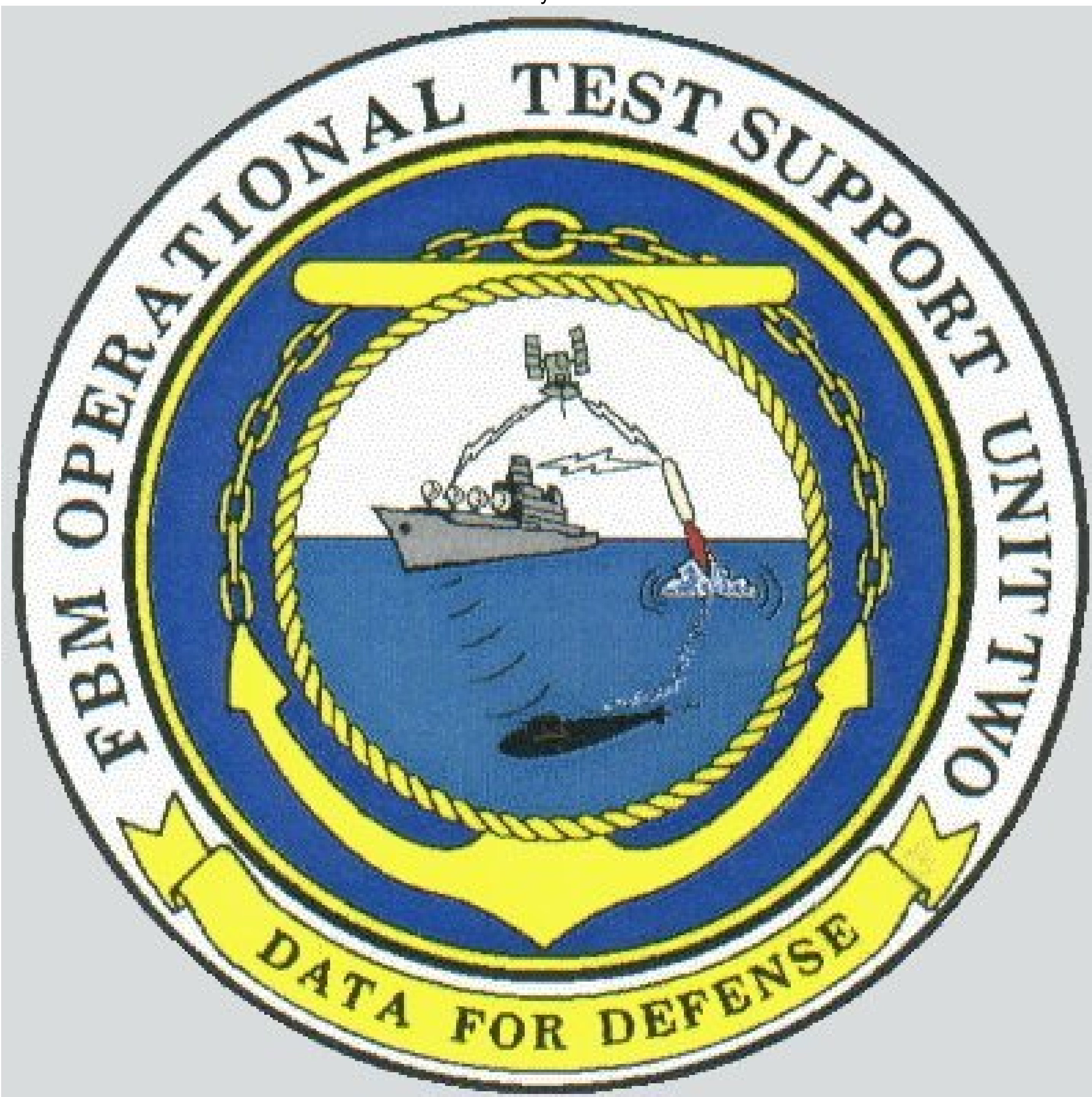
Contributed by Bill Valashinas



FBM OPERATIONAL TEST SUPPORT UNIT TWO

DATA FOR DEFENSE

Welcome Aboard!

COMMANDING OFFICER

GREGORY A. QUEEN
COMMANDER
UNITED STATES NAVY

Commander Queen was born in Washington, DC. He began his Navy career at the United States Naval Academy, graduating in 1976.

