued the crew of a torpedo bomber that went down about five miles away. The pilot, Lieuten-



Commander Alexander K. Tyree, Bowfin's skipper, is congratulated by Admiral Lockwood after returning from her ninth and final War Patrol of World War II.

ant R. U. Platt, and gunner, AMM3c Pazoglavis, were uninjured in the crash. On that patrol the *Bowfin* had the first combat injury to a member of the crew when she attacked two small Japanese craft with machine guns; they put up a fierce fight and R. E. Lee, torpedoman second class, was hit in both legs. He was transferred the next day to the submarine *Sennett* for return to a base hospital. The boat went to Guam on completing her patrol, which had lasted for 60 days during which she sailed 14,325 miles.

War Patrol No. 8

This entire patrol was conducted in the area off northern Honshu and Hokkaido. The air war against Japan was heavy then, and the *Bowfin* sighted literally hundreds of U.S. aircraft while she was on station. There were few ship contacts because by that time the Japanese merchant marine and navy had been nearly wiped out. On 1 May the *Bowfin* sighted and attacked a small freighter, the 2,719-ton *Chowa Maru*, and sank her with two hits. That called for a small celebration, as it was the submarine's second birthday. Exactly one week later, after having chased her for several hours, the *Bowfin* torpedoed and sank the 880-ton cargo ship

Daito Maru No. 3. The *Bowfin* returned to Guam on 15 May, having completed the shortest patrol—23 days and only 5,649 miles—of her combat career.

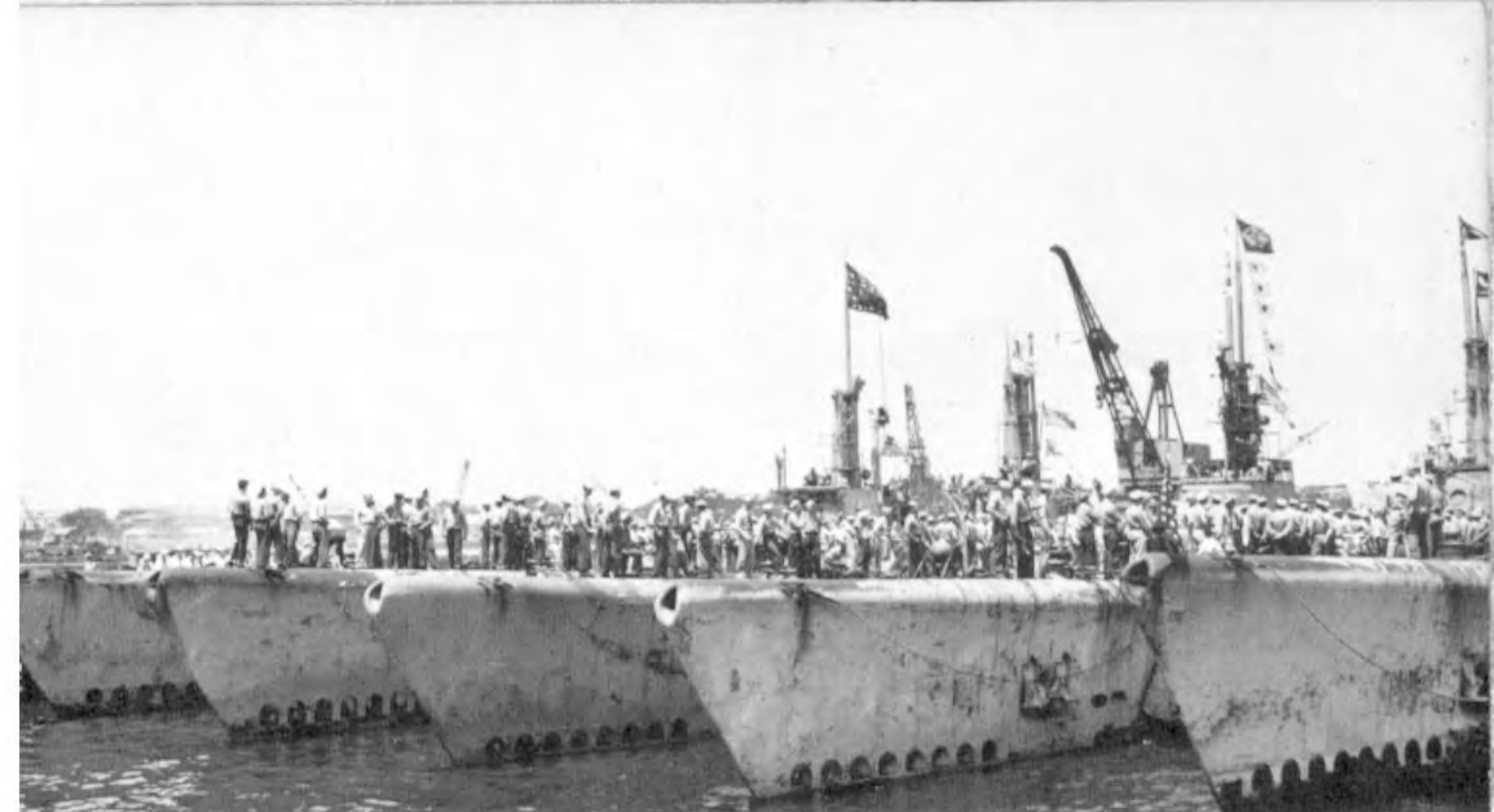
War Patrol No. 9

This patrol began in Guam and took the sub to the Sea of Japan. Shipping was scarce; the *Bowfin* entered several harbors and found them empty of targets. Only two ship contacts were made, and both times *Bowfin* scored a kill. On 11 June she found a cargo ship, sailing unescorted, and hit her with four torpedoes. The ship was the 1,898-ton *Shinyo Maru* which sank in three minutes. Four days later the *Bowfin* torpedoed and sank the *Akiura Maru*, a small, 887-ton freighter. The submarine returned to Pearl Harbor on 4 July for post-voyage repairs.

