

Welcome Aboard



**WORLD'S FIRST
NUCLEAR FBM
SUBMARINE**

**WELCOME ABOARD
USS GEORGE WASHINGTON (SSBN 598)**

It is our pleasure to welcome you to GEORGE WASHINGTON. We trust that your visit will be both pleasant and informative.

Since her commissioning on 30 December 1959, GEORGE WASHINGTON has established a long list of enduring achievements. While we take pride in our leadership in POLARIS, we know that the new records we set are the by-products and not the mainstream of our mission. In completing our POLARIS patrols, we have contributed to the prevention of war and in this do we find our greatest pride.

The pride we feel in this ship is not ours alone. It belongs to those in government and service who conceived her, to those who supplied her equipment, and to those thousands who have faithfully supported her. It also belongs in full and equal measure to those who wait at home with patience and courage.

We are especially proud of the men who have served in GEORGE WASHINGTON. Their labor, dedication, and endurance on long patrols can never be really appreciated. Without them and their irresistible spirit, GEORGE WASHINGTON is a hull—with them she is a ship.



COMMANDER ROBERT V. MORGAN

Commander Robert V. MORGAN was born in Kansas City, Missouri and subsequently settled in Sedalia, Missouri. He was graduated from the United States Naval Academy on 3 June 1959.

Commander MORGAN's initial duty assignment was in USS NICHOLAS (DDE 449) homeported at Pearl Harbor, Hawaii. He served over two years in NICHOLAS, participating in the first FRAM II overhaul and one deployment to the Western Pacific.

Commander MORGAN reported to submarine school in September, 1961 and subsequently attended Nuclear Power Training at Mare Island, California and Idaho Falls, Idaho.

In May 1963, Commander MORGAN reported for duty in USS THOMAS EDISON (SSBN 610) (GOLD) where he completed four polaris patrols. Following detachment from EDISON in March 1965, Commander MORGAN was assigned as Engineer Officer in the pre-commissioning unit of USS MARIANO G. VALLEJO (SSBN 658) (BLUE) at Mare Island Naval Shipyard, Vallejo, California. Following the completion of VALLEJO's first patrol, Commander MORGAN was ordered as Engineer Officer at Fleet Submarine Training Facility, Pearl Harbor, Hawaii. Upon completion of this tour Commander MORGAN was awarded the Navy Commendation Medal for meritorious service.

In February 1970, Commander MORGAN reported for duty as Executive Officer, USS SCAMP (SSN 588). During his service in SCAMP, including a refueling overhaul at Bremerton, Washington and two deployments to the Western Pacific, from SCAMP's homeport in San Diego, she was awarded a Meritorious Unit Commendation and Commander MORGAN was presented a second award of the Navy Commendation Medal.

Commander MORGAN was assigned as Commander Submarine Force Representative to Enlisted Personnel Distribution Office, U. S. Pacific Fleet in San Diego, California from November 1972 until September 1974, at which time he commenced training as Prospective Commanding Officer.

Commander MORGAN is married to the former Lucille Beebe of Glendora, California. They reside in Aiea with their three sons, Lance, Robert and Michael.

"POLARIS—from out of the deep to target. Perfect". This radio message from Commander J. B. OSBORN to President EISENHOWER at 12:39 P.M. (EST) on 20 July 1960 marked the culmination of five years of intensive study and work leading to the world's first Fleet Ballistic Missile Submarine—the USS GEORGE WASHINGTON (SSBN 598).

PRE-COMMISSIONING. The story began in 1955 when a committee headed by Dr. James R. KILLIAN, Jr., recommended to President EISENHOWER the development of a self-sufficient undersea shipbased ballistic missile. A revolutionary partnership of nuclear power, missile, and submarine was in the formative stage. On 1 November 1957 the keel was laid for the USS SCORPION at the Electric Boat Division of General Dynamics Corporation, Groton, Conn. In order to accommodate the formulation of this concept in warfare, the decision was made to modify SCORPION. The hull was severed and a 130 foot missile section was inserted to convert it to the GEORGE WASHINGTON. This move could not have been undertaken without Congressional approval and supplemental appropriations to the 1958 fiscal shipbuilding program.

