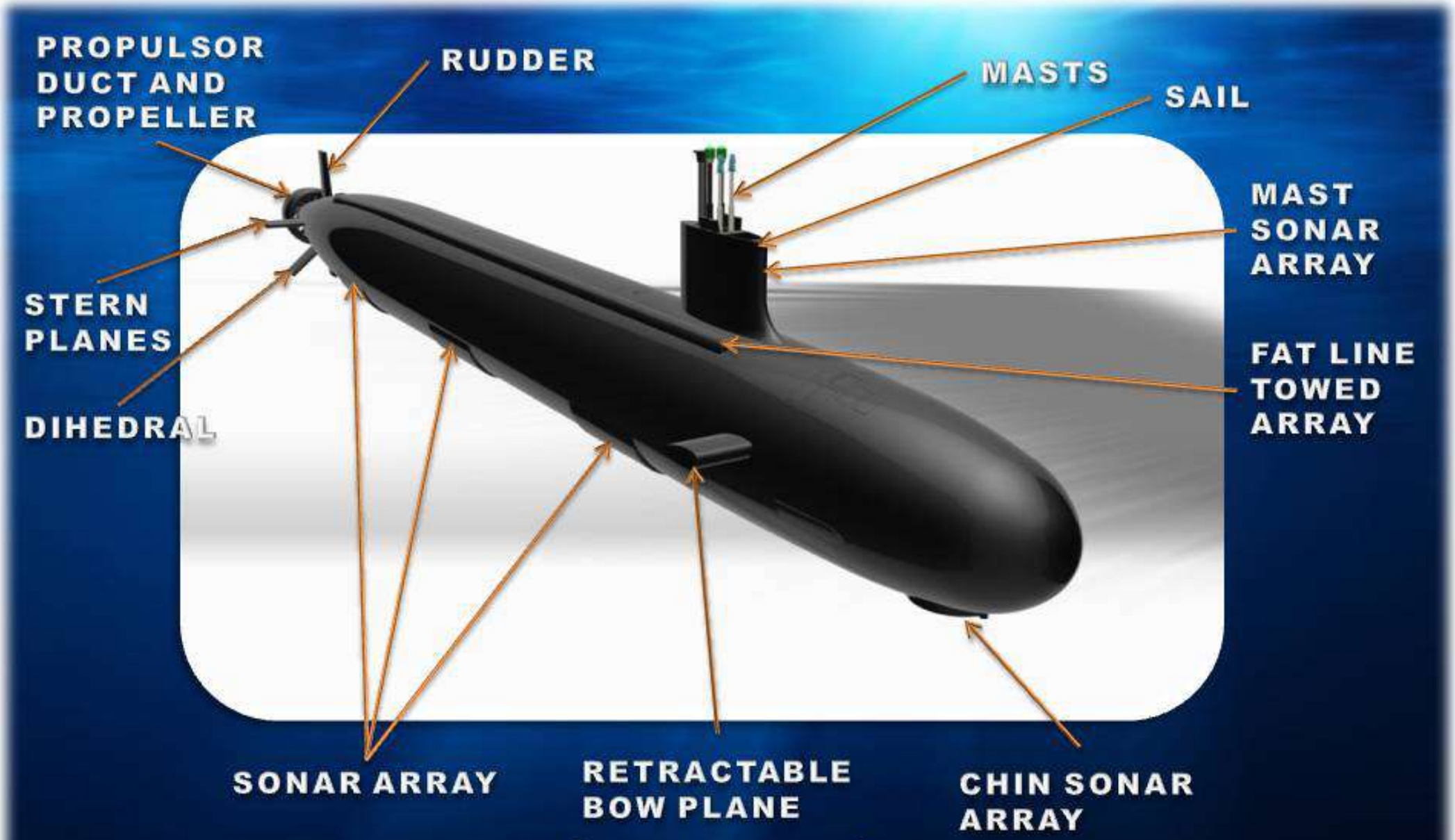
USS Virginia
SSN 774

Designers: Peter Botton, Tyler Breeding, Chad Edney, Corey Jones, Jennifer Roop

Instructor: Jeff Levy



Exterior Elements & Specifications

Displacement: 7,700 tons
Length: 377 feet
Beam: 34 feet
Speed: 25 knots
Depth: 800 feet

The hull is constructed to the equivalent of 5 layers of 3/8" thick HY 100 Steel for a total thickness of approximately 2" . The exterior hull surface has a sonar absorbing rubber coating molded/applied to it.