After attending Naval Submarine School in Groton, CT and the Poseidon Weapons Officer Course at Dam Neck, VA, Commander Queen reported aboard USS Daniel Webster (SSBN 626) (Gold) where he served as division officer in the Weapons Department from April 1977 until May 1980. While onboard he earned his gold dolphins and completed Strategic Weapons Officer qualifications.

Commander Queen reported to Naval Submarine School in Groton, CT and served as an instructor from May 1980 until January 1982. He was then assigned as the Weapons Officer aboard the USS Nathan Hale (SSBN 623) (Gold). Following his Weapons Officer tour, he reported to the staff of Director, Strategic Systems Programs in Washington, DC, where he served from July 1985 to March 1988 in the Weapons Evaluation Branch (SP 205). After attending the Submarine Executive Officer's Course in Groton, CT, he was assigned as the Executive Officer of USS Darter (SS 576) from May 1988 to December 1989. After attending the Naval Postgraduate School, he reported in October 1992 to the Office of the Chief of Naval Operations for duty as a sealift analyst in the Strategic Sealift Division.

Commander Queen has been awarded the Navy Commendation Medal with one gold star, Navy Achievement Medal with one gold star, and the Battle Efficiency "E" Award.

EXECUTIVE OFFICER

THOMAS M. GUINN
LIEUTENANT COMMANDER
UNITED STATES NAVY

Lieutenant Commander Guinn was born in Springfield, Illinois and graduated from Southern Illinois University with a Bachelor's Degree in Education Management. He is a distinguished graduate of the Naval Postgraduate School advanced degree program, earning a Master's Degree in Education and Management in 1989. In addition, Lieutenant Commander Guinn is a distinguished graduate of the Naval War College, Newport, Rhode Island and has completed joint professional military education at the Armed Forces Staff College, Norfolk, Virginia.

Lieutenant Commander Guinn enlisted in the Navy in October 1974 as a Submarine Radioman. Upon commissioning as an Ensign in 1982, Lieutenant Commander Guinn reported to USS ANDREW JACKSON (SSBN 619)(GOLD), where he served as Assistant Weapons Officer. While assigned to USS ANDREW JACKSON, he earned his gold dolphins and completed Strategic Weapons Officer qualifications.

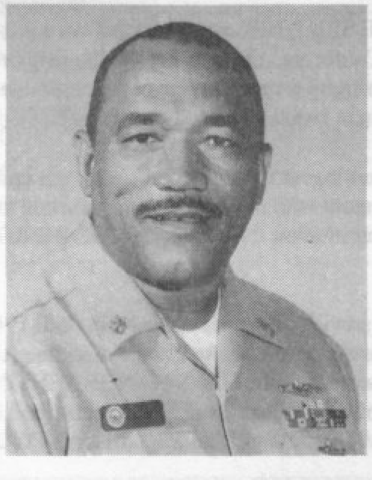
Upon completion of postgraduate studies, Lieutenant Commander Guinn reported to USS TENNESSEE (SSBN 734)(BLUE) as the Strategic Weapons Officer. He conducted eight TRIDENT II(D-5) missile launches as part of the PEM, DASO and CINC evaluation test programs. His Strategic Weapons Department set the standard for the TRIDENT II fleet as USS TENNESSEE became the first TRIDENT II(D-5) capable submarine to convert a technical assist visit into a Nuclear Weapons Acceptance Inspection, signifying a crew's readiness to perform their strategic deterrent mission. During this tour he earned the designation "Qualified for Command in Submarines".

In April 1992, Lieutenant Commander Guinn reported to Commander, Joint Strategic Target Planning Staff (JSTPS) in Omaha, Nebraska, where he earned recognition as the staff expert on TRIDENT II weapons system issues for the newly formed United States Strategic Command (USSTRATCOM). In June 1994 he relieved as Executive Officer, FBM Operational Test Support Unit TWO.

Lieutenant Commander Guinn is authorized to wear the Joint Service Commendation Medal, Navy Commendation Medal, Navy Achievement Medal with three gold stars, Joint Meritorious Unit Commendation, Navy Meritorious Unit Commendation, Battle Efficiency "E" Ribbon (two awards, Good Conduct Medal with one Bronze Star and the Sea Service Deployment Ribbon with four Bronze Stars.

