



by Tom Dougherty

USS *Dolphin* (AGSS-555) - The "Triple Nickel" - The Last U.S. Diesel Submarine

One of the more unusual submarines fielded by the U.S. Navy is the AGSS-555 *Dolphin*. Along with *Albacore* and NR-1, the *Dolphin* was purpose-built—in her case to act as a deep-diving platform to test new technologies and equipment at ocean depths of 3000 feet. In fact, for *Dolphin*, the Navy will admit to a 3000 foot depth; the actual limiting depth remains classified. For comparison, the Cold War *Sturgeon* class had a test depth of 1300 feet, and the *Los Angeles* class around 1000 feet. Listed at the end of this article are some of the publicly revealed experimental equipment tested on the *Dolphin*.

Dolphin was originally designed in 1961 in anticipation of the Committee on Undersea Warfare studies that the next generation of SSNs would be deeper diving, and that 4000-6000 foot depths would be achievable in the near future. A 1964 study, Project Seabed, suggested that deeper diving was also necessary in SSBNs, with projections of future missile submarines operating at 8000 feet. This would allow the SSBN to sit on the mid-Atlantic ridge, as well as take positions above or below the deep sound channel for sonar evasion purposes. *Dolphin* was to be the



USS *Dolphin* (AGSS-555) cruising on the surface. The crew on deck emphasizes her compact size.

testbed for many of the necessary new technologies (for example: deeper torpedo operations, hull material, hull penetrations, and propeller shaft glands). But, the Vietnam war drained the DOD budget for advanced submarine hull designs and materials.

Several aspects of *Dolphin's* design and construction are very unique. Laid down in early 1962 at Portsmouth Naval Shipyard and completed in 1968, *Dolphin* is small at 152 feet in length with a 19.3 foot beam. The submarine's displacement was 875 tons surfaced and 950 tons submerged. *Dolphin* was constructed of HY80 steel, with a ring-stiffened cylinder shape and two hemispheric end caps. She had special "king frames" along her length in place of heavier pressure bulkheads. The hull construction HY80 metal and ring reinforcements consume 54% of her total displacement. These features allowed *Dolphin* to dive to depths greatly exceeding operational submarines. The submarine was one contiguous compartment with different operating sections, such as experimental areas, sonar, control, engineering, and crew bunking. Unlike other submarines, there are no watertight doors sealing off the different compartments. In drydock, *Dolphin's* blunt bow is hemispheric, and her stern tapers down dramatically after her aft compartment's pressure hull hemisphere.

Dolphin could do 10 knots surfaced and averaged 7.5 knots submerged. She had two General Motors V71 12-cylinder diesel engines of 425 h.p. which drove electric generators (317 Kw). Each diesel had twin-screw superchargers (one per six cylinders) and used sea water to exchange heat with the radiators. The diesels were actually derived from bus engines, as standard diesels would not fit in the hull space available. In the battery well there were 126 silver oxide cell batteries used to power dual 825 h.p. electric propulsion motors (1650 shp total) turning a single screw. Because of

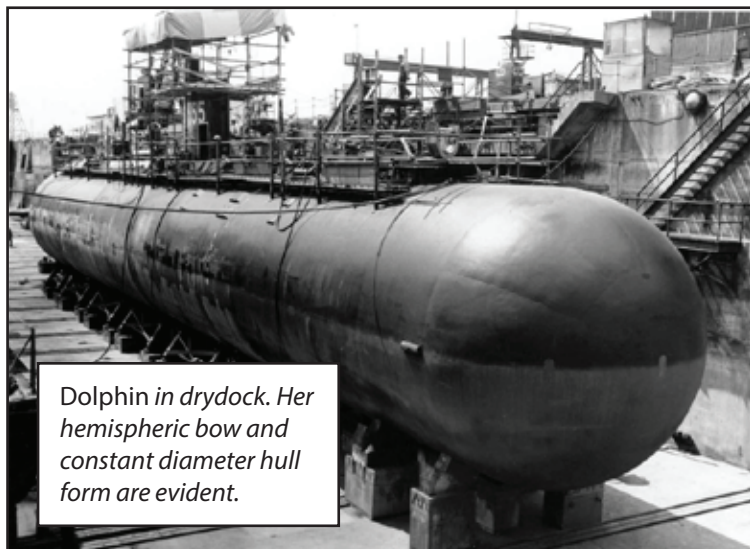


June 8, 1968. Dolphin is launched from Portsmouth Naval Shipyard. The steep taper of her stern from the pressure hull cylinder is evident.

limited space in the sail, *Dolphin* had neither a snorkel nor a main induction valve to provide air when running the diesels. The solution? Leave the bridge hatch or one of the other hatches open when running the diesel.