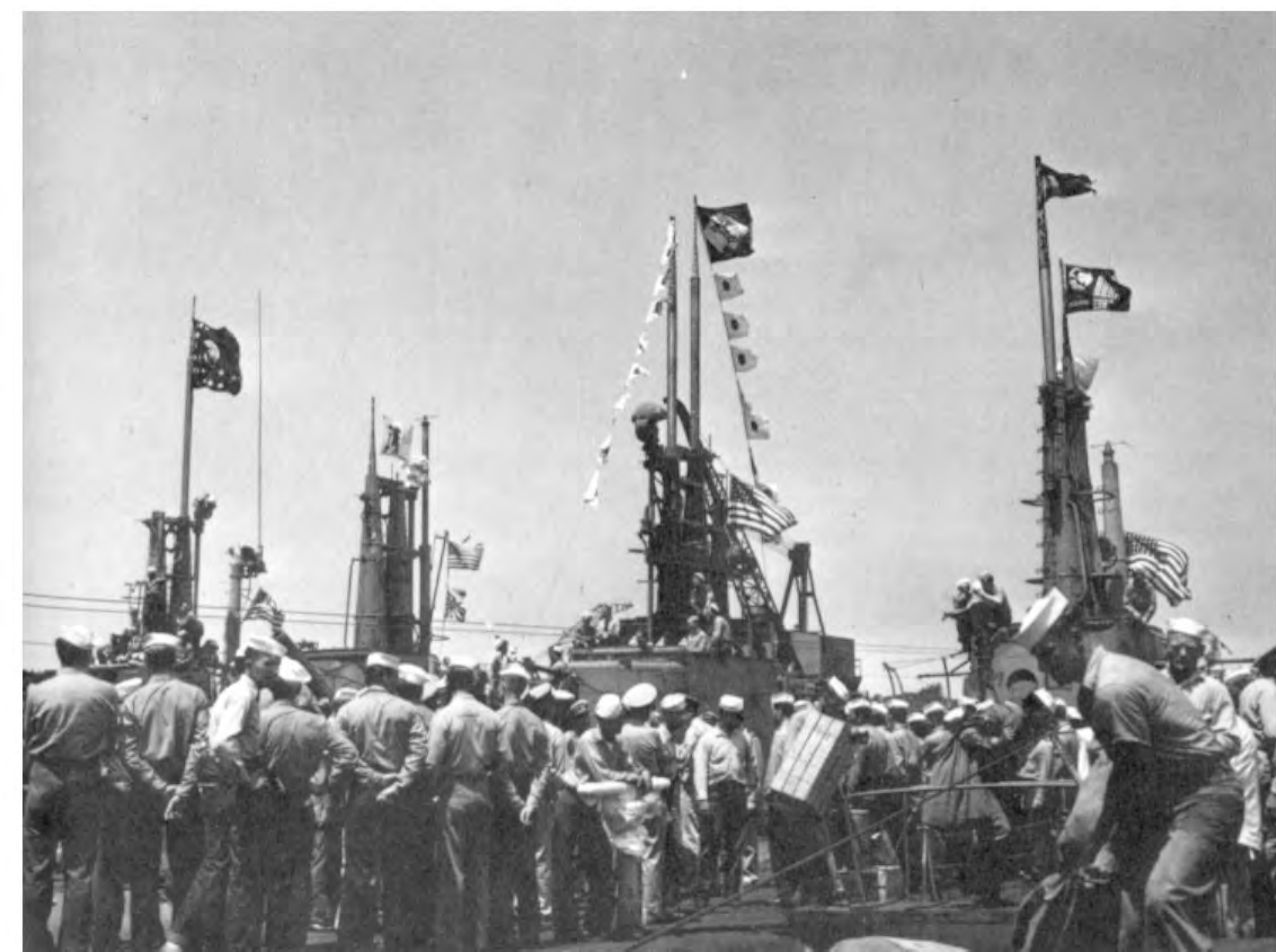
In August the *Bowfin* was headed for Guam to train for her tenth patrol when the Japanese agreed to surrender. She turned around and returned to Pearl Harbor. On 29 August she left Hawaii and headed for Panama and the east coast of the United States. She served with the Atlantic Fleet until January 1947, when she was placed in reserve. She was recommissioned in 1951.

Congratulations, medals, awards and critiques are of little interest to the bluejacket after a long patrol. "Mail Call" and news from home keep the crew going—here Bowfin's sailors devour the contents of a mail bag.





Bowfin returned from her ninth War Patrol in company with four other boats. (Above, left) Moored at the Submarine Base, Pearl Harbor, from inboard: Flying Fish (SS229), Spadefish (SS411), Tinosa (SS283), Bowfin (SS287) and Skate (SS305). (Above, right) Another view of the nest. (Below, left) Action on Bowfin's deck, note Battle Flag and Presidential Unit Citation Pennant. (Below, right) Japanese prisoners which were picked up are taken ashore by a Marine guard.





Shown after her reactivation in late 1951, Bowfin was assigned to SUBRON 3 and SUBRON 5 during the Korean conflict.

Post-WWII Service

The *Bowfin* was a member of the mothball fleet at New London for over four years after she was decommissioned. But as the Navy began to build up strength again after the Korean conflict erupted in 1950, she was again fitted out for sea. The ship was put in commission a second time on 27 July 1951, and spent the next couple of years on training duty in the Pacific.

She operated out of San Diego, as a unit of Submarine Squadron 3 and later Submarine Squadron 5. In 1952 the Mare Island Navy Yard at Vallejo put the boat through a thorough overhaul. In 1953 she sailed as part of a Task Group on a training cruise to Seattle, Washington. In October of that year she sailed for San Francisco, where she was inactivated. The following year she went into the reserve fleet at Mare Island.

The *Bowfin* returned to Seattle in May, 1960, to replace the submarine *Puffer* as a Naval Reserve training vessel. She spent the next ten years on that duty, going nowhere but making lots of friends among naval reserve crews and visitors. Finally, in December of 1971 the ship was stricken from the Navy list. In naval language, that means a ship is too old for any useful purpose, and the next step is usually being sold for scrap and sent off to a razor blade factory.

But the *Bowfin* was lucky. She was old enough to retire, and the Navy sent her back to Hawaii, where one can retire in comfort. Fresh paint now and then helps hide her age, but she is actually the oldest ship in Pearl Harbor, and enjoys having visitors. Welcome aboard!



Bowfin served as a Naval Reserve Training Ship at Seattle, Washington for ten years. Moored to the training center pier, her tubes and vents sealed, *Bowfin* finished her Navy career.

Ship Sinkings

The official list of Japanese naval and merchant vessels sunk during World War II was compiled after the war ended, by the Joint Army-Navy Assessment Committee, based on both American and Japanese records. There were considerable discrepancies between claims of vessels sunk and damaged, and the official compilation. Further, the JANAC list included only ships of 500 tons and over; many ships claimed sunk by submarines were smaller than estimated, and did not make the list. In many cases, a ship torpedoed and seen to be on fire was not heavily damaged, and managed to limp into port. Sometimes explosions would be witnessed by submariners, but if the damaged ship was not actually seen to sink, or if wreckage from it was not later picked up, the sinking could not be claimed.