Virginia Class (SSN-774)
Fast Attack Nuclear Submarine

RIGHT SIDE VIEW

FRONT VIEW

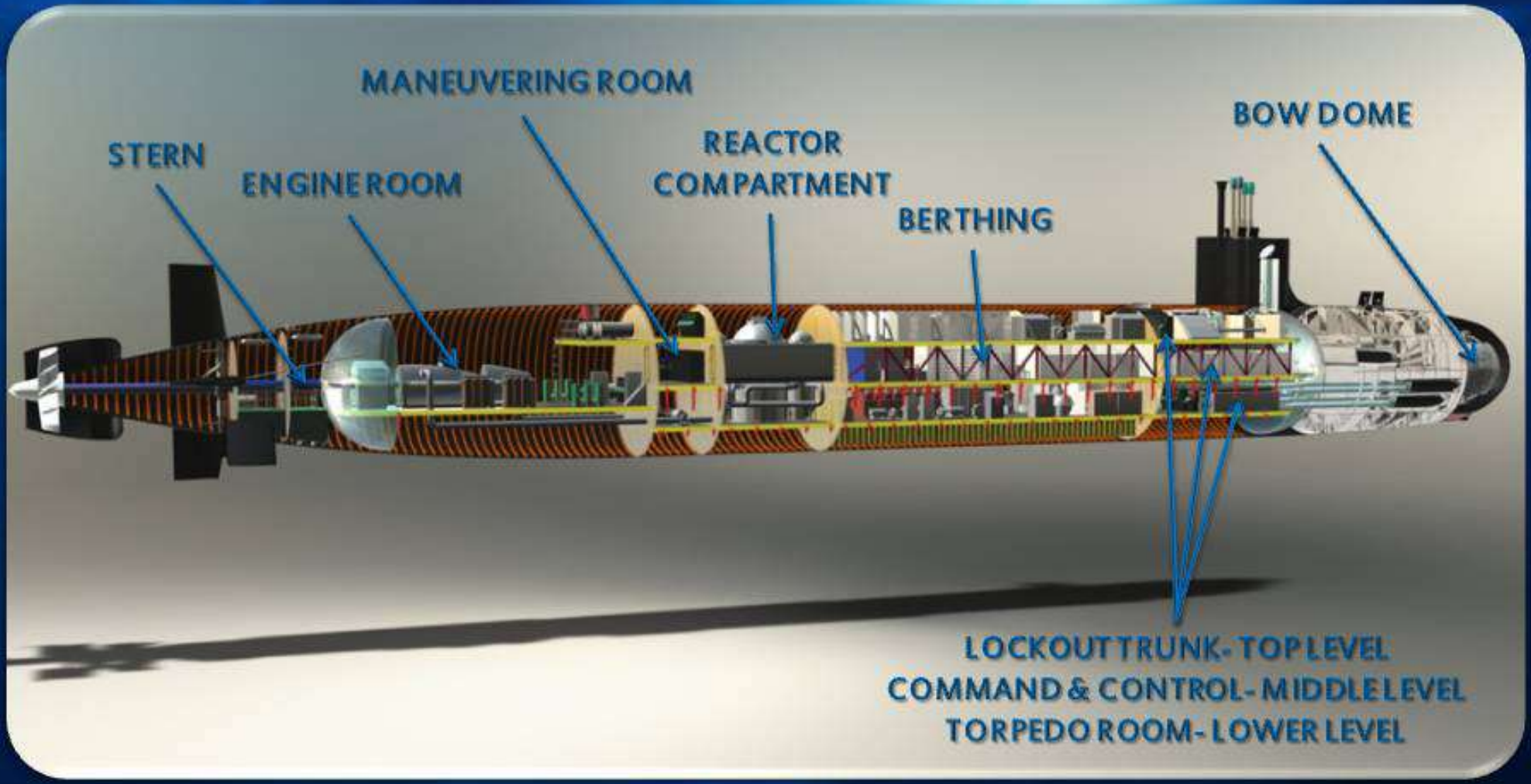
BOTTOM VIEW

BACK VIEW

LEFT SIDE VIEW

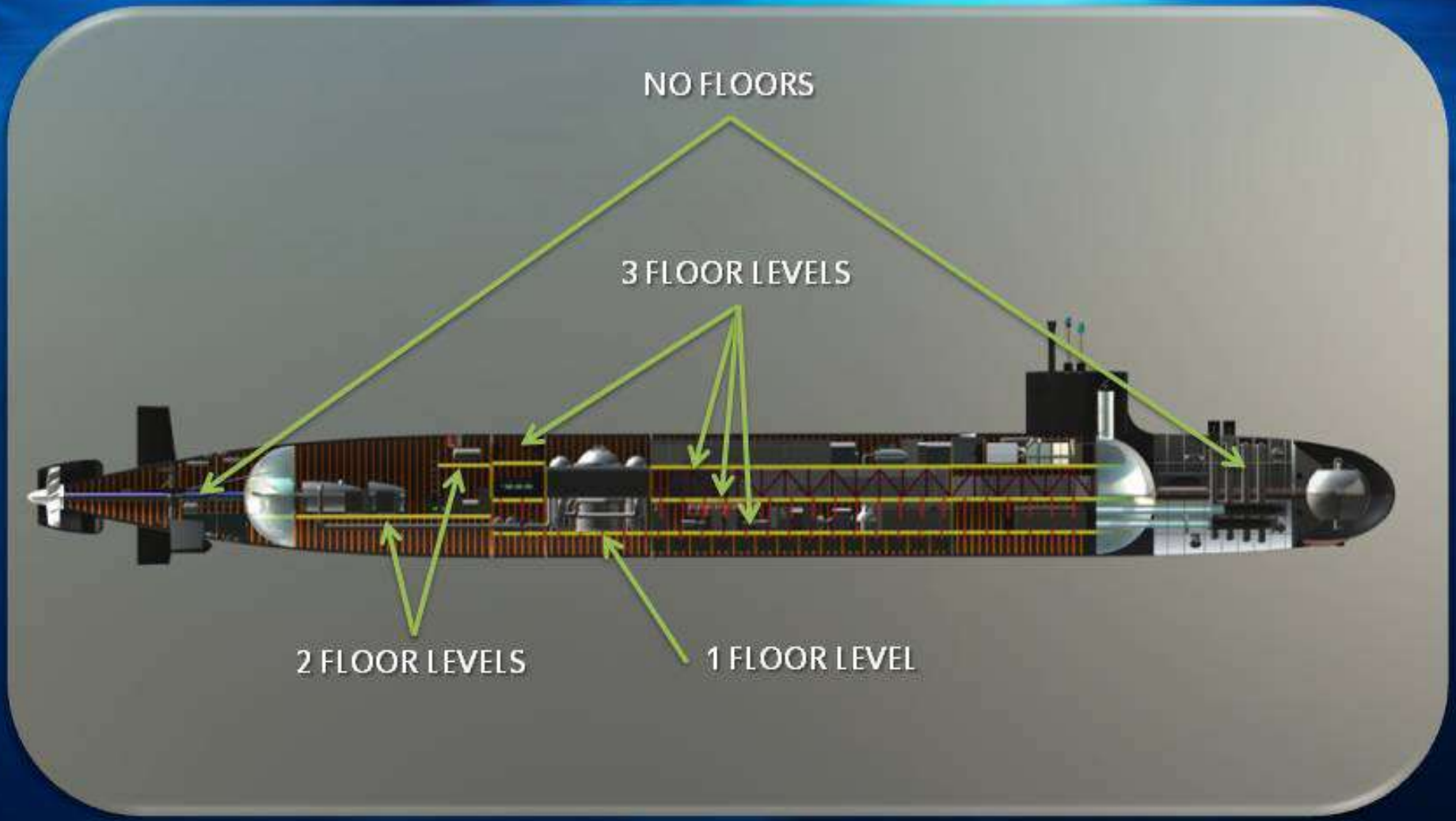
SUBMARINE SPECS:
-DISPLACEMENT= 7,700 TONS
-SPEED= 25KNOTS
-LENGTH= 377 FEET
-DEPTH= 800 FEET
-BEAM= 34FT

DESIGN SUBMARINE TEAM	5/10/2011	NEW RIVER COMMUNITY COLLEGE
CHECKED JEFF LEVY		TITLE: USS VIRGINIA (SSN 774)
QA		
MFG		
APPROVED		SIZE: D; DWG NO: Full Assembly; REV
		SCALE: 1/256; SHEET 1 OF 19



MAIN INTERIOR SECTIONS & GENERAL CHARACTERISTICS

The Virginia class fast attack submarines are 377 feet long, have a beam of 34 feet, and draw 32 feet of water (surfaced.) Their full load displacement is 7,800 tons submerged. Ship's compliment is 134 officers and enlisted. The Virginia class submarines have a top speed of 25 knots on the surface and a submerged speed of more than 32 knots. The maximum diving depth is in excess of 800 feet. Because the reactor in the Virginia class submarines is designed to outlive the useful life of the hull, the operational range of these submarines is effectively unlimited.