Due to her small interior size, *Dolphin* was limited in both crew complement and mission endurance. She carried three officers and 24-35 enlisted, plus a small contingent (usually 3-4) of mission-specific scientists. During her 38+ year career, *Dolphin* operated solely as a naval research vehicle, never traveling far from the port where she was currently assigned. Over the years of operation, various pieces of advanced naval submarine

technology and science equipment were installed, tested, and removed. *Dolphin* had the capability of carrying twelve tons of instrumentation, performing deep water acoustic research, sensor trials, and many other activities. In 1968, she had a single, centerline torpedo tube installed to conduct deep torpedo tests with DEXTOR (Deep EXternal TORpedo), which utilized a ram catapult for launching. After these tests, which included the deepest torpedo launch to date, the tube was removed and various sonar test systems were cycled through her bow. During *Dolphin's* last days, she was conducting advanced acoustic detection systems



Dolphin in drydock. Her hemispheric bow and constant diameter hull form are evident.

and civilian Navy employees to abandon ship. The Oceanographic Research ship *McGaw* was operating in the vicinity and immediately responded to Kelety's call for assistance. They were evacuated by boat to *McGaw* after the *Dolphin's* hatches had been secured. All crewmembers were safely recovered with only a few minor injuries. The quick response of the crew placed the submarine in a stable condition. Submarine Support Vessel *Kellie Chouest* got underway from San Diego early on May 22 to assist in *Dolphin's* recovery. The submarine was towed back to San Diego the following day.

For the next three years, *Dolphin* underwent extensive repairs, upgrades, and refurbishment at a cost of \$50 million.

She was placed back in service in the summer of 2005. However, due to budgetary considerations, just over a year later AGSS-555 *Dolphin* was deactivated on September 22, 2006, and decommissioned and struck from the Naval Vessel Registry on January 15, 2007. Fortunately, *Dolphin* was officially transferred to the San Diego Maritime Museum in 2008, where she is now one of two submarines in the museum's collection. The Russian Nato-designation *Foxtrot* diesel attack submarine featured in SCR issue #119 is the other. It is interesting to compare the interior photos of these two boats, which I visited and photographed in September of 2019.

***Dolphin* AGSS-555 Achievements:**

- Deepest U.S. submarine dive at more than 3,000 feet.

- Evaluation of various non-acoustic ASW techniques.
- Evaluation of various low probability of interception active sonars.
- First submarine launch of a mobile submarine simulator (MOSS) system.
- First successful submarine test of BQS-15 sonar system.
- Development of a Laser Imaging system of photographic clarity.
- Development of an Extreme Low Frequency (ELF) antenna for *Ohio*-class submarines.
- Development of highly accurate (4-inch) towed body position monitoring system.
- First successful submarine-to-aircraft optical communications.
- First successful submarine-to-aircraft two-way laser communication.
- Development of a new Obstacle Avoidance Sonar system.
- Development of a highly accurate target management system.
- Evaluation of a possible "fifth force of nature."

evaluations for future use.


No history of *Dolphin* would be complete without noting her harrowing near-loss in 2002. On May 21 of that year, while operating approximately 100 miles off of San Diego, CA, *Dolphin* was on the surface recharging her batteries when a gasket failed and serious flooding started. Due to the 10-foot swells at the time, an estimated 80 tons of seawater entered the ship. This constituted much of the boat's reserve buoyancy. The flooding shorted electrical panels and started fires. Chief Machinist's Mate (SS) John D. Wise, Jr. dived into the 57°F water of the partially flooded pump room. He lined up the seawater valves which allowed pumping to commence. Wise remained in the pump room for more than 90 minutes in order to keep the submersible pump from becoming clogged. His courageous efforts prevented the loss of the ship and crew. Wise received the Navy and Marine Corps Medal for his efforts.