The war patrol reports of the *Bowfin* listed a total of 38 ships, amounting to 109,230 tons, as being sunk. These claims were approved by higher authority in each case. Yet, the official report compiled by JANAC reduced the score to 16 ships for a total of 67,882 tons. Some of the discrepancy was undoubtedly due to errors in estimating sizes of ships; the 16 large ships officially credited to *Bowfin*, plus the 22 smaller craft sunk, brings her total to 38, no matter what the final tonnage was.

GENERAL DATA

<i>Name</i>	BOWFIN	<i>Displacement:</i>	1,525 tons (designed)
<i>Hull Number</i>	SS-287		1,810 tons (diving trim)
<i>Builder</i>	Portsmouth Navy Yard, Portsmouth, N.H.		2,415 tons (submerged)
<i>Laid Down</i>	23 July 1942	<i>Dimensions:</i>	311' 8" Length Overall
<i>Launched</i>	7 December 1942		27' 3" Maximum Beam
<i>Commissioned</i>	1 May 1943		15' 3" Mean Draft (diving trim)
<i>Disposition</i>	Arrived in Pearl Harbor for use as a War Memorial 1974.		12' 5" Freeboard @ bow (diving trim)
			3' 11" Freeboard @ Stern (diving trim)
			16' 0 ³ / ₈ " Dia. Pressure Hull (max.)
			12' 0" From Keel to C of Hull

ARMAMENT

Torpedo Tubes—Ten 21", six bow and four stern (MK39) 24 torpedoes carried

Guns:

(May 1943)	1—4"/50 (MK12), 2—20mm (MK5)
(Nov. 1944)	1—4"/50 (MK12), 2—20mm (MK10)
(Nov. 1944)	1—4"/50 (MK12), 1—40mm (MK3), 1—20mm (MK10)
(May 1945)	1—5"/25 (MK40), 1—40mm (MK3), 1—20mm (MK10)
(Postwar)	1—5"/25 (MK40), 1—20mm (MK10)
(Postwar)	1—5"/25 (MK40), 1—20mm (MK10)
(NRT)	None

MACHINERY

Main Engines: FOUR General Motors Model 16-278A diesel engines. 16-cylinder V-type, 2-cycle, 8³/₄ bore x 10¹/₂ stroke. 1,600 BHP developed @ 750 RPM (stbd. RH rot., Port LH rot.)

Main Generators: FOUR General Electric 1,100 kw machines
2,650 amps/415 volts (propulsion rating)
3,600 amps/296 volts (battery charging rating)

Main Motors: FOUR General Electric 1,375 HP machines.

Two-wire, direct-current, compensated compound/shunt, series and commutating field windings.

Gears: Combining and reduction type/ reverse by reversing input.

2—1,375 HP @ 1,300 RPM inputs
1—2,740 HP @ 280 RPM output

Batteries: TWO—Exide 126-cell type.

Shaft Horsepower: 5,480

Max. Speed: 20.25 knots (surface)
8.75 knots (submerged)

Auxiliary Generator: ONE—300 kw General Electric by ONE General Motors Model 8-268A diesel engine.

Propellers: TWO—Four-bladed 8' dia.

Rudder: ONE—balanced streamlined type. Train limits 38° to port and starboard.

Fuel Oil: 54,000 gals. (normal)
116,000 gals. (emergency)

COMPLEMENT: 80 (10 officers/70 enlisted)



BALLISTIC DATA

Gun Open Pedestal, Single Wet Mounts Installation on SS	Projectile			Explosive Charge		Muzzle Velocity		Gun Mount Elev. and Range			
	Type	Mk.	Wt. lb.	lb.	%	Firing chg.	fps	Surface El.	Yds.	AA El.	Range Alt.(ft.)
3"/50 MK 21 DP Mod 1 Elevation Limits: Minus 10° to Plus 85° RPM: 12.0	AP-T	29	13.47	0.14	1.03	Nominal weight 4 lb.	2650 2700 2700	45°	14,600	85°	29,800
	HC	27	12.95	0.74	5.7						
	AA	27	13.01	0.74	5.7						
(Complete fixed round weight—approx. 25 lbs./Manual operations)											

Armor penetration of AP projectile at 0 degree obliquity of face-hardened plate approximately 4.5" at 1000 yds. and 2.0" at 3000 yds.

4"/50 MK 9 SP Mods. 15, 16, 20 to 24 Elevation Limits: Minus 15° to Plus 20° RPM: 10.0	Com.	6, 10, 16	33.0	3.5	10.6	Nominal weight 14.5 lb.	2900	20°	16,200		
	HC	15	33.0	3.6	10.9						
(Complete fixed round weight—approx. 65 lbs./Manual operations)											

Note: No Armor Piercing Projectile

5"/25 MK 17 SP Mods 0, 1 Elevation Limits: Minus 10° to Plus 40° RPM: 10.0	HC	36	25.3	7.7	14.6	Nominal weight 9.6 lb.	2110	40°	14,500	40°	12,000
	AAC	36	53.7	7.7	14.3						
(Complete fixed round weight—approx. 75 lbs./Manual operations)											

40 mm (1.57"/60) MK 3 40 mm RPM: 160	AP	81	2.0			315 gr.	2890 2890	42°	11,000		22,800
	AAC	1-2	2.0								

Note: AP penetrates 1.7" at 1,000 yds. Ranges are absolute max. Tracer burns out at 5,000 yds. hor., 15,000 ft. vert.

20 mm (0.8"/70) MK 5 & 10 20 mm. RPM: 450	APT	9	0.269	—	—	27.7	2740	35°	4800	90°	10,000
	HE	3	0.271	0.024	0.9						
	HET	7	0.271	0.001							

Note: Tracer burns out at 3,000 yds.