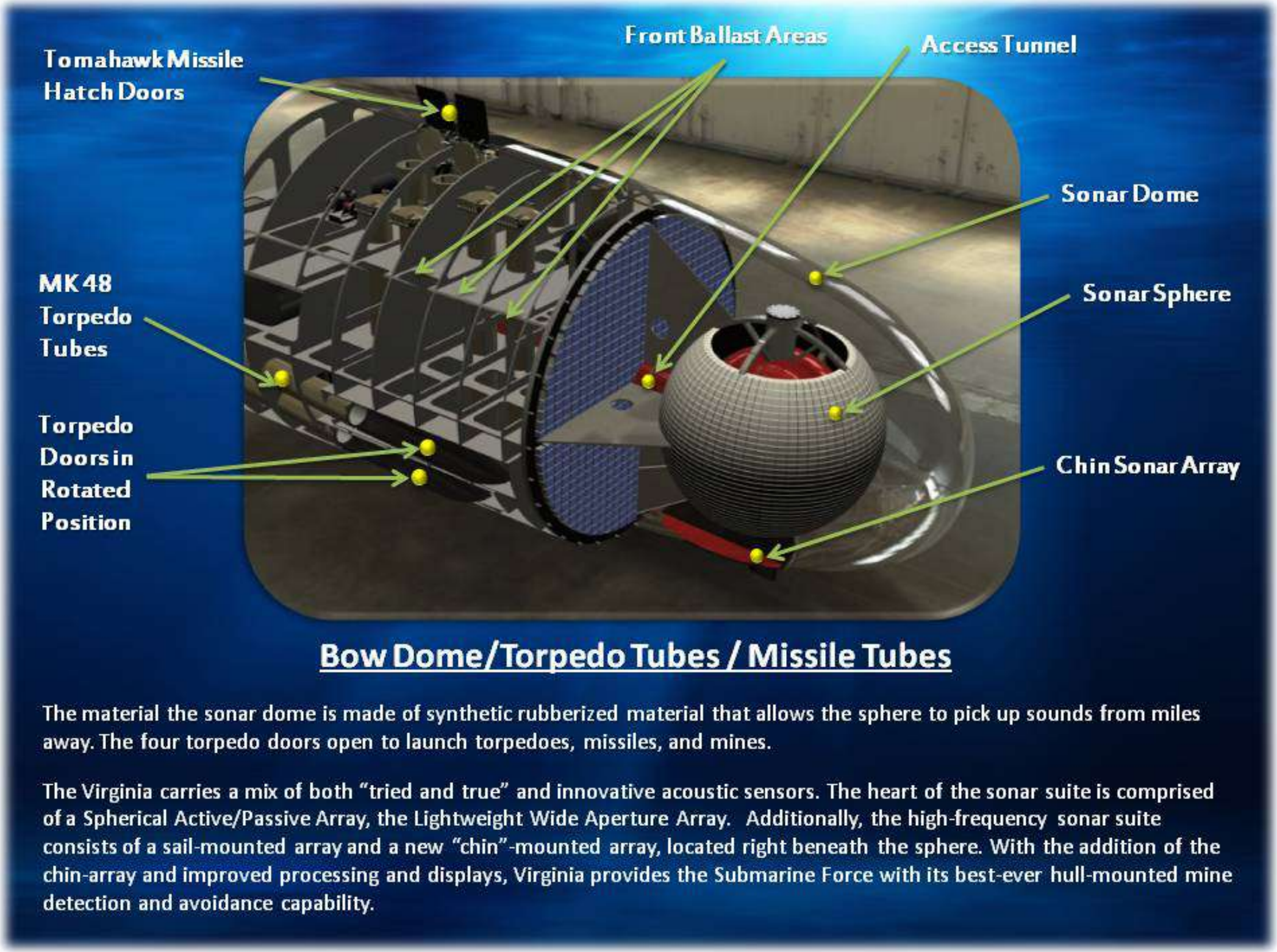


Structure

The Virginia Class Submarine is constructed in a modular sections, is welded together and has floor systems within the pressure hull. The floor systems are made up of steel beams, joists, flooring, braces & supports. These systems are separated from the hull and utilize a rubberized/bushing mounting system that helps the floor systems to float and reduce interior sounds.

Weapons

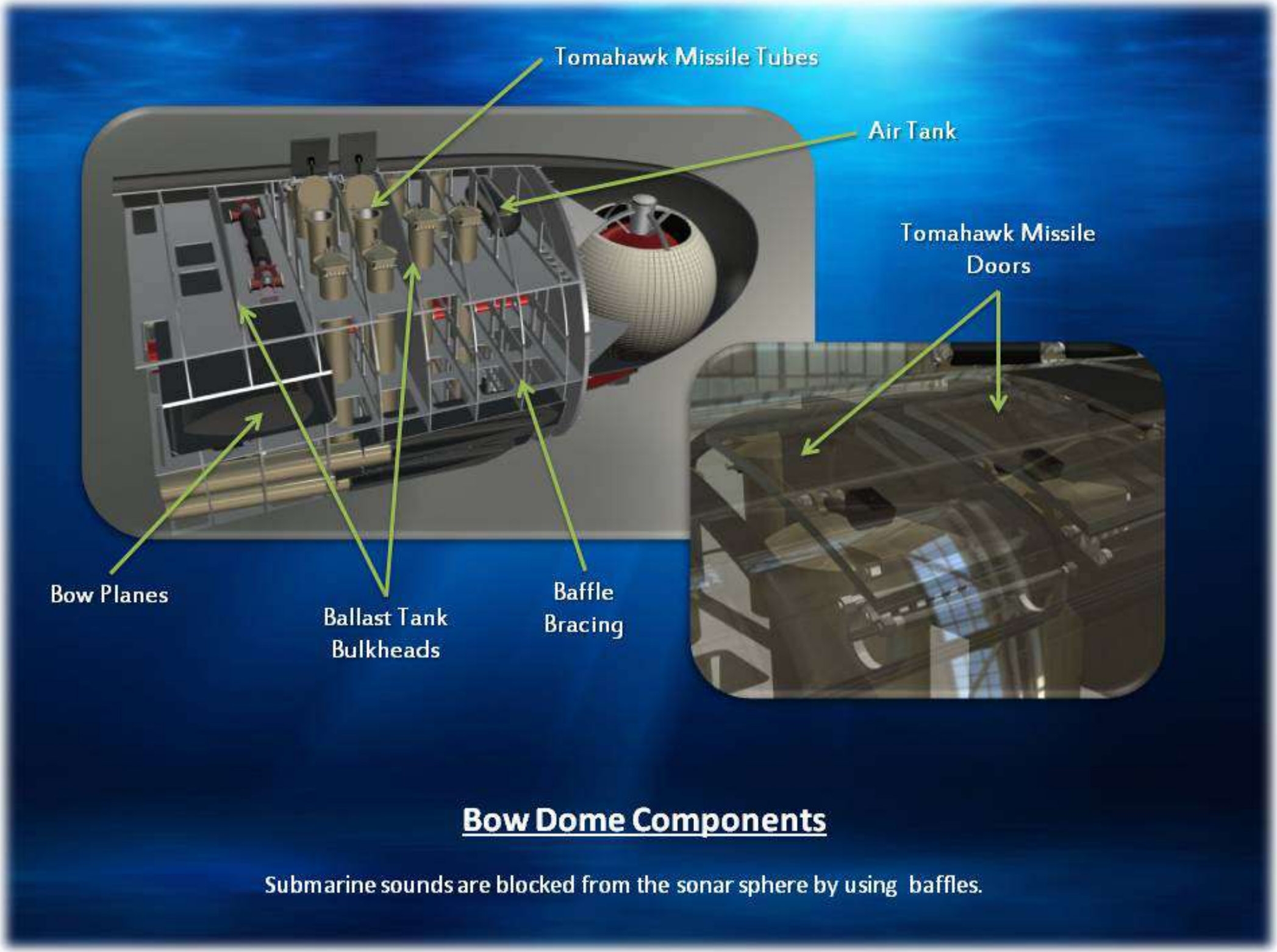
Weapons: Tomahawk Land-Attack Missiles, Mark 48 Advanced Capability Torpedoes, Advanced Mobile Mines, Unmanned Underwater Vehicles.