Thus on June 9, 1959, fourteen months after design specifications were approved the GEORGE WASHINGTON slid down the ways as the sixth nuclear submarine built by General Dynamic Corporation. Christened "GEORGE WASHINGTON" by Mrs. Robert B. ANDERSON (after an address by the Honorable J. McNEIL, Assistant Secretary of Defense), the launching completed the first phase of a new page in U.S. Naval History.

During the summer, fall, and winter of 1959 multiple interlacing channels of equipment testing, delivery and installation were brought together. Working night and day with the builders, the officers and men under the Prospective Commanding Officer, Commander OSBORN, coordinated the activities of initial outfitting. To accomplish this feat, over 6,000 contractors were involved in the program.

On September 15, 1959 GEORGE WASHINGTON was "provisionally accepted" by the Navy and two months later, on 17 November, put to sea for the first time. Vice Admiral H. G. RICKOVER, USN, was embarked to witness this historic event.

After highly successful sea trials, the ship was commissioned on 30 December in ceremonies at Groton, Conn. At the commissioning ceremonies, Dr. George B. KISTIAKOWSKY, science advisor to the President termed the GEORGE WASHINGTON "A microcosm of American industry" a tribute to the complexity and vast amount of infinite detail that had gone into making the first FBM submarine.

1960. On 28 June 1960, after further equipment installation and trials GEORGE WASHINGTON departed Groton for Cape Canaveral, to meet the POLARIS missile. In a submarine roughly the size of a light cruiser (380 feet long by 33 feet in beam, with a displacement of 5600 tons) were loaded two 28 feet long, 15 ton, solid propellant POLARIS missiles.

Then on 20 July, with Rear Admiral William F. RABORN, USN, in the Attack Center of the ship, the first successful launching of the POLARIS missile from a submerged submarine occurred. Less than three hours later a second successful missile was launched. Both missiles raced straight and true to the intended impact point 1100 miles down the Atlantic Missile Test

Range. The jubilant BLUE Crew returned the ship to Cape Canaveral to be relieved by the GOLD Crew.

On 30 July, after loading two more missiles, GEORGE WASHINGTON returned to sea. That afternoon, GOLD Crew duplicated the earlier success of BLUE as the third missile streaked down the test range. The fourth missile was fired on the first of August but had to be destroyed by the Range Safety Officer after an inflight malfunction developed. Nevertheless, the success of POLARIS had been proven—successful launching from a submarine became the fact after the drawing board dreams of the designers.

The GOLD Crew shakedown was completed on 30 August when GEORGE WASHINGTON returned to Groton for a postshakedown availability at the builder's yard. Completely ready except for her weapons, GEORGE WASHINGTON departed on 28 October for the Naval Weapons Annex, Charleston, South Carolina. The first patrol load of 16 POLARIS missiles was taken aboard as final preparations were made for the initial Fleet Ballistic Missile Submarine Deployment.

On 15 November, Vice Admiral Elton W. GRENFELL, USN, Commander Submarine Force, U.S. Atlantic Fleet read the citation by the Secretary of the Navy awarding the Navy Unit Commendation "For outstanding achievement during operations at sea from 9 June 1959 until 20 July 1960". Vice Admiral GRENFELL also presented the Legion of Merit to Commander OSBORN in the name of the Secretary of the Navy.

Following the ceremonies, the lines were cast off and GEORGE WASHINGTON, Commander J. B. OSBORN, Commanding, and the BLUE Crew proceeded to sea for the first POLARIS patrol—a full two years ahead of the initial program schedule. As GEORGE WASHINGTON proceeded down the Cooper River through Charleston, the "three cheers" rendered by her mother ship USS PROTEUS (AS19), ignited a spontaneous demonstration along the entire waterfront. The tremendous send-off by all the Naval units in the Charleston area, including "manning the rail", will never be forgotten by the personnel embarked in GEORGE WASHINGTON that afternoon.

1961. After 66 days and 10 hours of submergence and a most successful patrol, GEORGE WASHINGTON returned to New London. After a 21 day upkeep and refit period during which the work load approached overhaul proportions, the GOLD Crew departed on the first POLARIS FBM GOLD Patrol. The deployment occurred on a most appropriate date, GEORGE WASHINGTON's birthday.