HULL NUMBER INDEX

Balao SS285
Billfish SS286
Dolphin SS169
Fulton AS11
Gato SS212
Hardhead SS365

Mingo SS261
Orion AS18
Puffer SS268
Remora SS487
Sargo SS188
Sennett SS408

Shark SS174
Tambor SS198
Tench SS417
Trigger SS237
Volador SS490
Wahoo SS238
U-111 German Sub. (WW I)

LIST OF ABBREVIATIONS

AA—ANTIAIRCRAFT
AAC—ANTIAIRCRAFT COMMON
alt.—ALTITUDE
AP-T—ARMOR PIERCING TRACER
BB—BATTLESHIP
BHP—BRAKE HORSEPOWER
CA—CRUISER, HEAVY
cfm—CUBIC FEET/MINUTE
CFOT—CLEAN FUEL OIL TANK
Chg.—CHARGE
CL—CRUISER, LIGHT
☉ —CENTER LINE
CPO—CHIEF PETTY OFFICER
Com.—COMMON
DC—DIRECT CURRENT
DP—DUAL PURPOSE
El.—ELEVATION
FBT—FUEL BALLAST TANK
fps—FEET/SECOND
HC—HIGH CAPACITY
HE—HIGH EXPLOSIVE
HET—HIGH EXPLOSIVE TRACER
HP—HORSEPOWER

H.P.—HIGH PRESSURE
HTS—HIGH TENSILE STEEL
I-boat—JAPANESE SUB CLASS
JANAC—JOINT ARMY-NAVY
ASSESSMENT COMMITTEE
Kw—KILOWATT
lb.—POUND
LP—LOW PRESSURE
LH—LEFT-HAND
MBT—MAIN BALLAST TANK
MK—MODEL DESIGNATION/NUMBER
(also: Mk., Mark)
mm—MILLIMETER
NFOT—NORMAL FUEL OIL TANK
NRT—NAVAL RESERVE TRAINING
RH—RIGHT-HAND
RPM—ROUNDS/MIN. (ballistic)
RPM—REVOLUTIONS/MIN. (machines)
(machinery)
SS—SUBMARINE
SP—SINGLE PURPOSE
SUBRON—SUBMARINE SQUADRON
VT—VARIABLE TIME FUZE

CHARACTERISTICS OF MK 14 AND 23 TORPEDOES

Dimensions:

Diameter—21"
Length Overall—246"
Length of Warhead—47.28"
Length of Air Flask—116.16"
Length of Afterbody—63.38"
Length of Tail—19.19"

Propulsion:

Steam Turbine Type
Turbine Speed: L.P. 8,531 RPM
H.P. 12,123 RPM
Shaft H.P.: L.P. 102-105
H.P. 325-340
Reduction Ratio: 8.98:1
Propeller RPM: L.P. 950±20
H.P. 1,350±20

Weights:

Complete—3,073 lbs. (ready for war shot)
MK 16-1 War Head—666 lbs. TPX*
MK 16-4 War Head—600 lbs. TPX
Fuel—28.5 lbs.
Water—83 lbs.
Oil—24.4 lbs.

Performance:

Speed: L.P. 31.5 knots
H.P. 46 knots
Range (service): L.P. 9,000 yds.
H.P. 4,500 yds.
Total run: L.P. 10,200 yds.
H.P. 5,800 yds.

*TPX = Torpex (poured into shell in molten state).

Back Cover —

Bowfin's Battle Flag graphically depicts the successes of nine War Patrols. *Bowfin* sank forty merchant ships and six men-of-war. The "Free French" flag at top left of merchantmen flags represents a Vichy French pilot ship (*Van Vollenhoven*) sunk off Saigon, which was waiting to escort a Japanese convoy into port. Just above the six men-of-war flags, bottom left, is the Presidential Unit Citation to the ship and crew for the second war patrol. In the far right corner are flags denoting an unusual claim. Minami Daito is an island in the center of the Nansei Shoto chain. *Bowfin* went into the harbor and struck a convoy moored there (August 11, 1944). In addition to sinking two freighters, a torpedo hit a quay—destroying a crane, a bus standing on the quay, and the quay itself.

Pacific Fleet Submarine Memorial Association, Inc.

HONORARY MEMBERS

Honorable Daniel Inouye
United States Senator

Honorable Daniel Akaka
United States Congressman

Honorable George R. Ariyoshi
Governor, State of Hawaii

Admiral Thomas Hayward, USN
Chief of Naval Operations

Honorable Spark Matsunaga
United States Senator

Honorable Cecil Heftel
United States Congressman

Honorable Frank Fasi
Mayor, City & County of Honolulu

CHAIRMAN OF FUND RAISING

Earl E. McDaniel
Executive Vice President
Heftel Broadcasting Corporation

DIRECTORS*

John A. Baker, Jr.

J. Wilson Bowen

Thomas E. Bower

Jean Cote

Dr. John Craven

E.L. Doheny

Robert A. Erskine

Anita Hecht

Frank E. Midkiff

E.A. O'Neill

Charles Podrean

Earl C. Russell

George Saunter

Ansil L. Saunders

Robert L. Tanner

Joseph W. Turskey

ADVISORY GROUP

Don E. Imig

ADM Bernard A. Clarey, USN (Ret.)

VADM Ralph W. Christie, USN (Ret.)

RADM Paul L. Lacy, USN (Ret.)

RADM John H. McAuliffe, Jr., USNR (Ret.)

John A. Haldi

Frank Scheetz

Brian K. Y. Ho

Alfred Y. K. "Blackie" Wong

PRINCIPLE OFFICE

Prince Kuhio Building

Suite 6330, 300 Ala Moana Blvd.

Honolulu, Hawaii 96850

(808) 521-8374

OFFICERS

Harold B. Estes*
Chairman of the Board

Ted M. Damron*
President

Vern F. Brye*
Vice President

E. Alvey Wright*
Vice President

Margo Wood*
Secretary

Arthur F. Ogden, Jr.*
Treasurer

Lindsey Kiang*
Assistant Treasurer

James A. Stanton*
Legal Counsel

Alan S. Lloyd*
Parliamentarian

FRA LIAISON

Allen R. Williamson

STAFF

YNC (SS) Gray Bayles, USN (Ret.)
Executive Director

Warren E. Sessler
Curator

Maude Bettencourt
Secretary



A National project of the Honolulu Council

Ship Sinkings

The official list of Japanese naval and merchant vessels sunk during World War II was compiled after the war ended, by the Joint Army-Navy Assessment Committee, based on both American and Japanese records. There were considerable discrepancies between claims of vessels sunk and damaged, and the official compilation. Further, the JANAC list included only ships of 500 tons and over; many ships claimed sunk by submarines were smaller than estimated, and did not make the list. In many cases, a ship torpedoed and seen to be on fire was not heavily damaged, and managed to limp into port. Sometimes explosions would be witnessed by submariners, but if the damaged ship was not actually seen to sink, or if wreckage from it was not later picked up, the sinking could not be claimed.