After 90 minutes, the fire and flooding were beyond the ability of the crew to control, and Cmdr. Stephen Kelety, *Dolphin's* Commanding Officer, ordered the crew



Dolphin at sea following the 2002 emergency.

A Photo Tour of the USS *Dolphin*



*Dolphin as
a museum ship in
San Diego. Subsequent
photos taken Sept. 27, 2019
by Tom Dougherty.*



Dolphin port-side photo. Her flat turtleback deck structure is evident.



Above: Close up of the stern and upper rudder. Heavy sea growth at the waterline.

Right: Dolphin from the stern. The turtleback crew deck has an experimental "hump" aft.





View of the sail, bridge cockpit, and masts.

View of sail with arrays wrapped around the upper forward section.





Let's go aboard. Forward compartment with the trim tank (white) wrapped around the hemispherical bow interior.



Sonar shack. The remaining equipment is of relatively late vintage (2000's). The square hole is where equipment was removed.



More of the sonar shack. The relatively large space devoted to sonar reflects Dolphin's later role in sonar systems evaluations.



Looking toward the bow, forward crew bunks line the starboard side of the single hallway which runs the length of the boat.



Dolphin's control room while facing aft. The port side dive station is on the right behind the periscope. A maneuvering control panel is facing the control room rear. Plotting table behind the periscope, plus pump room access at lower right.



Above: The radio shack. Racks allowed equipment to be swapped in and out for tests.

Top right: At a right angle to the dive station in the control compartment rear are many of the controls found in a traditional submarine maneuvering room. Amps, volts, generator and battery status gauges, among others.

Lower right: Closeup of the ballast control panel. Hull opening indicators at top right. Vent indicators just below that.

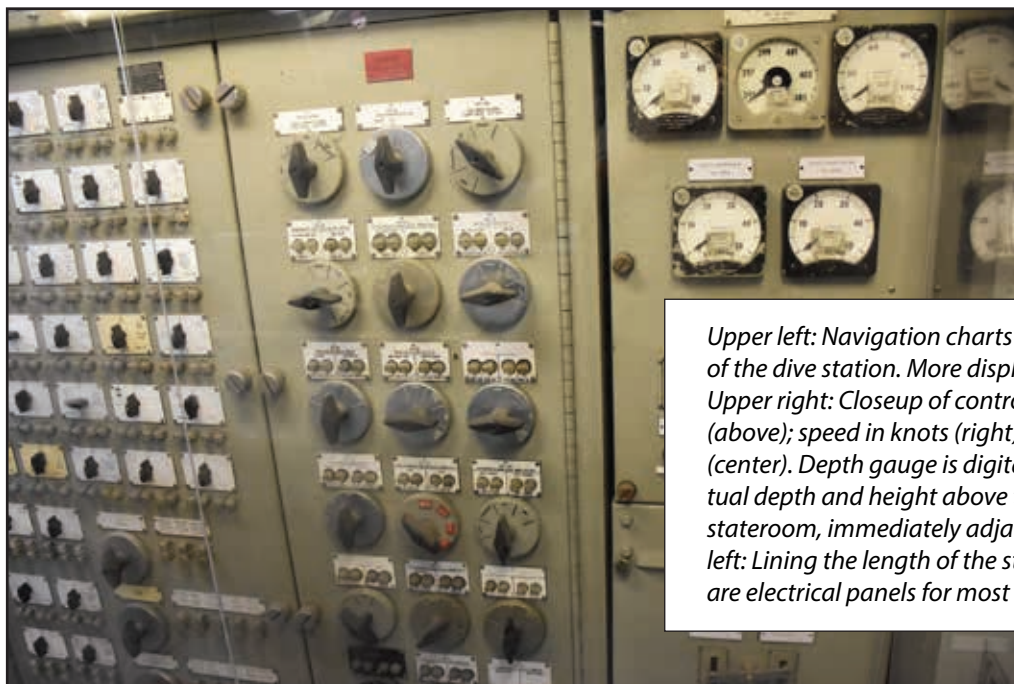




Left: Facing forward in Control, the single-pilot control station, with steering, heading, angle and depth gauges. Sperry gyrocompass tucked away at lower right.