Bow Dome/Torpedo Tubes / Missile Tubes

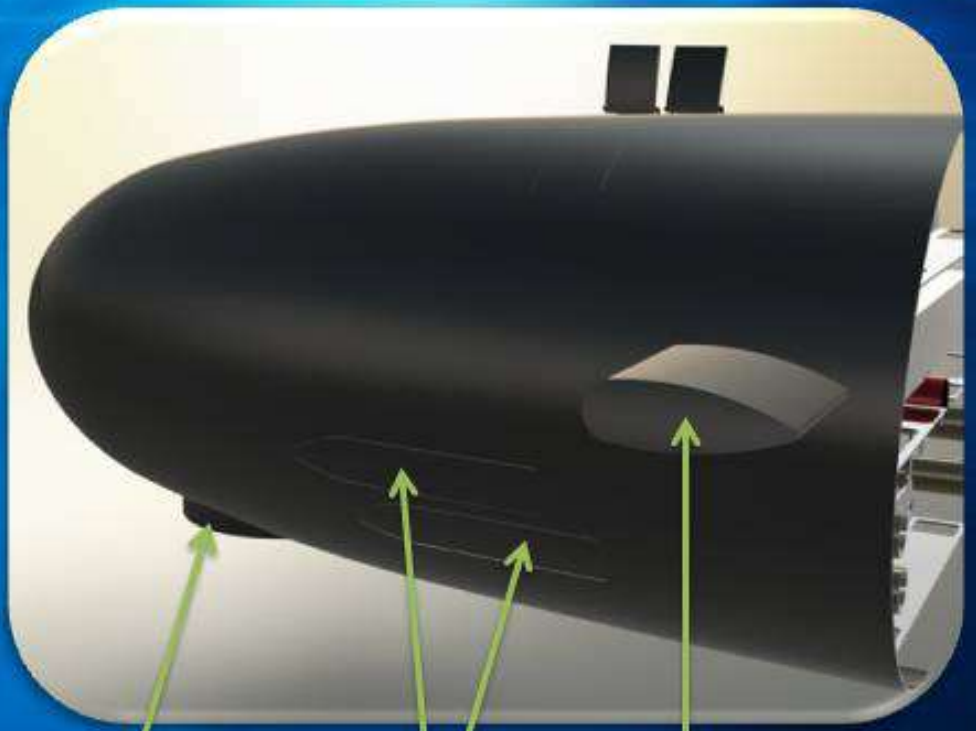
The material the sonar dome is made of synthetic rubberized material that allows the sphere to pick up sounds from miles away. The four torpedo doors open to launch torpedoes, missiles, and mines.

The Virginia carries a mix of both "tried and true" and innovative acoustic sensors. The heart of the sonar suite is comprised of a Spherical Active/Passive Array, the Lightweight Wide Aperture Array. Additionally, the high-frequency sonar suite consists of a sail-mounted array and a new "chin"-mounted array, located right beneath the sphere. With the addition of the chin-array and improved processing and displays, Virginia provides the Submarine Force with its best-ever hull-mounted mine detection and avoidance capability.



Bow Dome Components

Submarine sounds are blocked from the sonar sphere by using baffles.



Bow Planes retract when not in use.

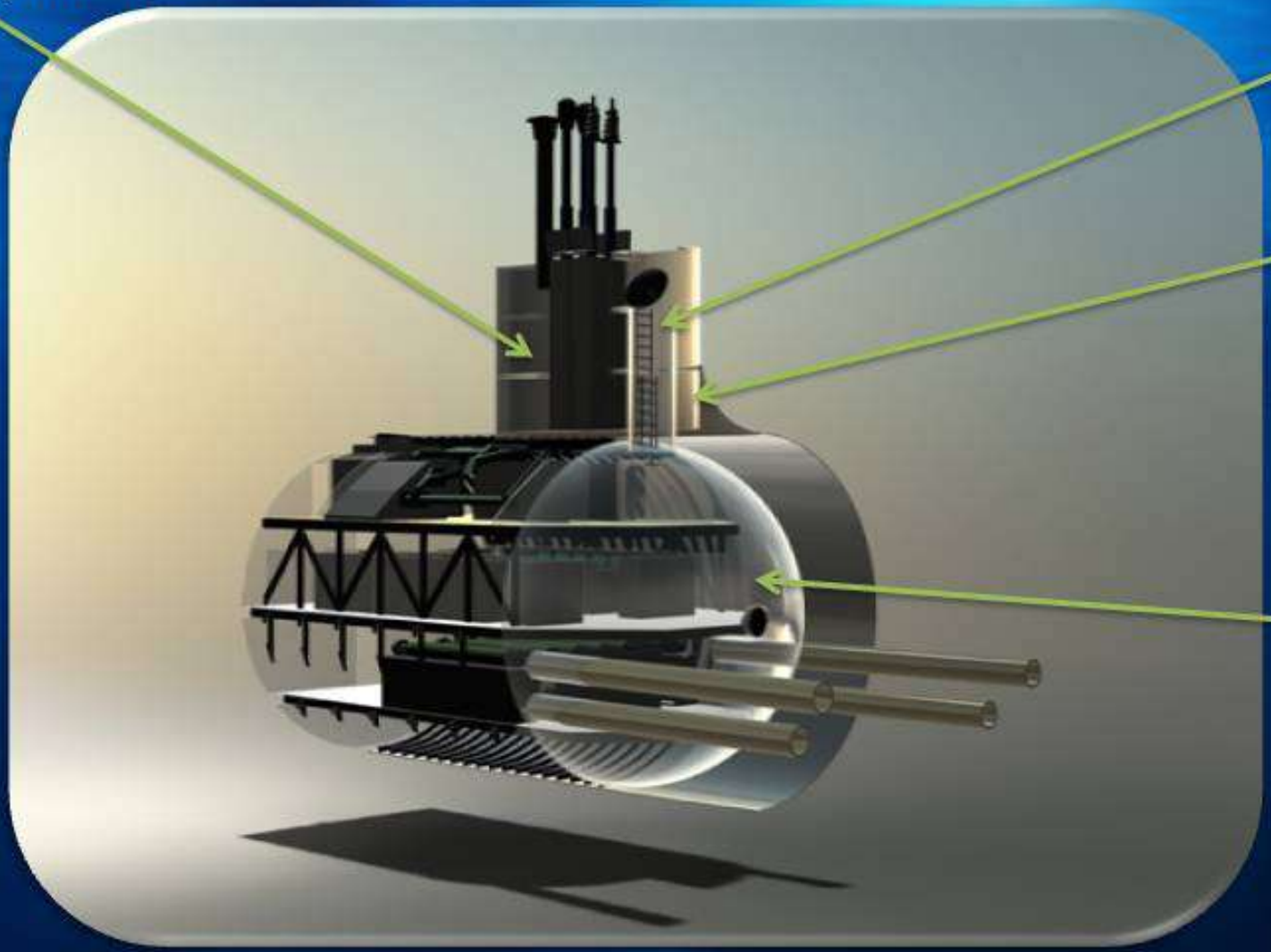
Chin Sonar Array

Torpedo Doors

Bow Planes out to assist with diving.