The war patrol reports of the Bowfin listed a total of 38 ships, amounting to 109,230 tons, as being sunk. These claims were approved by higher authority in each case. Yet, the official report compiled by JANAC reduced the score to 16 ships for a total of 67,882 tons. Some of the discrepancy was undoubtedly due to errors in estimating sizes of ships; the 16 large ships officially credited to Bowfin, plus the 22 smaller craft sunk, brings her total to 38, no matter what the final tonnage was.



USS BOWFIN WORLD WAR II COMBAT OPERATIONS

Less than four months after she was commissioned at Portsmouth, New Hampshire, the BOWFIN began combat operations halfway around the world in the South China Sea. She sailed from the East Coast early in July, made a brief stop in Panama, and then headed across the Pacific to Brisbane, Australia. In Brisbane she went alongside the submarine tender FULTON for post-voyage repairs and fitting out. A couple of days were spent in gunnery training and practice dives, planned to take her to deep submergence fast, a necessary maneuver in avoiding enemy depth charge attack.

On 19 August 1943 the BOWFIN sailed from Brisbane and headed north, around Australia to Darwin, where she refueled. Darwin was hundreds of miles closer to submarine patrol areas than either Brisbane or Fremantle, on the east and west coasts of Australia, but lacked any facilities needed for base operations. All it was good for was to serve as a handy place to stop in and say "Fill her up." That done, BOWFIN got underway again on 25 August, for her first patrol.

War Patrol No. 1

The BOWFIN left Darwin the morning of 25 August, and on 2 September she entered the Mindanao Sea. For nearly a month the BOWFIN sighted no major vessels. Fishing boats were seen frequently, and a few aircraft were picked up on radar, but none of them detected the submarine. It was noted that coastal villages on islands they passed were not blacked out, but showed lights at night.

On 24 September the BOWFIN joined up with the submarine BILLFISH. The next morning a convoy of six ships was sighted and the submarines began tracking it. After about five hours, the BOWFIN reached a position where she fired four torpedoes at a cargo ship and two more at a transport next astern of her. Through the periscope three torpedoes were seen to hit the first ship and two were seen to hit the second ship. The BOWFIN then reversed course, so her stern was toward the convoy, and fired four torpedoes from her stern tubes at a third ship, a tanker. The explosions of these torpedoes were heard, but not seen.

As soon as the torpedo explosions were seen by the Japanese ships, they discovered the BOWFIN's periscope and two of them began firing at it. As the BOWFIN submerged to avoid gunfire, the cargo ship (identified after the war as the KIRISHIMA MARU, 8,120 tons) could be seen settling in the water, the transport was sinking stern first, and the tanker was on fire.

An hour or so later the BOWFIN came up for periscope observation and saw a tremendous column of smoke which continued for over an hour. About three hours later one of the ships remaining from the convoy again fired on the BOWFIN, from a distance of about five miles, and she submerged. Later torpedo explosions were heard—evidently the BILLFISH was attacking the convoy.

During the night BOWFIN tracked the remnants of the convoy until finally the ships were lost at a range of ten miles. The next morning, while making a radar search, an enemy aircraft was detected. The plane was also equipped with radar, as indicated by interference on the BOWFIN's radar screen, so she submerged for the day.

On 27 September the BOWFIN picked up a contact which was identified as an inter-island steamer of about 1,500 tons. After chasing the ship for about three hours, the submarine reached a firing position and fired three torpedoes. One torpedo ran for a little over a minute, then its propellers were heard to stop. The others missed the target and were heard to explode when they stopped running and hit the bottom of the shallow sea.

On September 30 the BOWFIN left the Mindanao area. At dawn that morning, in a driving rain, a small diesel barge was sighted. It had a Japanese flag painted on the bow, and was deck-loaded with about a hundred Japanese soldiers. Such small targets were not worth the cost of a torpedo, so it was customary to sink them

Continued---



Page 2

with gunfire when possible. The BOWFIN closed to about two miles, surfaced, and opened fire on the barge with her 4-inch deck gun. When the barge replied with machine gun fire, the BOWFIN also opened up with her 20mm guns. The twentieth 4-inch shell fired hit the barge which practically disintegrated and sank instantly.

The next contact, made off Balikpapan, in the Makassar Strait, was a small two-masted schooner, sighted the evening of 2 October. Two shots fired across her bow failed to stop her so two more rounds were put into her and she sank.

Two days later BOWFIN headed south out of the patrol area, en route to Fremantle, West Australia, where she arrived on 10 October. Since leaving Brisbane, she had sailed 14,430 miles in 55 days. She had attacked and damaged at least three large ships and destroyed two small craft.

War Patrol No. 2

This patrol was from Fremantle to the South China Sea. A week out, BOWFIN sighted a group of five small schooners and began tracking them. Japanese aircraft were patrolling in the area and made several attacks on the submarine, but she managed to sink three of the schooners with her 4-inch gun before air attack forced her to submerge long enough for the remaining craft to escape. However, when she surfaced that night, another large schooner was sighted; this one was sent to the bottom with only two 4-inch shots.

Two days later BOWFIN was off the entrance to Tawi Tawi Bay (the tip of Borneo between the Celebes Sea and Sulu Sea) when two small coastal steamers were sighted heading for the bay. The BOWFIN ran ahead of them while submerged, then waited for them, surfaced, and set them both afire with gunfire. They were still burning when the BOWFIN had left the wreckage twenty miles behind.

On the morning of 26 November, while the BOWFIN was off the coast of Indo-China (now Viet Nam), near Saigon, she was running on the surface in a heavy rainstorm when she suddenly was surrounded by ships - she had sailed into the middle of a convoy and had to back all engines to avoid hitting a tanker. After tracking the convoy for an hour or so, BOWFIN fired a spread of torpedoes and sank the OGUROSAN MARU, a 5,069-ton tanker. While that ship was still sinking, the BOWFIN maneuvered to fire more torpedoes, and got the TAINAN MARU, a 5,407-ton cargo ship. She then had to pull out of the immediate area to reload torpedoes. In a couple of hours she was after the convoy again and put four torpedoes into a small French coastal steamer, the 691-ton VAN VOLLENHOVEN.