Lieutenant commander Guinn is married to the former Janet A. LaMarche of East Haven, Connecticut. They have three sons, Matthew, Daniel and Taylor.

COMMAND MASTER CHIEF



WILLIAM ELMORE ALLEN
MASTER CHIEF PETTY OFFICER
UNITED STATES NAVY

Master Chief Allen was born in Aiken, South Carolina and attended Hampton University, Hampton, Virginia.

Master Chief Petty Officer Allen enlisted in the Navy in June 1967 as a Submarine Radioman. After completion of Basic Training, Radioman "A" School and Morse Code School he reported to USS SAM RAYBURN (SSBN 635) where he earned his silver dolphins.

In 1968, Master Chief Allen reported to USS ALEXANDER HAMILTON (SSBN 617). He completed seven patrols and one Demonstration and Shakedown Operation (DASO). Upon completion of this tour he reported to Combat Systems Technical Schools Command as a student in the Advanced Crypto Maintenance Course.

In March 1974, he reported to Commander in Chief, U.S. Naval Forces Europe in London, England as a Communications Watch Officer. Master Chief Allen then reported to USS DANIEL WEBSTER (SSBN 626) completing six patrols, one DASO and a major shipyard overhaul. In January 1982, he reported to Commander in Chief Iberian Atlantic Command in Lisbon, Portugal as the NCOIC of the NATO Receiver Site Complex at Costa Da Caparica. During this tour he placed the first English speaking radio station on the air in Portugal. He also oversaw the construction and installation of the NATO Tare communications Complex. Upon completion of this tour he reported to USS ULYSSES S. GRANT (SSBN 631) where he completed four patrols, one DASO and a major shipyard overhaul.

In January 1990, Master Chief Allen reported to Commander, Submarine Squadron TWO in Groton, Connecticut as the Assistant Communications Officer. During this tour he was selected to serve on the Fiscal Year 1993 Chief Petty Officer Selection Board.

Master Chief Petty Officer Allen has been awarded the Joint Service Commendation Medal, Navy Commendation Medal, Navy Achievement Medal, Good Conduct Medal with silver star, Sea Service Deployment Ribbon with two silver and one bronze star and the Navy Overseas Duty Ribbon with four bronze stars.

Master Chief Allen is married to the former Eulita E. Gachette of Pointe Michel, Commonwealth of Dominica, West Indies. They have one daughter, Angela and a son, Mark.

USNS RANGE SENTINEL

The ex-USS SHERBURNE now USNS RANGE SENTINEL was commissioned at 1400, 20 September 1944 at the Permanente Metals Corporation of Richmond, California. On October 20, the ship proceeded to San Francisco, California to receive her first assignment as a training ship for troop transport crew being assembled at the Pre-commissioning Training Center at Treasure Island. This training assignment lasted from 24 October to 22 December 1944.

On 15 February the ship, loaded with her first contingent of troops and cargo, got underway bound for Eniwetok. She successfully completed her first wartime deployment with no damage, and returned to San Francisco on 24 May 1945. She was deployed on her second and final wartime mission on 2 June, 1945. The SHERBURNE was present in Tokyo Bay on 2 September 1945 for the Japanese surrender.

After the war, the SHERBURNE continued her service with the Pacific Fleet until 1947, when she was decommissioned. In 1959 she was struck from the naval Vessel Register and transferred to the maritime Administration for lay-up. In October 1971 the ex-USS SHERBURNE was placed in service as the USNS RANGE SENTINEL (T-AGM-22). The RANGE SENTINEL is under the operational command of the Military Sealift Command, and in direct support of the Navy's Fleet Ballistic Missile program as represented by FBM Operational Test Support Unit TWO which was activated in October 1971.

Since activation of the USNS RANGE SENTINEL, FBM Operational Test Support Unit TWO has successfully supported and tracked over sixty Polaris (A3), Poseidon (C3), Trident (C4), and Trident II (D5) CINC EVALUATION TESTS (CETs) from submerged submarines. As a secondary mission, USNS RANGE SENTINEL and the crew of OTSU II have been the support ship for more than sixty Demonstration and Shakedown Operations (DASOs). During these DASOs the USNS RANGE SENTINEL may host up to 250 guests to observe the submarine missile launch.

