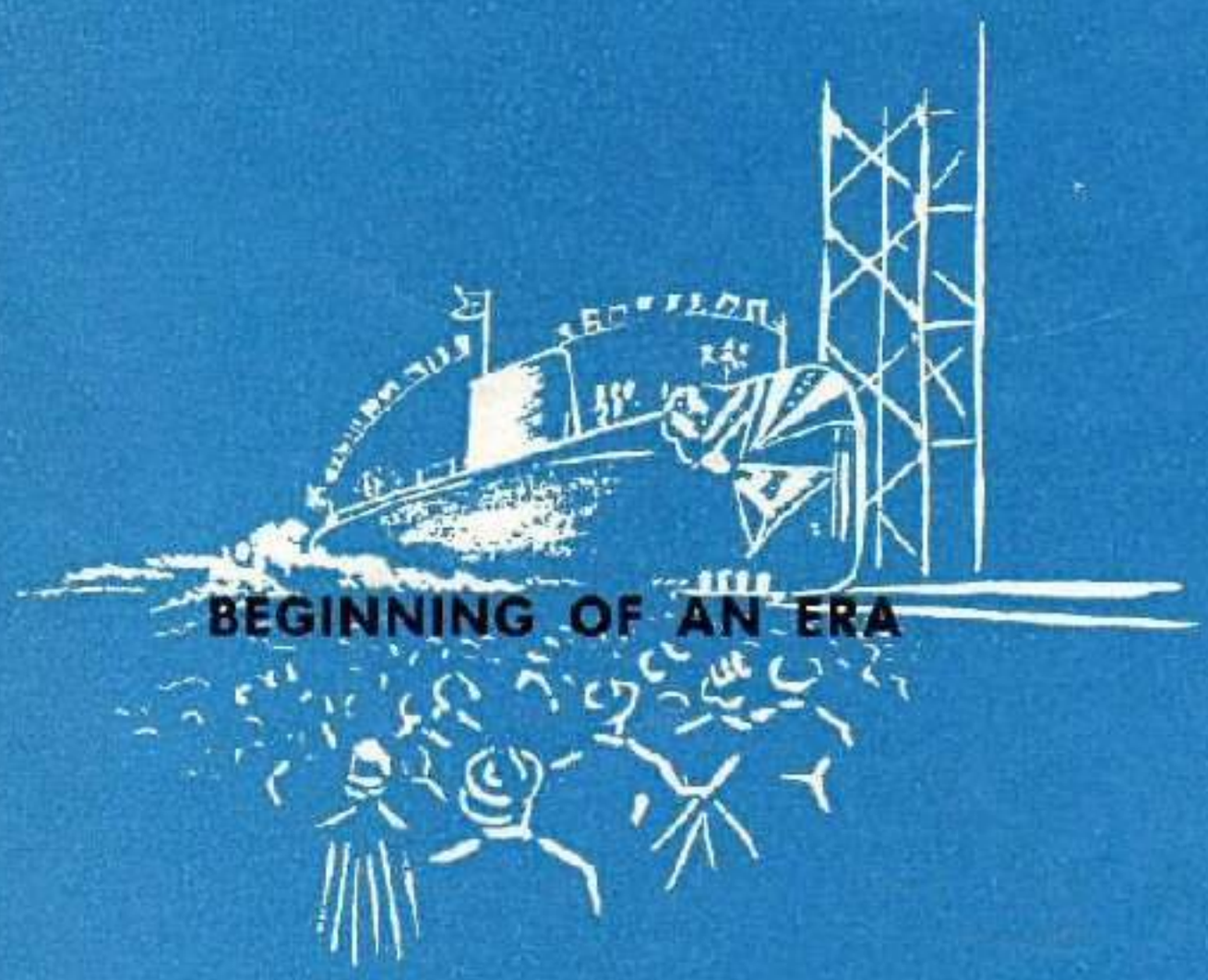
USS NAUTILUS



BEGINNING OF AN ERA

UNDERWAY ON NUCLEAR POWER

Combat Potential . . .

It has been said that anything a conventionally powered submarine can do, NAUTILUS and submarines like her can do better, quicker and longer. True submarines like the NAUTILUS are deadly enemies of both surface ships and other submarines because the true submarine, independent of the earth's atmosphere, can remain fully submerged almost indefinitely and is thus especially difficult to locate and destroy. Submarines like the NAUTILUS can also be fitted to fire guided missiles. In this role they will serve as invisible and virtually undetectable launching platforms, and thereby constitute an almost unchallengeable deterrent force to any potential aggressor.

Nautilus is a name which has been associated with proud fighting ships of the U. S. Navy since 1803. The SSN571 is the sixth ship to bear that name. The first two were schooners, the third a submarine, the fourth was a motor patrol boat and the fifth was a submarine that earned the Presidential Unit Citation during World War II.