The following day the BOWFIN torpedoed a very small transport-type ship and then joined up with the BILLFISH again. On 28 November the two submarines met a large convoy, and in a short period the BOWFIN torpedoed the SYDNEY MARU, a 5,425-ton cargo ship, and the TONAN MARU, a 9,866-ton tanker. While she was concentrating on the tanker, another ship in the convoy fired on the BOWFIN, making some hits which resulted in leaks through the starboard main induction line.

At dawn the next morning the submarine surfaced while men worked topside to plug holes - but they still leaked. The patrol was cut short and the submarine headed back to Australia. En route, she sank a small yacht-sized ship on 2 December, again using the deck gun. She arrived in Fremantle on 9 December 1943, having been underway for 39 days and sailing 10,023 miles.

War Patrol No. 3

This patrol took the BOWFIN into the Netherlands East Indies area. Her first action came on 16 January, in Makassar Strait, when a small schooner was sighted. As soon as the submarine surfaced, the crew of the schooner jumped overboard. A couple of 4-inch shots sank the craft.

The next morning, in the same area, a freighter and two escort ships appeared.

Continued---



Page 3

The BOWFIN should have got all three, but faulty torpedoes ruined the day. First she fired four torpedoes from her bow tubes, at a close range of 1,200 yards. Only one torpedo made a hit. Then she swung around and fired two torpedoes from her stern tubes. Both of them exploded prematurely. With the enemy ship dead in the water, BOWFIN had to pull out of the area to reload torpedoes. The next morning she returned and found the ship still afloat, with her escorts standing by. This time four good hits finished off the ship, the 4,408-ton SHOYU MARU. At least two hits were made on the smaller escort ship.

With her torpedoes expended, the BOWFIN then returned to Darwin for a reload. She also took on a high-ranking passenger for a submarine, Rear Admiral R.W. Christie who rode the boat for the rest of the patrol, to observe the performance of torpedoes about which there were many complaints - they ran too deep, exploded prematurely, or didn't explode at all.

The second day out, a small freighter-type ship was sighted, tracked down, and sunk with three torpedoes. On 28 January the BOWFIN sighted a large tanker early in the morning and spent fourteen hours chasing it in order to get into good firing position. Finally, about eight that night, she surfaced only 300 yards from the tanker and fired all six bow torpedo tubes. But the tanker changed course at that exact moment and all six torpedoes missed. The submarine's crew hurriedly reloaded, and six more torpedoes were fired. This time two hits sent columns of fire and smoke up out of the ship, but she refused to sink. As BOWFIN moved in for another attack, the tanker opened up on her with machine guns and deck guns.

After twenty minutes of dodging gunfire, BOWFIN fired two more torpedoes. Both missed. Then she fired two more. Both hit. The tanker still refused to sink. BOWFIN fired another torpedo. As BOWFIN moved in for another attack, the tanker opened up on her with machine guns and deck guns.

After twenty minutes of dodging gunfire, BOWFIN fired two more torpedoes. Both missed. Then she fired two more. Both hit. The tanker still refused to sink. BOWFIN fired another torpedo. Then one missed. Then she fired one more, for a hit. The tanker in turn opened up again with all her guns, so the BOWFIN submerged. Then she heard a tremendous explosion, but when she surfaced to see what had happened the tanker still had not sunk. In fact, she was underway again. When daylight came, the BOWFIN searched for the ship but could not find it. However, she could not claim the ship as sunk, as no one had seen the ship sink and she had not found any debris or survivors to show that the ship actually did sink.

Next, on 29 January, the BOWFIN laid a string of mines in Makassar Strait the only time during the war she did so, and then headed back for Fremantle. The next day she sank two small schooners with her deck gun. She reached Fremantle on 5 February, completing a 28 day patrol in which she sailed 7,949 miles.

War Patrol No. 4

This patrol was in the Celebes Sea, and again the BOWFIN ran out of torpedoes and had to return to Darwin for a reload. Her first contact was made on 10 March when a convoy of four ships and two escorts was sighted. BOWFIN fired six torpedoes but four of them exploded prematurely. Enemy aircraft drove the submarine down and she was unable to observe whether the other two torpedoes exploded or not. The escorting ships took turns dropping depth charges. The BOWFIN submerged to 350 feet to avoid the attack. Once a chain could be heard dragging across the hull of the submarine as the escorts searched for her. In all, they dropped twenty-four depth charges; the submarine was shaken up, but undamaged.

When BOWFIN was able to surface again, one of the cargo ships could be seen down by the stern while other ships were trying to take her in tow. Five aircraft were patrolling around the convoy, as the group of ships got underway. BOWFIN fired tor-

Continued---



Page 4

pedoes at one of the escorts, and at the ship towing the damaged freighter, but was unable to observe results as one of her own torpedoes turned back toward her and she went deep to avoid it. The next morning she found the damaged ship again, fired more torpedoes at it, but was forced down by attacking escorts. When the submarine came up for periscope observation again, the freighter was unprotected. This time BOWFIN got off four torpedoes before she had to dive to avoid another air attack. When she came up again for a look, the 4,470-ton TSUKIKAWA MARU had gone down, leaving the sea littered with lifeboats and floating debris.

Late that night BCWFIN caught up with the rest of the convoy and fired her last four torpedoes. One was a miss, the others exploded prematurely. She then had to return to Darwin to reload, which was done on 14 March. She was underway again the next day, and 18 March attacked a small convoy. Again the torpedoes were troublesome. Four of them fired at the short range of 900 yards all ran under the target, the next two missed. The escorts dropped sixteen depth charges but they also missed. That afternoon BOWFIN again fired four torpedoes at the ship she'd missed that morning. All four missed.

On 24 March, in the Celebes Sea, the BOWFIN sighted a convoy of five ships and trailed them for several hours. Then in a night surface attack, she fired at three ships and made hits on all of them. The SHINKYO MARU (5,139 tons) and BENGAL MARU (5,399 tons) were sunk. The third ship was set on fire but refused to sink, and BOWFIN was out of torpedoes again, so she returned to Fremantle. During her 36 day patrol she had steamed 9,272 miles.



her patrol, which had lasted for 60 days during which she sailed 14,325 miles.

War Patrol No. 8

This entire patrol was conducted in the area off northern Honshu and Hokkaido. The air war against Japan was heavy then, and the BOWFIN sighted literally hundreds of U.S. aircraft while she was on station. There were few ship contacts because by that time the Japanese merchant marine and navy had been nearly wiped out. On 1 May the BOWFIN sighted and attacked a small freighter, the 2,719-ton CHOWA MARU, and sank her with two hits. That called for a small celebration, as it was the submarine's second birthday. Exactly one week later, after having chased her for several hours, the BOWFIN torpedoed and sank the 880-ton cargo ship DAITO MARU No. 3. The BOWFIN returned to Guam on 15 May, having completed the shortest patrol--23 days and only 5,649 miles--of her combat career.