During the SEVENTH patrol, Commander Submarine Force, U.S. Atlantic Fleet, Vice Admiral Elton W. GRENFELL, USN, rode the GEORGE WASHINGTON for ten days. During this same period a television crew from NBC-TV recorded a one hour fullcolor documentary concerning the ship and crew at sea. This was nationally televised on December 19, 1962.

In November 1962, GEORGE WASHINGTON proved the operational readiness of the POLARIS system by undergoing a record short upkeep of only nine days.

On 11 June 1964, 5 years after launching, GEORGE WASHINGTON returned to Electric Boat Division of General Dynamics Corporation Groton, Conn. For her homecoming she proudly streamed a 146 foot long homeward bound pennant. Homeward bound pennants have a long history in Naval Traditions. They are symbolic of the length of time a vessel has been deployed from the Continental United States and are displayed on the return voyage only if the vessel has been away for more than 9 months. The homeward

bound pennant flown by GEORGE WASHINGTON had fifteen white stars on a 9 foot blue hoist with each star representing a patrol. Each foot of the 137 foot long red and white fly represented each officer and man aboard.

While at Electric Boat, GEORGE WASHINGTON received the POLARIS A-3 missile capability and much new equipment. Many changes and improvements were added to make living aboard more pleasant for both officers and men.

In 1966, after completion of overhaul the GEORGE WASHINGTON resumed her vital role in the nation's defense. Owing primarily to the excellence of her equipment and crews, she was able to make four POLARIS deterrent patrols every year—each patrol lasting approximately two months.

In 1970, Eleven years after launching, the GEORGE WASHINGTON entered Charleston Naval Shipyard, Charleston, South Carolina for her second overhaul, and modernization.

In November 1971, GEORGE WASHINGTON sailed from Charleston to return to the fleet as an operational submarine.

In January of 1973, the GEORGE WASHINGTON completed her last deterrent patrol in the Atlantic. On October 17, 1972, the announcement was made official that the homeport of GEORGE WASHINGTON would be changed from Charleston, South Carolina to Pearl Harbor, Hawaii.

Whether in Atlantic or Pacific waters, GEORGE WASHINGTON has continued her role as a valuable asset to the protection of democracy and a deterrent to aggression. This asset was ably demonstrated by earning the Battle Efficiency "E" for her outstanding performance in Fiscal Year 1975.

Shortly after her Sixteenth anniversary in December 1975, GEORGE WASHINGTON will enter Mare Island Naval Shipyard, Vallejo, California for her third overhaul, one which will extend her usefulness into the 1980's.

THE POLARIS WEAPON SYSTEM

The Weapons System is a complex matrix of several subsystems including the missile, fire control, launcher, navigation and various supporting subsystems located throughout the submarine. The men of the GEORGE WASHINGTON form the cohesive substance that brings all of the subsystems together to function as the most powerful deterrent to war in the world today.

THE MISSILE AND MISSILE GUIDANCE

The Polaris missile, named for the North Star, is a two-staged ballistic missile, designed to be launched from either surfaced or submerged submarines. The missile is powered by solid fuel rocket motors and is guided by a self-contained inertial guidance system independent of external commands or control.

Within the submarine, personnel can prepare and check the missiles for firing while the ship is submerged. Ejected from its launching tube by air or gas, Polaris is forcefully propelled above the surface of the water where the rocket motor fuel ignites. The missile guidance system puts the missile on the correct course at the time of launch and automatically computes a new course should the missile deviate from its path. At the precise instant required, the guidance system shuts off the rocket motors and triggers separation of the re-entry body from the missile. The re-entry body with its nuclear warhead then follows a ballistic (free falling) trajectory to the target as far as 2500 miles away.

FIRE CONTROL

The fire control system feeds a wealth of coordinated information to the missile guidance system. Ship location, true north heading, target location, and trajectory to be flown by the missile are continuously supplied until the very instant of firing.