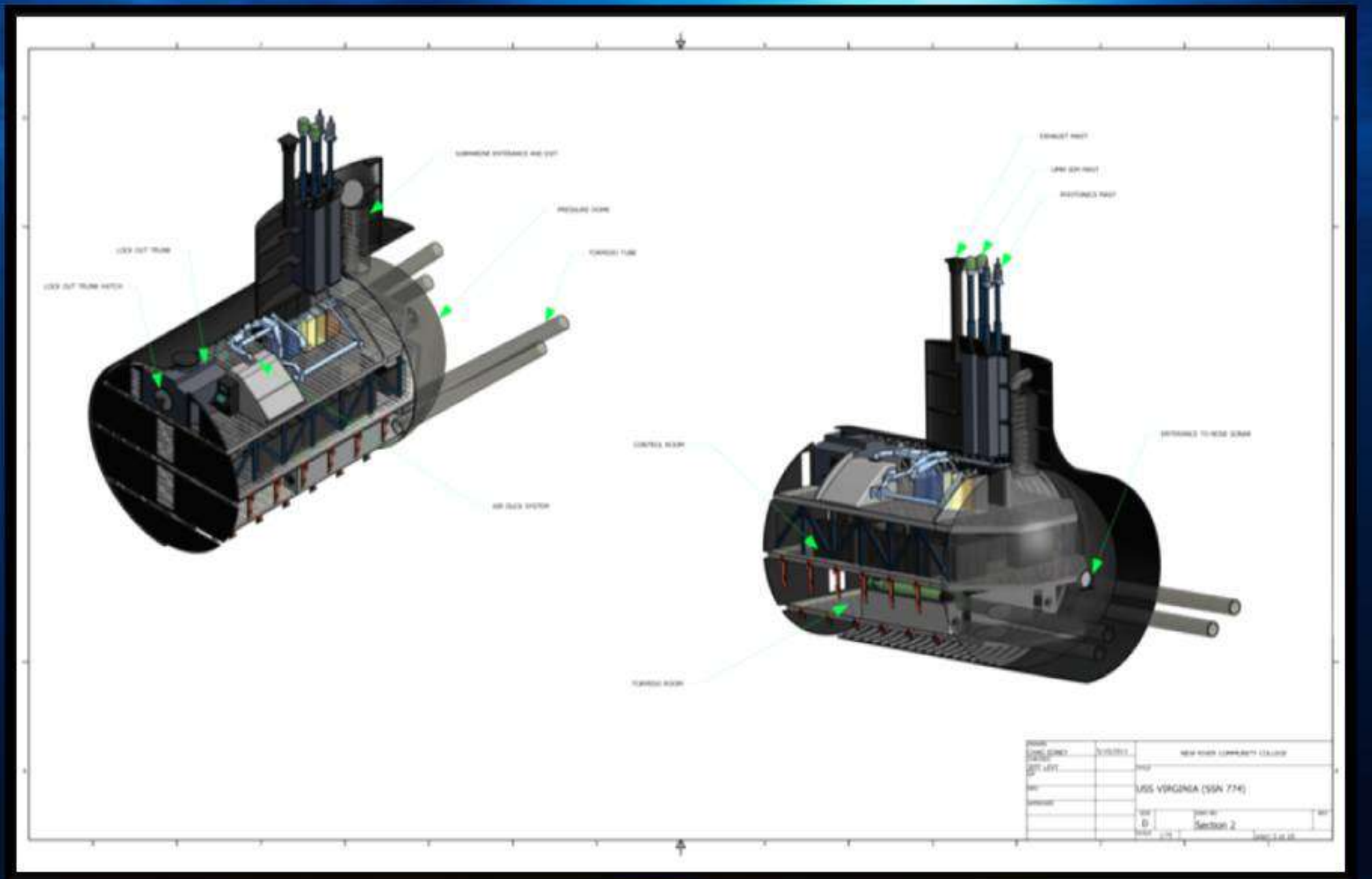
Functions of Bow Planes

Bow planes are worked in pairs; their shape is designed to cut through the water to make a smoother path for the hull.

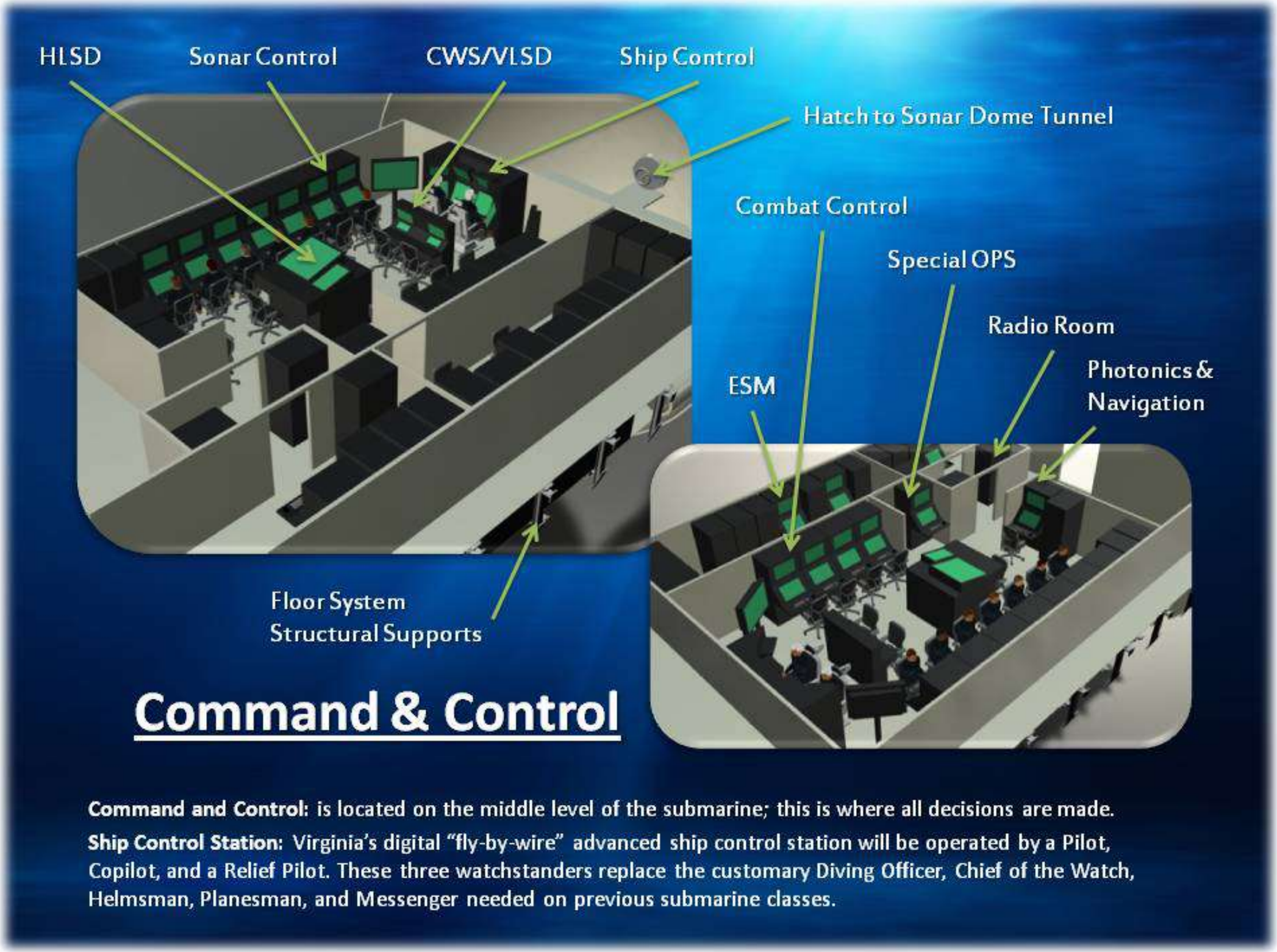


Sail

The sail is equipped with sonar array in the front. It also has storage compartments which can be accessed from the outside of the submarine; these are handy for special forces.