GENERAL CHARACTERISTICS

Hull Type: VC2-S-AP5
Displacement: 11,860 Tons
Length: 455 Feet
Beam: 62 Feet
Ships Crew: 72
Navy Detachment: 40
Normal Speed: 15 Knots

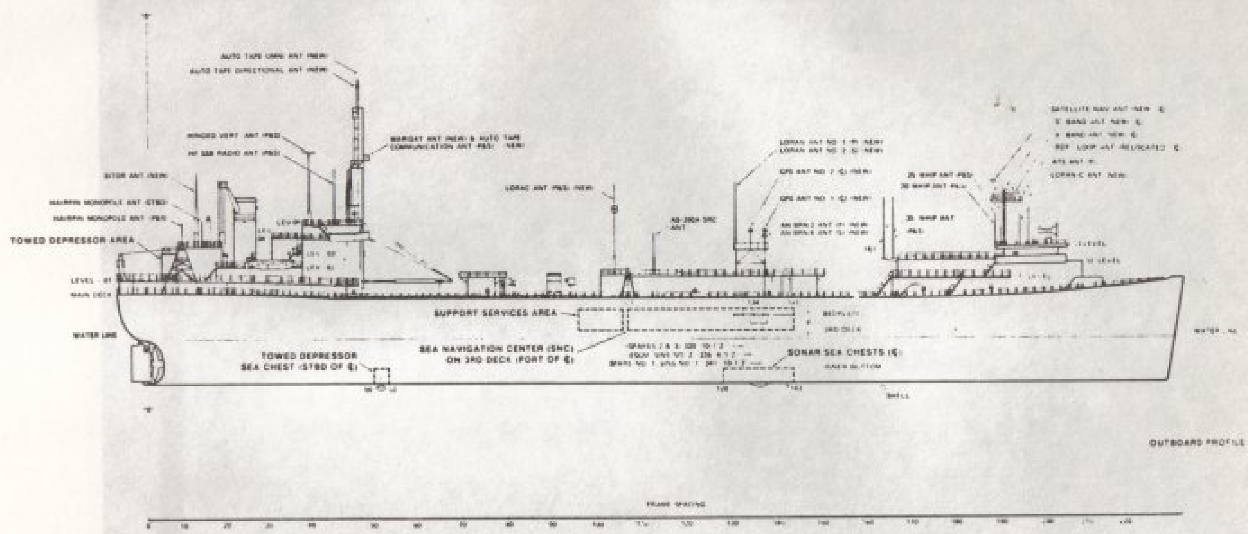
USNS VANGUARD

USNS VANGUARD was constructed in 1944 as a tanker, the SS MISSION SAN FERNANDO. In March, 1967, she was converted to a NASA Apollo Range Instrumentation Ship, and re-named USNS VANGUARD. The ship played an active role in the Apollo Lunar Program as a mid-ocean station in the world wide manned space flight network. In 1979, the Strategic Systems Project Office of the U.S. Navy acquired USNS VANGUARD from NASA. The ship was converted to a navigational test vehicle during the period April through October 1980 at Todd Shipyard, Alameda, California.

USNS VANGUARD is under the operational and administrative control of the Military Sealift Command, Atlantic Base, Bayonne, New Jersey. It is currently operating out of Port Canaveral, Florida. The ship has a marine crew of 80 MSC Civil Service employees and a technical crew of 20 Unisys and Rockwell International engineers.

GENERAL CHARACTERISTICS

Displacement: 24,710 Tons
Length: 595 Feet
Beam: 75 Feet
Ships Crew: 100
Navy Detachment: 12
Normal Speed: 14 Knots



OUTBOARD PROFILE

FIRST POSEIDON FLIGHT IN 1968

Development of the Poseidon (C3), a missile system with substantially greater capabilities than the Polaris series, began in 1966. Like its predecessors, the Lockheed-developed Poseidon is a two-stage underwater or surface-launched ballistic missile powered by solid fuel rocket motors and directed by a self-contained inertial guidance system.

The first Poseidon flight test missile was successfully pad-launched from Cape Kennedy, Florida, on August 16, 1968. Development flight tests were completed on June 29, 1970, and in October 1970, the first C3 was submarine-launched from the USS JAMES MADISON. Poseidon became operational aboard the MADISON in March 1971.