War Patrol No. 9

This patrol began in Guam and took the sub to the Sea of Japan. Shipping was scarce; the BOWFIN entered several harbors and found them empty of targets. Only two ship contacts were made, and both times BOWFIN scored a kill. On 11 June she found a cargo ship, sailing un-escorted, and hit her with four torpedoes. The ship was the 1,898-ton SHINYO MARU which sank in three minutes. Four days later the BOWFIN torpedoed and sank the AKIURA MARU, a small 887-ton freighter. The submarine returned to Pearl Harbor on 4 July for post-voyage repairs.

In August the BOWFIN was headed for Guam to train for her tenth patrol when the Japanese agreed to surrender. She turned around and returned to Pearl Harbor. On 29 August she left Hawaii and headed for Panama and the east coast of the United States. She served with the Atlantic Fleet until January 1947, when she was placed in reserve. She was recommissioned in 1951.


Post-WW II Service

The BOWFIN was a member of the mothball fleet at New London for over four years after she was decommissioned. But as the Navy began to build up strength again after the Korean conflict erupted in 1950, she was again fitted out for sea. The ship was put in commission a second time on 27 July 1951, and spent the next couple of years on training duty in the Pacific.

She operated out of San Diego, as a unit of Submarine Squadron 3 and later Submarine Squadron 5. In 1952 the Mare Island Navy Yard at Vallejo put the boat through a thorough overhaul. In 1953 she sailed as part of a Task Group on a training cruise to Seattle, Washington. In October of that year she sailed for San Francisco, where she was inactivated. The following year she went into the reserve fleet at Mare Island.

The BOWFIN returned to Seattle in May, 1960, to replace the submarine FUFFER as a Naval Reserve training vessel. She spent the next ten years on that duty, going nowhere but making lots of friends among naval reserve crews and visitors. Finally, in December of 1971 the ship was stricken from the Navy list. In naval language, that means a ship is too old for any useful purpose, and the next step is usually being sold for scrap and sent off to a razor blade factory.

But the BOWFIN was lucky. She was old enough to retire, and the Navy sent her back to Hawaii, where one can retire in comfort. Fresh paint now and then helps hide her age, but she is actually the oldest ship in Pearl Harbor, and enjoys having visitors. Welcome Aboard!



STERN SHOTS

from
massie

On November 4, 1943 BOWFIN under Lt. Commander W.T. Griffith was bound for the South China Sea. She left Exmouth Gulf with her prospective course charted along the usual route through Lombok Straits. Five days out, not far from Makassar, she battle-surfaced to shoot up a convoy of five schooners. She sank four of these sailing vessels before a patrol plane drove her under. Hit by BOWFIN'S 4-inch shells, the wooden ships went down like rocks - a phenomenon that convinced Griffith they were loaded with machinery or other heavy cargo.

Griffith and his boys were only warming up. Entering Sibutu Passage on the night of November 11, BOWFIN battle-surfaced again to set fire to a pair of small oil tankers. This gun action was fought in bright moonlight within a range of Japanese shore batteries on Sibutu Island, but the shooting was over and BOWFIN was under before the coast artillerymen knew what it was all about.

BOWFIN cruised for a short time in the waters off Mindanao, found no targets, and proceeded west across "Dangerous Ground" toward Cape Varella. Rain, Wind, heavy seas and a fleeting submarine contact. Nothing to radio home about. Midnight, November 25-26, she was approaching Fisherman's Islands in the sort of weather that makes a poor sailor wish he's never heard of a fog'sle head and "grave-yard watch." Sheeting black rainstorm and seas of India ink. Blindfold for a ship's lookout - worse for a wave-smothered periscope - but nothing to stop radar.

At 0200, BOWFIN'S SD picked up several large "pips" - distance two miles and one mile. Three minutes later the inquiring SJ contacted something off in the night, 1,000 yards distant.

"I first thought I had blundered into the beach or some small islands, although I had 75 fathoms of water," Griffith noted in the log. "Came hard left to clear out to seaward, and backed emergency to keep from ramming an enormous tanker!"

A few minutes later the submarine backed full to keep from ramming another big tanker. Griffith realized he was in the midst of a Japanese convoy, northward bound. Five ships showed up on the radar screen with visibility practically zero and a blind spot ahead on the SJ due to improper tuning. However, after an hour and a half of tracking, Griffith knew the disposition of these targets. The ships were moving by two's in parallel columns 4,000 yards apart, the fifth ship trailing between the columns with an escort.

Griffith directed an approach on the leading vessel in the nearest (the starboard) column. At 0351 he fired three torpedoes. One struck the tanker's bow, and in the glaring blast the ship's bow section and foremast disintegrated. A second torpedo exploded amidships. As the tanker settled by the head a tide of liquid flame spread across the water. The men on BOWFIN'S bridge could see the tanker's broken silhouette and smell the burning gasoline. The vessel's deep-toned whistle wailed a disaster call in the night.

Meantime, Griffith had shifted the submarine for a torpedo shot at the second ship. As the volcanic blast of a hit lit up this second target, BOWFIN had to back emergency to keep from ramming the torpedoed tanker which had veered around broadside within 300 yards of the submarine.

Griffith did some fast maneuvering. Explosions that sounded like depth charges were going off to starboard. The torpedoed tanker, its foredeck awash, was almost on top of BOWFIN. The second

(Continued page 2)



STERN SHOTS

from
massie

Page 2

vessel, damaged, wallowed in the sea about 1,500 yards beyond. Deciding to finish off the tanker before the escort could arrive on the scene - the other ship could wait - Griffith swung BOWFIN for a stern-tube salvo, and fired three torpedoes at 1,200 yards. One hit under the tanker's stack, and the whistle choked off as if its throat had been plugged.

BOWFIN was steered off into darkness for a quick reload, then Griffith skirted the scene of action for a last look. Rain was smothering the gasoline fires, and in the dim and smoky light the big tanker was slowly sinking in a sea of fumes. The second vessel was gone - like Charon's ferry in the night-draped Styx.