Section 2

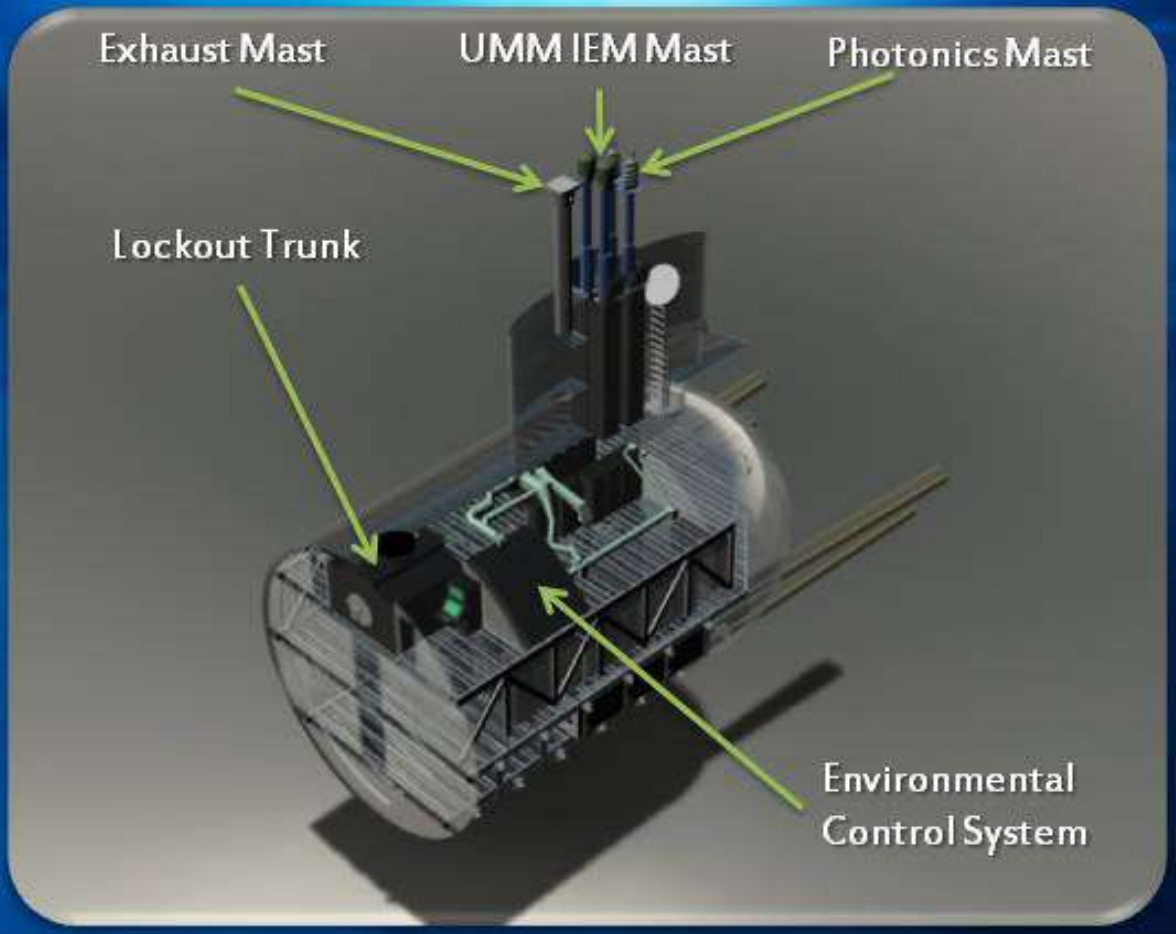


Command & Control

Command and Control: is located on the middle level of the submarine; this is where all decisions are made.

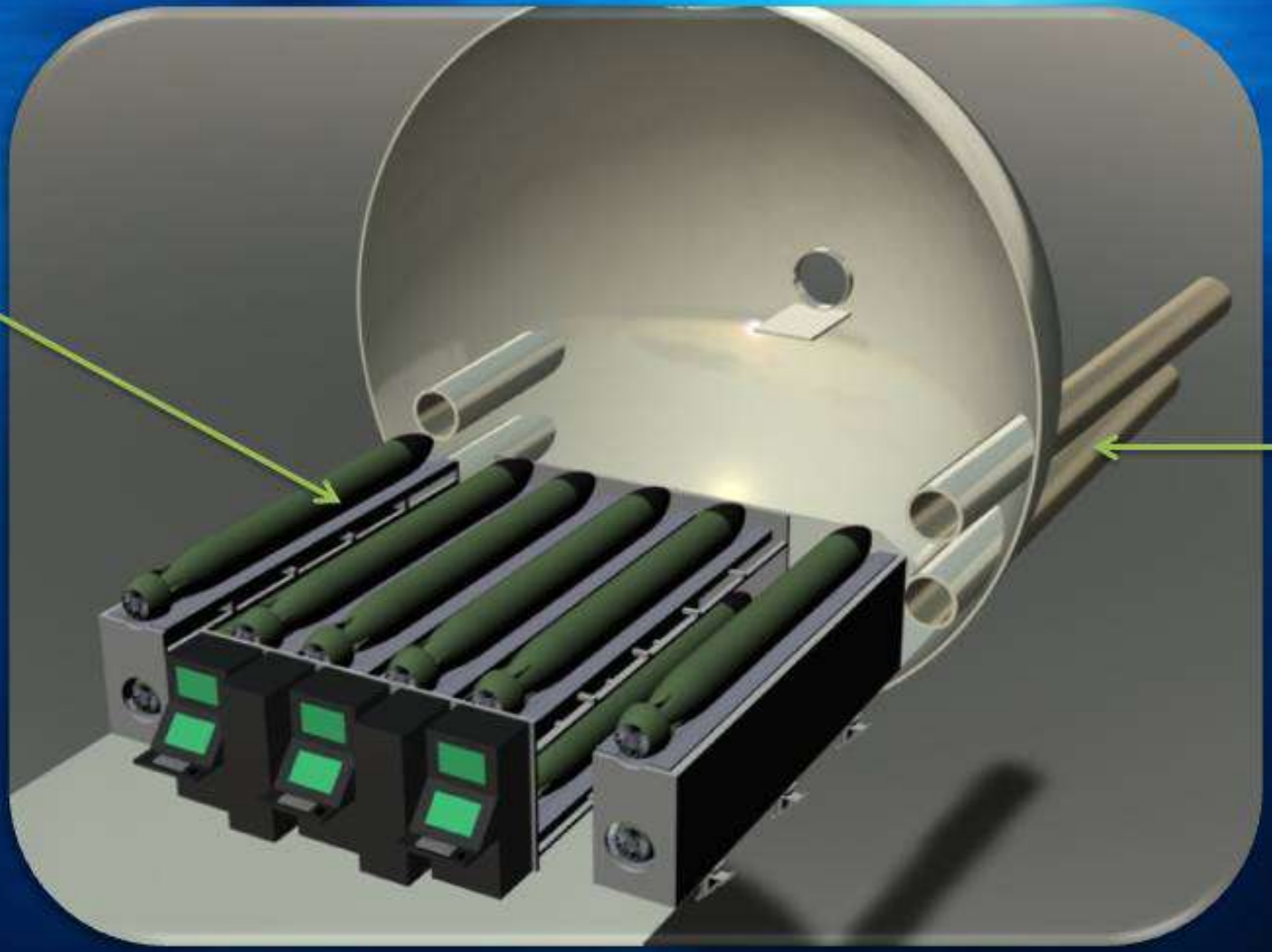
Ship Control Station: Virginia's digital "fly-by-wire" advanced ship control station will be operated by a Pilot, Copilot, and a Relief Pilot. These three watchstanders replace the customary Diving Officer, Chief of the Watch, Helmsman, Planesman, and Messenger needed on previous submarine classes.