Phaseout of Polaris A1, A2, and A3 missiles occurred in 1965, 1974, and 1979 respectively, leaving only Poseidon C3 missiles on patrol in the fleet.

FIRST TRIDENT I (C4) LAUNCHED IN 1979

The three-stage, 4,000 miles range Trident I (C4) derives its name form the three-tined spear carried by the Greek god Poseidon and applies to the missile, the submarine, and the refit facilities.

After successful pad launches from Cape Canaveral, Florida, the first backfitted submarine to fire a Trident I (C4) missile was the USS FRANCIS SCOTT KEY (SSBN 657), in April 1979.

Trident was developed to ensure that the United States had a modern survivable strategic deterrent in the 1980's and beyond. It will allow the eventual replacement of strategic systems now deployed in the fleet whose effectiveness has been decreased because of age or more recent technology advances.

Because of C4's 4,000 mile range, each Trident submarine cruises in an ocean area 10 times larger than previously possible with Poseidon missiles. The increased range of the missile eliminates the need for overseas submarine bases, and allows submarines to spend more time on patrol, since they will be within target range sooner.

FIRST TRIDENT II (D5) FLIGHT IN 1989

The Trident II (D5) is a three-stage, solid propellent, inertially guided fleet ballistic missile. Trident II (D5) will be launched underwater from the USS OHIO Class of nuclear-propelled Trident Submarines, each of which has 24 missile tubes.

The first eight Trident Class Submarines are now carrying the Trident I (C4) missile, and may be backfitted to carry the Trident II (D5) missile. The ninth Trident Submarine, USS TENNESSEE (SSBN 734), was the first Trident Submarine to carry the Trident II (D5) missile.

Trident II and its' predecessor Trident I have ranges in excess of 4,000 nautical miles (4,600 statue miles). Trident II is more sophisticated, with a significantly greater payload capability. Similarly, the Trident/OHIO SSBNs are quieter, more capable, and harder to detect than their predecessors, the Poseidon Class SSBNs.

The Trident I missile was first deployed in 1979, and will remain on patrol until phased out in the late 1990s. Trident II was phased in after initial deployment in 1989 and will be the U.S.'s strategic seaborne deterrent well into the next century.

TRIDENT SUBMARINE

The Trident submarine has the capability to carry 24 Trident missiles, 8 more than the Poseidon Class submarines.

The combination of the new missile and submarine and the enhanced survivability of the FBM Submarine force will prove effective against any enemy threats.

The Mission

The Mission of Fleet Ballistic Missile Operational Test Support Unit TWO (OTSU-2) is two-fold in support of the Strategic Submarine Fleet. It includes first, the testing and evaluation of Strategic Navigational Systems and procedures, and second; the provision of Communications, Flight Safety and Telemetry Acquisition capabilities in support of Submarine Launched Ballistic Missile (SLBM) test flights in broad ocean areas.

To Support the Navigation portion of OTSU-2's mission, the Navigation Test ship, USNS VANGUARD, is equipped with the latest state of the art Strategic Navigational System. VANGUARD's role is to deploy to broad ocean areas and conduct tests in order to certify the accuracy of navigation equipments and procedures utilized onboard operational FBM submarines. Data from these tests is used to refine the submarine navigation systems and improve the accuracy of navigational inputs to submarines' missile fire control system.

To support the missile flight test portion of the OTSU-2 mission, the USNS RANGE SENTINEL has the assigned task to assume and maintain position during CINC Evaluation Tests as the Launch Area Support Ship (LASS). In this capacity, RANGE SENTINEL provides the necessary facilities to support and track a maximum of two missiles in flight simultaneously.

The CINC Evaluation Test (CET) program is part of a continuing process to determine the state of readiness and the effectiveness of the FBM Weapons System. Tactically deployed submarines scheduled for CETs have selected missiles configured with telemetry/destruct systems and exercise warheads. Because the missiles are selected at random before being specially instrumented for test, CETs are considered to offer a true indication of system reliability. The submarine and RANGE SENTINEL rendezvous at a predetermined point in the ocean where the CET-configured missiles are then launched from the submarine under conditions of tactical realism.