LAUNCHER

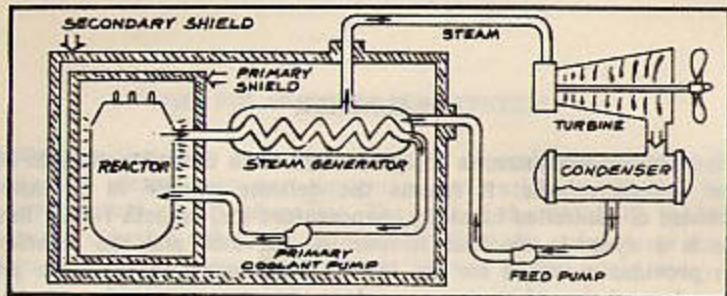
The launcher subsystem is designed to perform three functions in supporting the Polaris missile. It houses the delicate missile in a comfortable environment of controlled humidity, temperature and smooth riding. Since the missile is a dynamic machine it must be serviced and the launcher subsystem provides a means for the Missile Technicians to cross the pressure hull boundary of the submarine to perform maintenance on the missile. Last, and most important, the launcher subsystem can eject the missiles from the submarine in a matter of minutes after receipt of a command to launch.

NAVIGATION

The navigation system is an important factor in successful missile firing and must be able to pinpoint the ship's exact position at all times. To permit extended periods of submergence during patrol, the ship is equipped with the Ship's Inertial Navigation System (SINS), an improved version of the equipment used for under ice polar explorations by earlier nuclear submarines.

LIFE SUPPORT

In addition to the many facilities provided to insure the habitability of the ship, there is an ample air conditioning system for the benefit of the personnel and machines. Special atmosphere control equipment is provided to maintain standard atmospheric conditions. Electrolytic oxygen generators permit the submarine to manufacture an unlimited supply of oxygen from the sea water. Other specialized equipment provides for removal of irritants, elimination of carbon dioxide and maintenance and proper balance of other atmospheric elements during prolonged submerged periods.



THE POWER PLANT

The GEORGE WASHINGTON is powered by a nuclear power plant which consists of a nuclear reactor with its associated circulating water and steam cycles and auxiliary machinery.

The primary system is a circulating water cycle and consists of the reactor, identical port and starboard loops of piping, primary coolant pumps and the tubes of the steam generators. Heat is produced in the reactor by nuclear fission and is transferred to the circulating primary coolant water which is pressurized to prevent boiling. This water is then pumped through the steam generator tubes where it transfers its heat to the shell or the secondary side of the steam generators where it boils water to form steam. It is then pumped back to the reactor by the primary coolant pumps where it is heated for the next cycle.

The secondary system is the steam producing cycle and is made up of the shell side of the steam generators, turbines, condensers, and steam generator feed pumps. It is completely isolated from the primary system since the primary water goes through the tubes of the steam generator while the water which is boiling to make steam is on the shell side of the steam generator. Steam rises from the steam generators, then flows to the engine room where it drives the ship's service turbo-generators which supply the ship with electricity and the main propulsion turbines which drive the propeller. After passing through the turbines, the steam is condensed and the water is fed back to the steam generators by the feed pumps. There is no step in the generation of this power which requires the presence of air or oxygen. This fact alone allows the ship to operate completely divorced from the earth's atmosphere for extended periods of time.

During the operation of the nuclear power plant high levels of radiation exist around the reactor and personnel are not permitted entrance into the reactor compartment until a few minutes after the reactor is shut down. Heavy shielding is used to protect the crew so that the average crew member receives less radiation than he would receive from natural sources ashore.

THE CREW

Each FBM submarine has two crews, called Blue and Gold, of about 140 officers and men each. While one crew mans the ship on patrol, the other crew is at its homeport, undergoing refresher training, taking leave, breaking in new crew members, and in general getting ready to go back to sea.

Each crew is made up of the highest caliber of men. Originally the main source for FBM personnel was from within the Navy. For the most part the training required was only that needed in the specialized Polaris field. But with the steady demand for more and more men as the Polaris submarine fleet has grown, most now are new recruits and are the very best men our nation can make available.

A special recruiting program for qualified high school graduates guarantees technical training and operational experience in the FBM weapon system field. For men directly concerned with Polaris missiles and the missile launching system, schooling can run more than two years.