Lockout Trunk & Masts



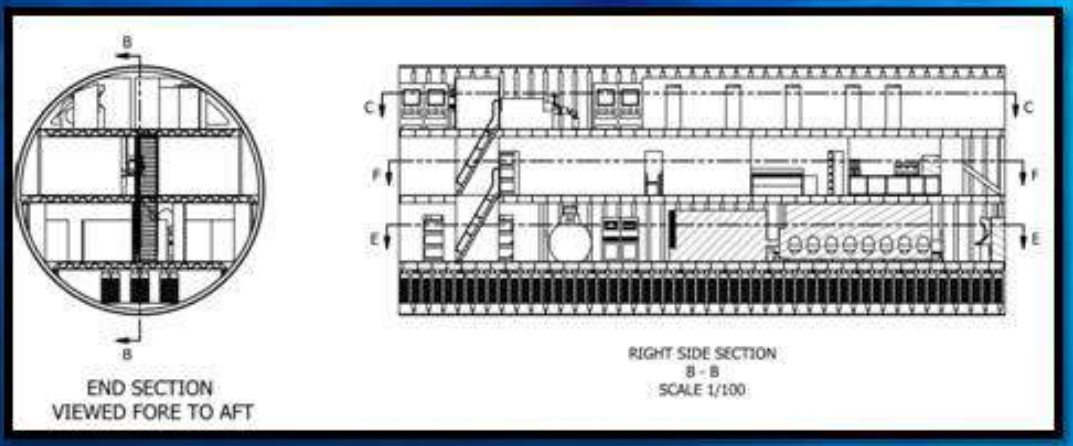
The lockout trunk is located on the top level and is used for special forces to enter and exit the submarine. This chamber is designed for rapid deployment of a 9 man diving team directly from the submarine. To support SOC operations, the Virginia class submarines are capable of transporting and launching both the DDS (dry deck shelter) and the SDV (SEAL delivery vehicle).

Photonics Mast takes the place of a periscope; by utilizing special low light cameras to take pictures of its surroundings. The Virginia class submarines are the first class of American submarine to be equipped with this non-hull penetrating fiber-optic periscope system. The Virginia is equipped with two Kollmorgen BVS-1 photonic masts. In addition to the standard daylight optic capabilities of traditional periscopes, the photonic masts will also incorporate LLTV (Low Light TV), thermal imaging, and laser range finding capabilities.



Torpedo Room

The torpedo room is located on the lower level. Air turbine pumps are used to eject the torpedoes out of the doors.


B
B
END SECTION
VIEWED FORE TO AFT
C
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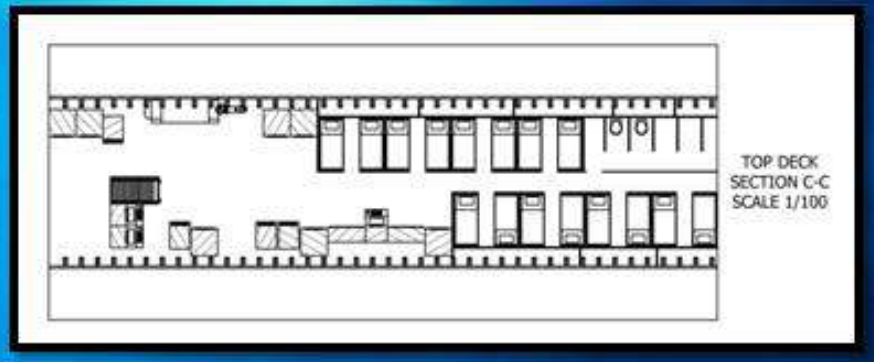
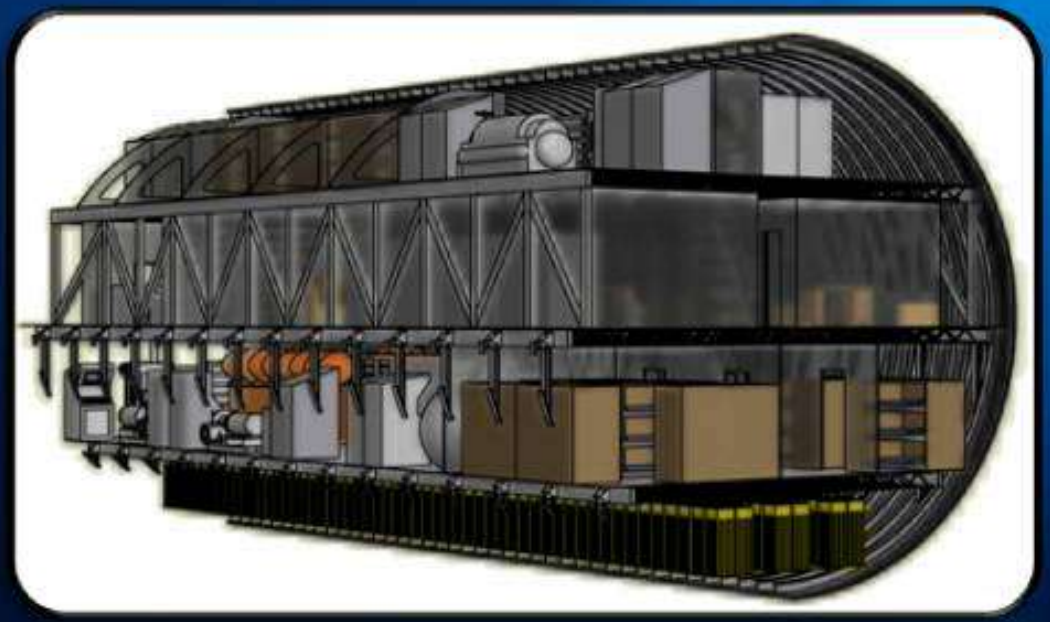
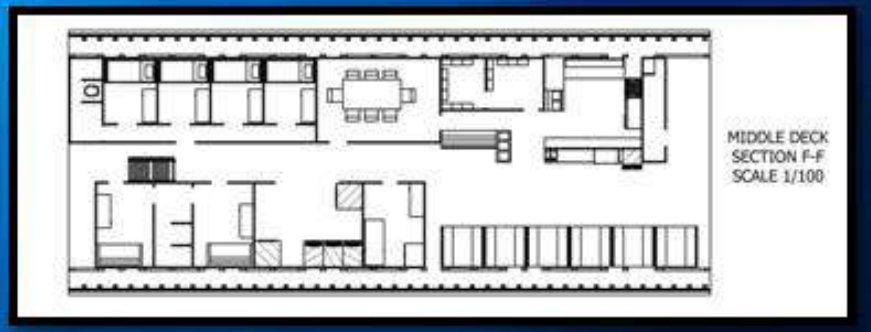
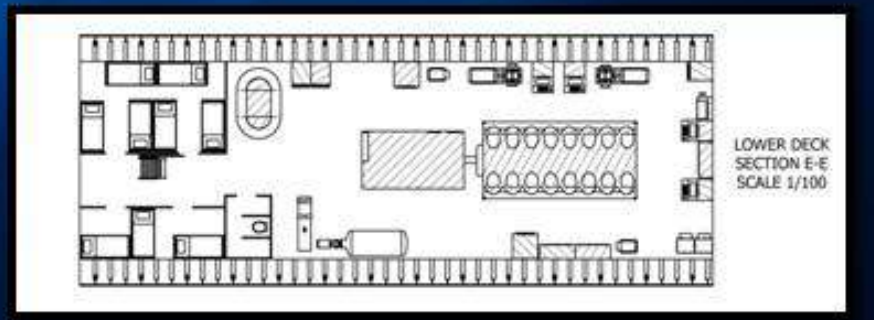
RIGHT SIDE SECTION
B - B
SCALE 1/100