The USNS RANGE SENTINEL has a secondary mission assignment as Support Ship for Trident submarine Demonstration and Shakedown Operations (DASOs). The DASO program was established to determine the readiness of the complete weapons system for operational deployment, particularly following a shipyard overhaul or conversion period.

TRIDENT (D5) MISSILE

The Trident II (D5) missile is a three-staged solid propellant, inertially guided, submarine-launched fleet ballistic missile. Its range is far greater than the Poseidon (C3) missile, thus providing a several-fold increase in the operational ocean area of the U.S. submarine fleet. The D5 is also more sophisticated than the original Trident I (C4) missile. The D5 was carried by the new Trident submarines and may be backfitted into existing Trident Submarines. The new missiles equipped with multiple independently targetable reentry vehicle (MIRV) warheads. The Trident II missile has been certified and is deployed aboard Trident class (SSBN-726) submarines.

STATISTICS

	Poseidon (C3)	**Trident I (C4)**	**Trident II (D5)**
Length	34 Feet	34 Feet	44 Feet
Diameter	74 inches	74 inches	83 inches
Weight	65,000 pounds	73,000 pounds	130,000 pounds
Powered stages	2	3	3
Motor case material	1st Stage - Glass Fiber 2nd Stage - Glass Fiber	Kevlar/Epoxy	1st & 2nd stage - Graphite/Epoxy 3rd Stage- Kevlar/Epoxy
Nozzles	1, each stage	1, each stage	1, each stage
Controls	Single moveable nozzle actuated by a gas generator	Single moveable nozzle actuated by a gas generator	Single moveable nozzle actuated by a gas generator
Propellant	Solid 1st Stage-Composite	Solid, Cross-Linked Double Base	Solid Nitrate Ester Plasticized Polyethylene Glycol
Guidance	All inertial	Stellar & inertial	Stellar & inertial
Range (nominal)	2500NM (2800SM)	4000NM (4600SM)	>4000NM (4600SM)
Warhead	Nuclear capable	Nuclear capable	Nuclear capable

The following table illustrates the comparison between the 616 Class submarine and the new Trident I and the Trident II submarines.

SUBMARINES

	616 Class (All Decommissioned)	Trident I (8 Subs)	Trident II (7 Subs)
Length	**425 Feet**	**560 Feet**	**560 Feet**
Surface Displacement	**8,320 Tons**	**16,750**	**16,700**
Submerged Displacement	**8,250**	**18,750**	**18,700**
Torpedoes	**4 Bow**	**4 Bow**	**4 Bow**
Crew	**14 Officer 133 Enlisted**	**14 Officer 123 Enlisted**	**15 Officer 142 Enlisted**
Launch (Msl)	**Gas steam generator**	**Gas steam generator**	**V.E.E.**
Fire Control	**Mk 88 Mod 1 & 2**	**Mk 98**	**Mk 98 Mod I**
Navigation	**Mk 2 SINS**	**Mk 2 SINS**	**ESGN**

TECHNOLOGY ADVANCEMENT

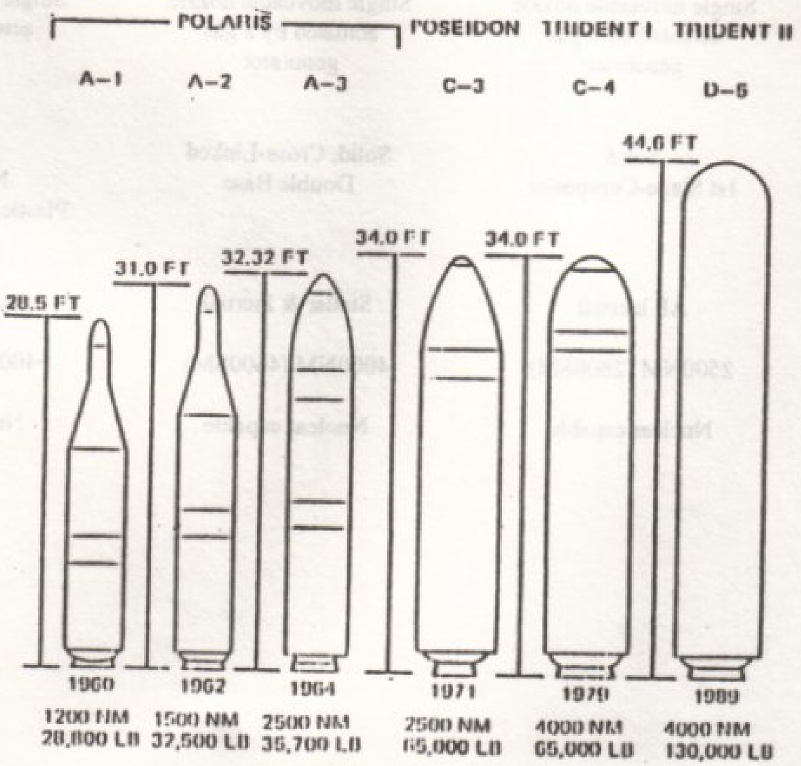
Increasing Trident's performance by 60 percent over that of the Poseidon missile called for advancement in the following key areas: propulsion, microelectronics, and new weight-saving materials.