Right: In the center of the control compartment, the periscope.





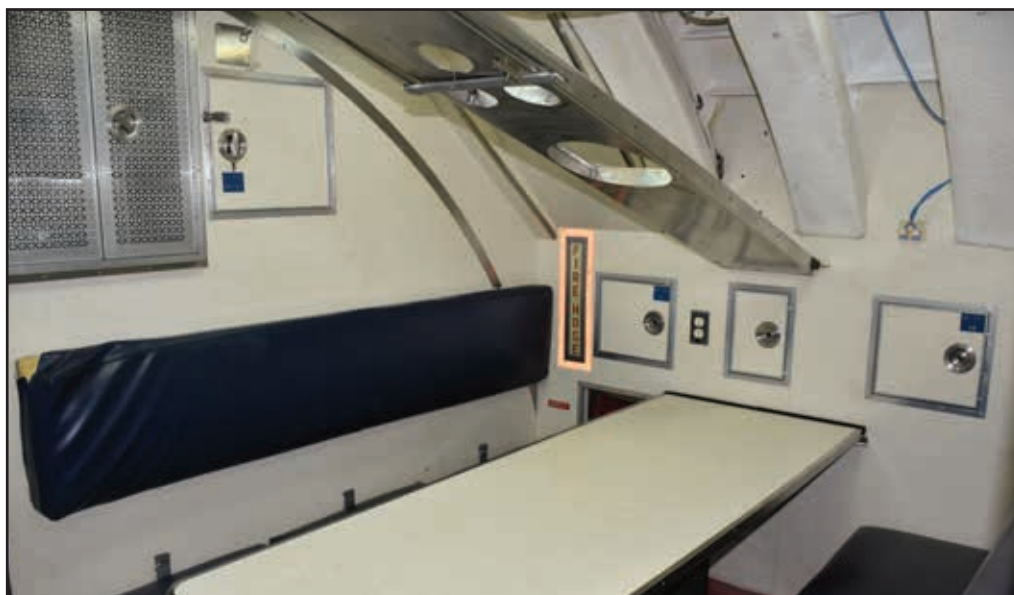
Upper left: Navigation charts stored in cabinets to the right of the dive station. More display screens between and above. Upper right: Closeup of control station gauges: inclinometer (above); speed in knots (right); planes and rudder indicators (center). Depth gauge is digital, displaying ordered depth, actual depth and height above the bottom. Bottom right: Officers' stateroom, immediately adjacent to the Captain's bunk. Bottom left: Lining the length of the starboard side of the control room are electrical panels for most ship functions.



Dolphin's Captain's area and office. Mirror at upper left has the only photo of the author ever to appear in the SCR—partially obscured by Nikon DSLR. (Wish it were clearer.—ed.)



Ship's galley. It is an unusual "in-line" setup which lines the starboard side of the long hallway running fore and aft: cooking while the same space serves as a passageway!



Opposite the galley is the crew's mess; a single table and benches for meals. The steep curvature of the hull is evident from the internal supports.



View of the Dolphin's galley and crew's mess looking forward. Tight spaces!



Turning around from the galley and looking aft, engineering is the next area.



Controls for the two diesel-electric motor sets. Most engine and electrical controls are forward in the control room.



Air control systems (HPAC) stations in the engineering space.