NAUTILUS operates under the Commander Submarine Force, U. S. Atlantic Fleet, with headquarters at the Submarine Base at New London, Connecticut. The evaluation of NAUTILUS' engineering plant has been fully completed. Her current employment is aimed toward a continuing evaluation of her immense combat potential and toward acquainting anti-submarine units with the problems of combatting submarines like the NAUTILUS.

The NAUTILUS Program . . .

From the time the first atomic "pile" under the Chicago Stadium went critical in 1939 many men dreamed of the useful application of atomic energy. In 1947 and 1948 Captain (now Admiral) Rickover and a group of naval engineering officers began investigating the feasibility of a submarine nuclear propulsion plant. Studies were conducted first at Oak Ridge and later in 1948 at the Argonne National Laboratories. These studies led to the formal establishment within the Bureau of Ships and the Atomic Energy Commission of a program, with Admiral Rickover in charge, to design and build a nuclear sub.

Contracts were let to the Westinghouse Electric Corporation to build the power plant and later, to the Electric Boat Division of General Dynamics Corporation, Groton, Connecticut, to build the submarine. At the same time a prototype engineering plant was authorized and built at the National Reactor Testing Station at Arco, Idaho. This prototype was put into operation in March 1953 by officers and men selected for assignment to NAUTILUS and has since been operated by naval trainees. Its first operation provided trained operators and invaluable operational data on new equipment for the NAUTILUS.

On December 12, 1951 the Navy Department announced that the world's first nuclear powered submarine (SSN571) would carry the name NAUTILUS. Authorized by the Congress in July 1951, her keel was laid at the Electric Boat Division by the Honorable Harry S. Truman, President of the United States, on June 14, 1952. A year and a half later, January 21, 1954, Mrs. Dwight D. Eisenhower broke the traditional bottle of champagne on her bow as the ship slid down the ways of the General Dynamics shipyard into the Thames River.

NAUTILUS was commissioned September 30, 1954. Present on this occasion were many distinguished guests, including Admiral Jerauld Wright, Commander in Chief, U. S. Atlantic Fleet who in the commissioning speech stated, "Today the Navy turns a channel marker in the course of history." After many months of painstaking construction and dockside testing, on the morning of January 17, 1955 at 1100 A. M. her Commanding Officer, Commander Eugene P. Wilkinson, ordered the lines cast off and signaled to the Submarine Force Commander, "Underway on nuclear power."

NAUTILUS Operations . . .

Two years later NAUTILUS returned to Electric Boat Division to have her first nuclear core replaced. Her performance during this two year period exceeded the most optimistic hopes. She had been underway for 5,566.5 hours, of which 3,170.9 hours were submerged. She had steamed 62,559.6 miles of which 36,498.0 miles were steamed submerged. NAUTILUS early captured all records for submerged endurance and speed. During one transit from Key West, Florida to New London, Conn., NAUTILUS averaged a speed in excess of 20 knots making the run completely submerged. At another time she remained completely submerged for 265 hours. In May 1957 NAUTILUS established another record for long, high speed submerged transits by returning to Panama from San Diego at an average speed of 19.1 knots.

The most significant result of all her operations was the proof that nuclear power was safe, reliable and an immensely successful means of submarine propulsion. Nineteen nuclear propelled submarines are now operating, being built, or planned. No further diesel powered submarines are planned.