In the propulsion area, Trident I was the first fleet ballistic missile to use three stages and a new, higher-energy propellant. Addition of the third stage provided increased range performance by using more of the total available missile volume for boost propulsion. The new high-energy propellant essentially packed more power into the available space than could be achieved with Poseidon propellant.

In micro electronics, Lockheed undertook development of components that incorporated three electronic technologies (beam lead, di-electric isolation, and low-power Shottky transistor-transistor logic). Each of the technologies existed as separate entities, but the combination of the three into a single electronic device represented a major advancement.

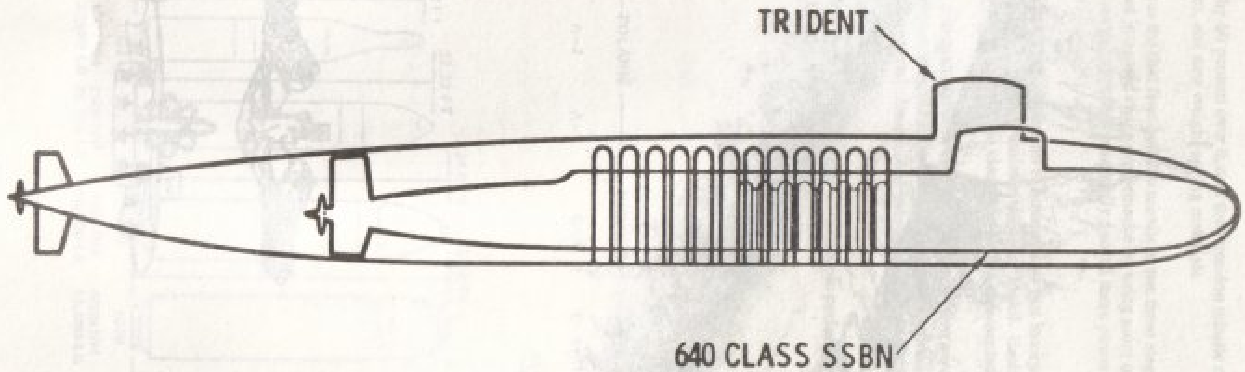
New forms of strong, light-weight materials were developed to reduce Trident's weight. The equipment section and other missile support structures are made from graphite epoxy and in some cases represent a 40 percent weight saving over aluminum. Development of the new material also resulted in lower labor costs when compared to manufacturing processes in use at the start of the development program.

Trident also uses an extendable "Aerospike" to increase its aerodynamic performance. The spike attaches to the front end of the missile and telescopes into position after launch.



FLEET BALLISTIC MISSILES

SSBN COMPARISON



LAUNCH AND FLIGHT SEQUENCES

The missile is launched from a submerged FBM submarine and is affected by the pressure of expanding gas within the missile launch tube. after the missile has attained sufficient acceleration and traveled a specified distance from the submarine, the first-stage motor ignites. The Aerospike deploys, and the boost phase begins. When the first-stage motor burns out, it and the inter-stage are separated form the missile, the second stage motor is ignited, and the boost phase continues. As acceleration decreases because of second stage motor burnout, the second stage motor is separated and the third stage motor ignites to continue the boost phase. Third stage burnout completes the boost phase, after which the post boost control system provides equipment section thrust and control until all the reentry bodies have been deployed.