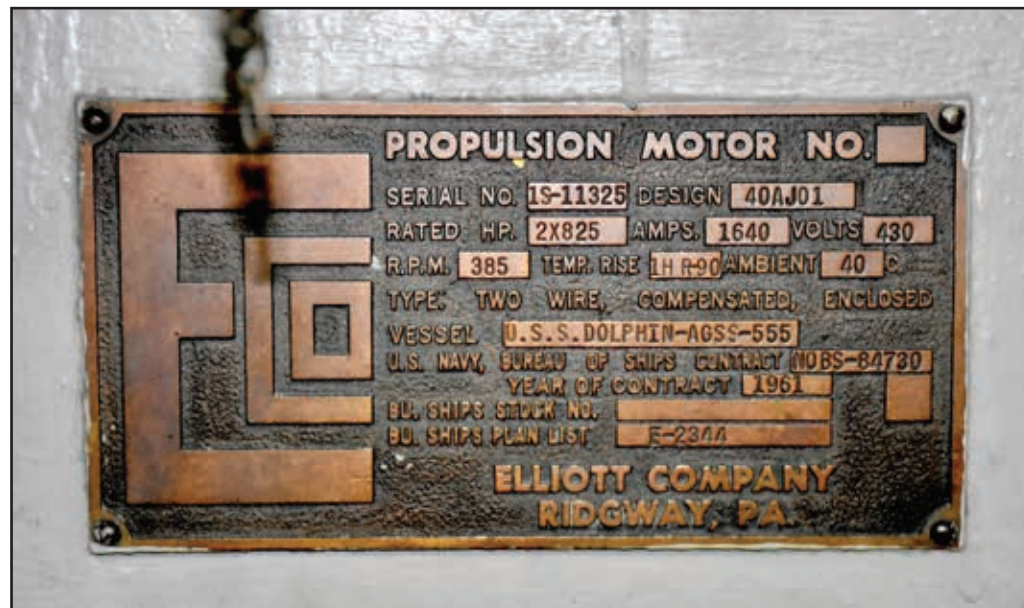


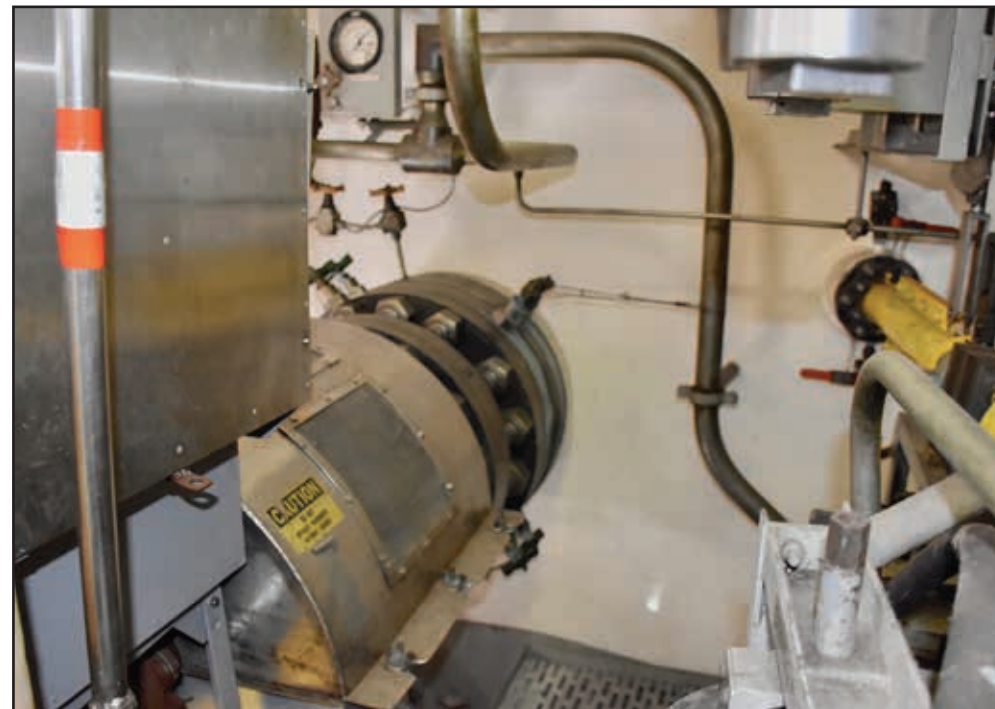
Plate mounted on the electric motor with specs for the unit.



Narrow walkway aft beside the two tandem electric drive motors.



Looking forward, the curve of the electric motor installation.



Top left: On the opposite (port) side of the electric motors is a workbench and tool area.

Above: Stern end of the Dolphin. The all-important shaft seal, which allows the shaft to rotate yet keeps the water out. At 3000 feet, the water pressure is 1320 lbs. per square inch!

The Maritime Museum of San Diego, established in 1948, preserves one of the largest collections of historic vessels in the United States. The collection includes the USS *Dolphin*, Russian *Foxtrot B-36*, and *Star of India*, an 1863 iron bark. 