ENGINEERING PLANT DESCRIPTION

Primary System

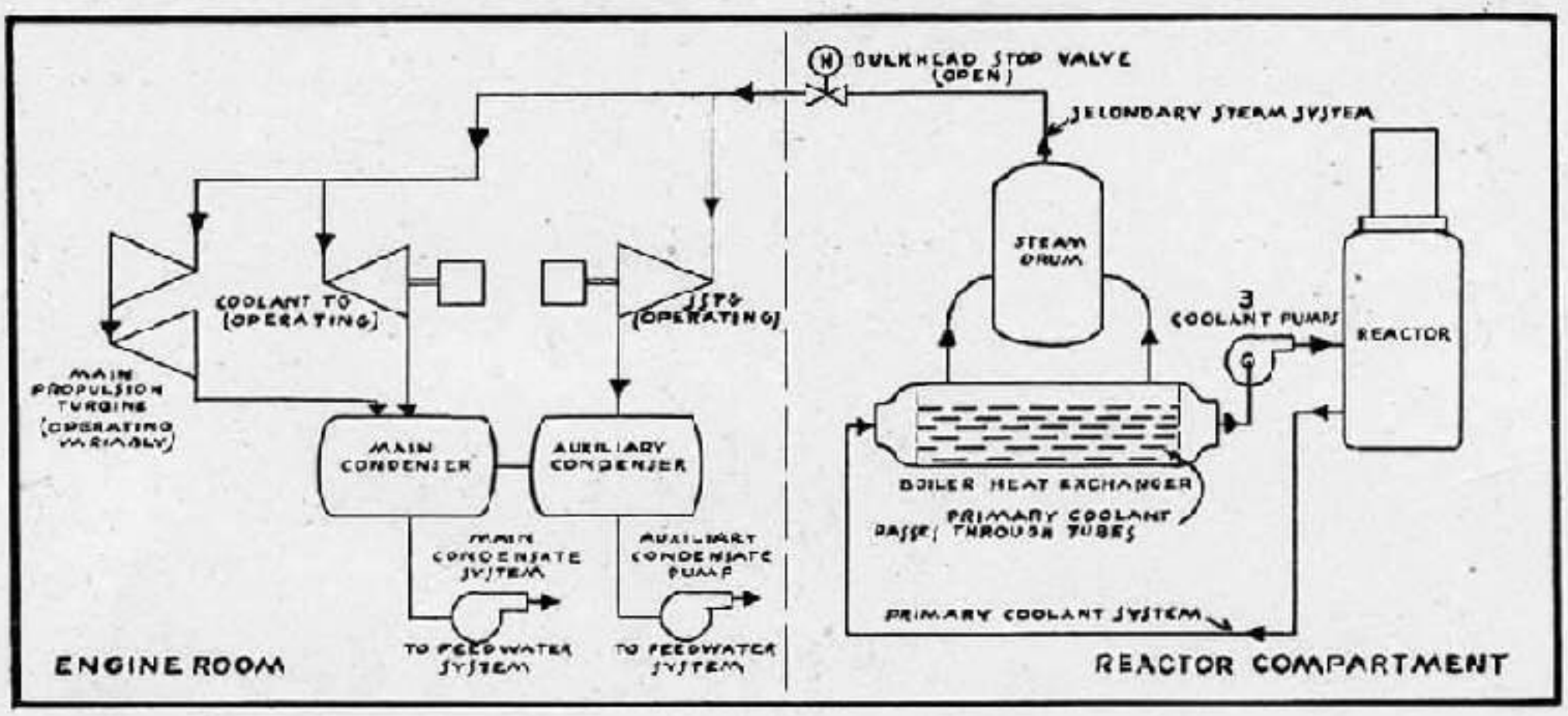
The reactor compartment equipment includes one reactor, and two primary loops, of which only one loop is shown on the sketch.

The reactor gives up heat to the primary coolant, water, which then is forced through the boiler heat exchanger tubes where it gives up heat to form steam on the shell or secondary side of the boiler. The primary coolant is then pumped back into the reactor where it is again heated up.

The water from the starboard and port loops mixes together in the reactor, but the rest of the plant is divided into identical units port and starboard. The primary coolant water is kept pressurized to insure that boiling will not take place in the reactor.

Secondary System

The secondary system is the steam system. It is completely isolated from the primary system since the primary water goes through the tubes of the boiler



while the secondary water which is boiling to make steam is on the shell side of the boiler.

Steam rises from the boiler to the steam drum where the water carry-over is separated from the steam. The dry saturated steam then flows back to the engine room where it drives ship service turbo generator sets (SSTG), coolant turbo-generator sets (CTG) and the main propulsion turbines.

Provision is made for declutching the propulsion turbines and reduction gears from the propeller shafts so that the ship can be driven through the water by electric motors mounted integrally on the propeller shafts. The electric motors can receive power from the battery, from small diesel engines or from AC-DC motor generator sets.

Radiation

When the reactor is in operation on the lower level of the reactor compartment it is kept isolated and personnel cannot enter this space. Within a few minutes after shutdown the lower level reactor compartment can be entered to perform maintenance work.

The shield of the NAUTILUS reactor reduces the radiation to a level such that, during a cruise lasting the life of the reactor, the average crew member will receive less radiation than he would during a lifetime from x-rays and cosmic rays and natural radioactivity in the sea, air, drinking water and ground. In one year of operation the average crew member received less than the Bureau of Standards allowable radiation dosage for one week.

Startup

A typical schedule for startup from a cold condition follows:

Four hours before underway—one man starts a pre-critical checkoff, which is a thorough check of all reactor control equipment. The in-port watch in the engine room and reactor compartment checks systems lined up for operation.

Two hours before underway time—Engineering duty section stations the watch. Commence pulling rods.

One and one-half hours before underway time—Reactor startup completed —warming up primary loop and steam lines.

Thirty minutes before underway—warm up turbines. Put turbo generator sets in operation.

Fifteen minutes before underway time—ready to answer bells.

KEEL LAID :	14 June 1952
LAUNCHED:	21 January 1954
COMMISSIONED :	30 September 1954
MAIDEN VOYAGE :	17 January 1955
DELIVERY :	22 April 1955
BUILDER :	General Dynamics Corporation Electric Boat Division