Griffith headed BOWFIN toward Cape Varella to search for the rest of the convoy. At 1050 a periscope sweep brought a 5,000-ton freighter into view. Attempting a submerged approach, Griffith encountered trouble with depth control, and surfaced to accomplish a fast end-around. Four torpedoes scored four hits, blowing the AK completely to pieces.

As Griffith maneuvered the submarine over to the flotsam-strewn water where the freighter had exploded, a small OTORI escort vessel came climbing over the waves about 1,500 yards away. The seas were too rough for the six-foot depth-setting required for a torpedo shot at this A/S craft, and Griffith headed BOWFIN away.

The following day, BOWFIN found another target - a small coastal steamer - which was disposed of with three torpedo shots. Then, early on the morning of the 28th, BOWFIN received a contact report from the submarine BILLFISH operating in the area - a convoy was in the vicinity. Shortly after the reception of this news, BOWFIN was on the track of five large ships which were steaming under escort.

Griffith directed a surface approach, and at 0313 making a surface attack, he fired four torpedoes at the leading (and largest) target. Four hits sank the ship in as many minutes.

At 0317 Griffith fired two more bow torpedoes. These smashed into the second vessel, leaving her awash to the bridge. At this juncture the third vessel of the convoy, which had been moving in column off BOWFIN'S beam, turned and headed straight for the submarine. Griffith's blast cast the ship open up with the superstructure 500 yards off. The second shot hit the submarine. The shell ricocheted from the deck into the superstructure and exploded between the pressure hull and the starboard induction pipe. The blast carried away the low-pressure air lines aft, ripped open part of the main induction pipe, and destroyed the ventilation lines.

Griffith fired two stern-tube shots at the attacking ship. That ended the Japanese gunnery. Both torpedoes hit, and the vessel went down, sagging in the middle like a weighted hammock. With this target out of the way, Griffith sent BOWFIN in pursuit of the remainder of the convoy.

While the last two torpedoes aboard were being loaded, the submarine overhauled the quarry. Griffith drove in for an attack on the largest vessel, calculating the set-up carefully. At 0353 he fired the torpedoes. The first prematured at 500 feet, and its explosion deflected the second, sending it on a course wide of the mark.

"This premature cost us two sure hits and a 7,000-ton vessel," Griffith commented afterwards. (The submarines of SoWesPac were still using the Mark 6 exploder.)

Continued on Page 3)



Page 3

So BOWFIN headed home from the South China Sea. But her war patrol was to have a P.S. On December 1 she made contact with a four-ship convoy north of Celebes. Griffith tracked, and then radioed the convoy information to BONEFISH on the chance that Hogan's submarine, then in the area, could intercept. The following day BOWFIN sighted a 75-ton oil-carrying yacht in Makassar Strait. Griffith ordered a gun attack, and BOWFIN'S sharpshooters destroyed this unwary craft.

Her main induction patched and her patrol report crammed with action, BOWFIN arrived at Fremantle on December 9th.

"They fought the war from the beginning to the end of the period," Admiral Christie lauded BOWFIN'S submariners. And for this outstanding aggressive and successful patrol, BOWFIN was awarded the Presidential Unit Citation. For the Japanese merchant marine she had contrived the following obituary:

- Down at sea Nov. 9: four cargo schooners, 425 tons
- Down at sea Nov 11: two small oil tankers, 800 tons
- Down at sea Nov 26: OGURASAN MARU, tanker, 5,069 tons.
- Down at sea Nov. 26: TAINAN MARU, freighter, 5,407 tons
- Down at sea Nov 27: VAN VOLLENHOVEN, Freighter, 691 tons.
- Down at sea Nov 28: SYDNEY MARU, passenger-cargo, 5,425 tons
- Down at sea Nov 28: TONAN MARU, tanker, 9,866 tons
- Down at sea Dec 2: one oil-carrying yacht, 75 tons

The tonnage of the schooners and small tankers sunk by gunfire is an estimate and probably on the light side. But the tonnages of the larger vessels were determined by post-war inquest, and a conservative adding machine, excluding the tonnages of the small craft, gives the total as 26,458 tons. BOWFIN'S was therefore one of the season's high-scoring patrols. This patrol, with that of BONEFISH, marked the beginning of the end for Japanese merchant shipping in the South China Sea.

A captain whose name was McPhail

Kept a weather eye on the sail,

when it started to luff

he rose in a huff

and clobbered the crew with a pail.

WAR PATROL RECORD

No.	Dates and Areas	Miles	Ships Sunk (tons)
1	16 Aug.—10 Oct. 1943 (Brisbane to Darwin to South China Sea, to Fremantle)	14,430	<i>Kirishima Maru</i> (8,120) plus 2 small craft
2	1 Nov.—9 Dec. 1943 (Fremantle to South China Sea to Fremantle)	10,023	<i>Ogurosan Maru</i> (5,069), <i>Tainan Maru</i> (5,407), <i>Van Vollenhoven</i> (691), <i>Sydney Maru</i> (5,425), <i>Tonan Maru</i> (9,866) plus 8 small craft
3	8 Jan.—5 Feb. 1944 (Fremantle to Makassar Strait to Darwin, to Java Sea to Fremantle)	7,949	<i>Shoyu Maru</i> (4,408) plus 4 small craft
4	28 Feb.—1 April 1944 (Fremantle to Celebes Sea to Fremantle)	9,272	<i>Tsukikawa Maru</i> (4,470), <i>Shinkyō Maru</i> (5,139), <i>Bengal Maru</i> (5,399)
5	25 April—21 June 1944 (Fremantle to Palau area to Midway Island to Pearl Harbor)	15,013	1 claimed but not verified.
6	16 July—13 Sept. 1944 (Pearl Harbor to Sansei Shoto area to Midway to Pearl Harbor)	13,437	<i>Tsushima Maru</i> (6,754) plus 7 small craft
7	25 January—25 March 1945 (Pearl Harbor to Saipan to Nanpo Shoto to Guam)	14,325	<i>Frigate No. 56</i> (750) plus 1 small craft
8	23 April—15 May 1945 (Guam to Honshu-Hokkaido area to Guam)	5,649	<i>Chowa Maru</i> (2,719), <i>Daito Maru No. 3</i> (880)
9	29 May—4 July 1945 (Guam to Sea of Japan to Midway to Pearl Harbor)	8,559	<i>Shinyo Maru</i> (1,898), <i>Akiura Maru</i> (887)

TOTAL MILES STEAMED: 98,668

SHIPS SUNK (Verified): 16 (67,882 tons) plus 22 small craft.