To be able to maintain and operate the equipment, a man must be thoroughly familiar with the basic theory and fundamental physical principles involved. A student must grasp the basics of digital computers, inertial theory, computer logic, transistor theory, use of testing devices and so on. Much of this kind of training is available outside the Navy only at the college level.

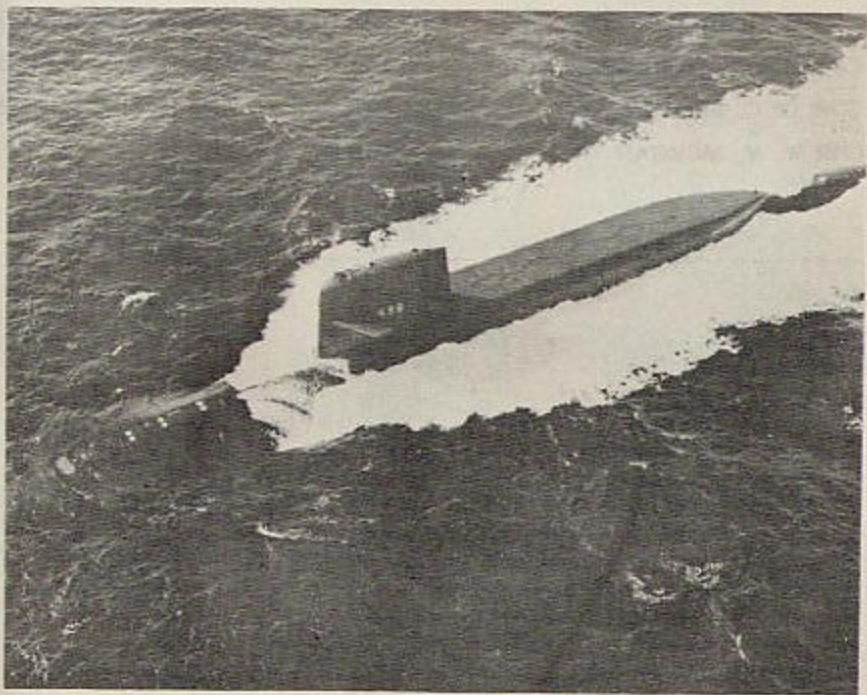
The goal of this highly specialized training is to have the technician fully ready for his assigned responsibilities the day he becomes a Polaris submarine crewman. On patrol, an FBM submarine is literally a world unto itself. There is no calling for outside help. The submarine must be—and is—self sufficient.

SUMMATION

With almost unlimited cruising range and with endurance limited only by the crew, the FBM nuclear submarine is capable of extended submerged operations in the international waters of the world which comprise about 70 percent of the earth's surface. Free of the need to surface or extend a snorkel above the surface for continuous operation, FBM nuclear submarines remain hidden by an oceanic curtain, their locations unknown to any potential enemy.

GEORGE WASHINGTON

Length overall	381 Feet
Breadth	33 Feet
Depth Capability	In excess of 400 Feet
Speed Capability	In excess of 20 Knots
Displacement (approximate)	5600 Tons
Keel Laid	1 November 1957
Launched	9 June 1959
Commissioned	30 December 1959



THE COMMANDING OFFICERS OF GEORGE WASHINGTON

CDR J. B. OSBORN	BLUE	JUN 59	MAY 62
CDR J. L. FROM	GOLD	DEC 59	JUN 63
CDR E. W. COOKE	BLUE	MAY 62	JUN 66
CDR D. P. BROOKS	GOLD	JUN 63	JUN 65
CDR O. SMITH	BLUE	JUN 66	DEC 69
CDR C. G. MERRITT	GOLD	JUN 65	MAY 70
CDR D. E. KNEPPER	BLUE	DEC 69	AUG 73
LCDR K. M. BUNTING (ACT)	GOLD	MAY 70	JUN 70
CDR D. E. FIELDS	GOLD	OCT 71	FEB 73
CDR C. G. GOSTER JR.	GOLD	MAR 73	JUN 75
CDR B. A. HOLMBERG	BLUE	AUG 73	SEP 75
CDR D. C. MINTON, III	GOLD	APR 73	JUN 75
CDR R. V. MORGAN	GOLD	JUN 75	