TOP DECK
SECTION C-C
SCALE 1/100




MIDDLE DECK
SECTION F-F
SCALE 1/100

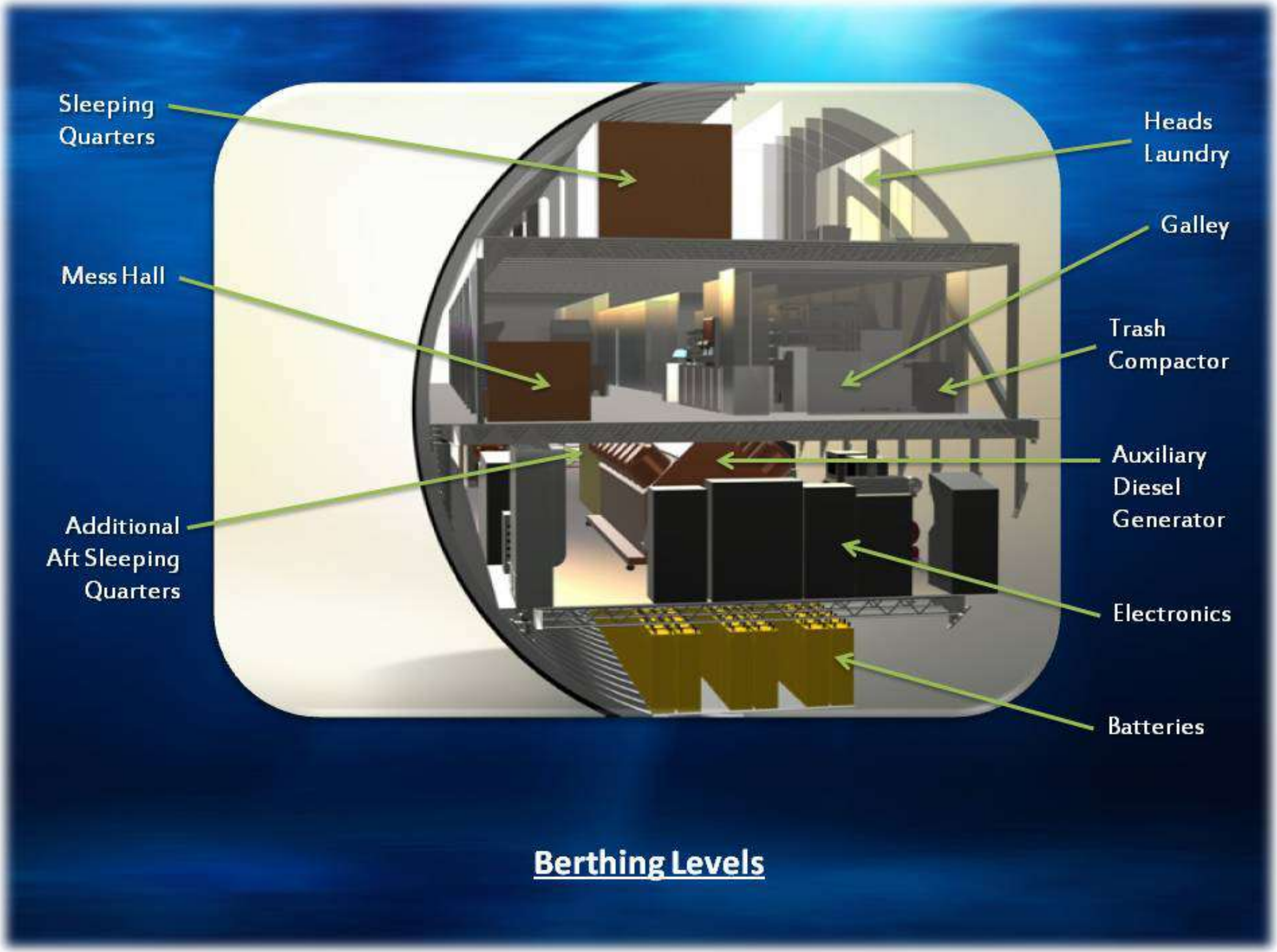

LOWER DECK
SECTION E-E
SCALE 1/100

Section 3

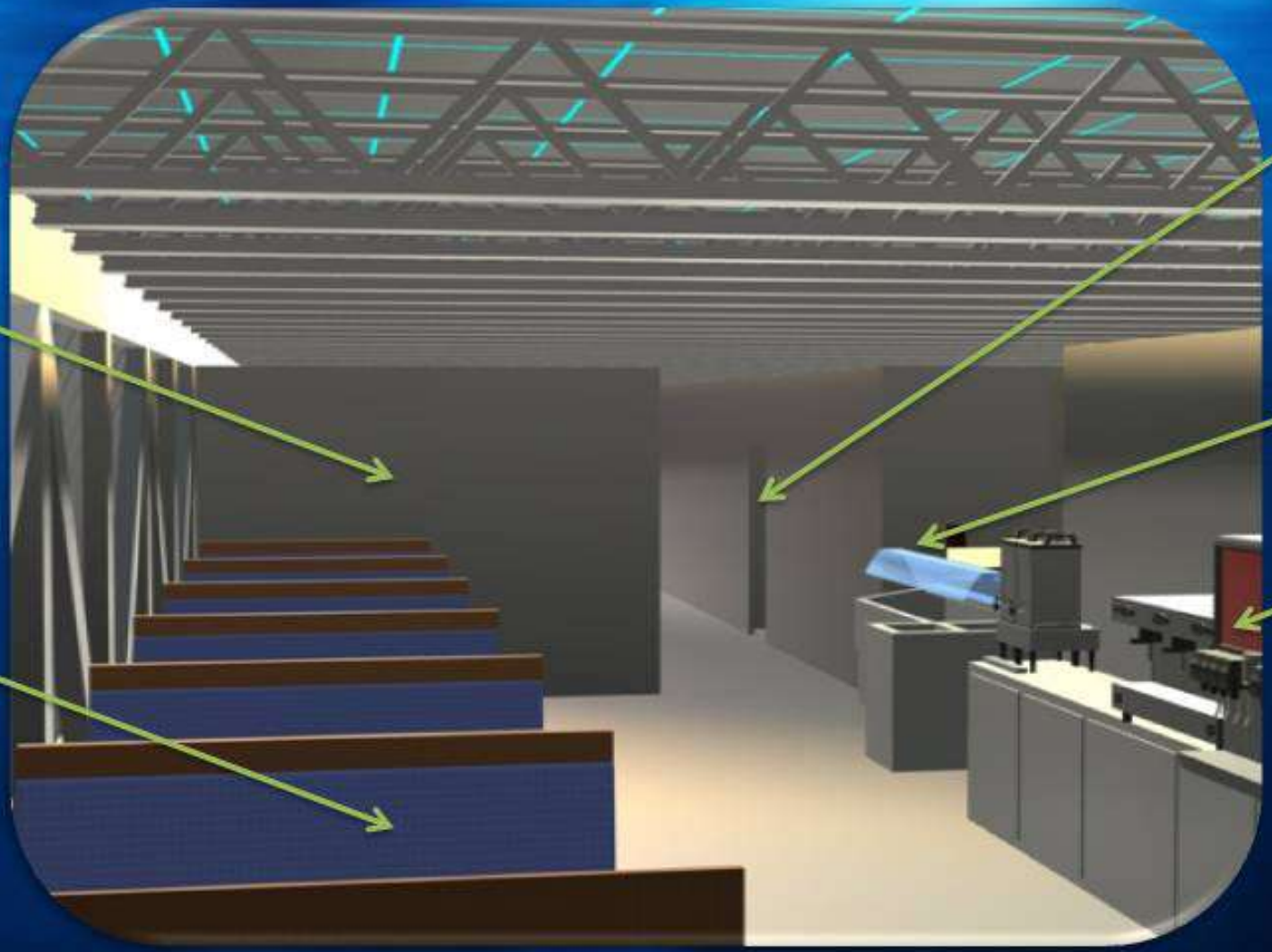
- Environmental Controls
- Lockout Trunk
- Command / Control
- Torpedo Room
- Pressure Dome

Berthing

This section holds the majority of the crews living spaces. Berthing, Mess Hall, Galley, and Washrooms are located here. The Auxiliary Machinery Room with backup Diesel Generator is located here as well.

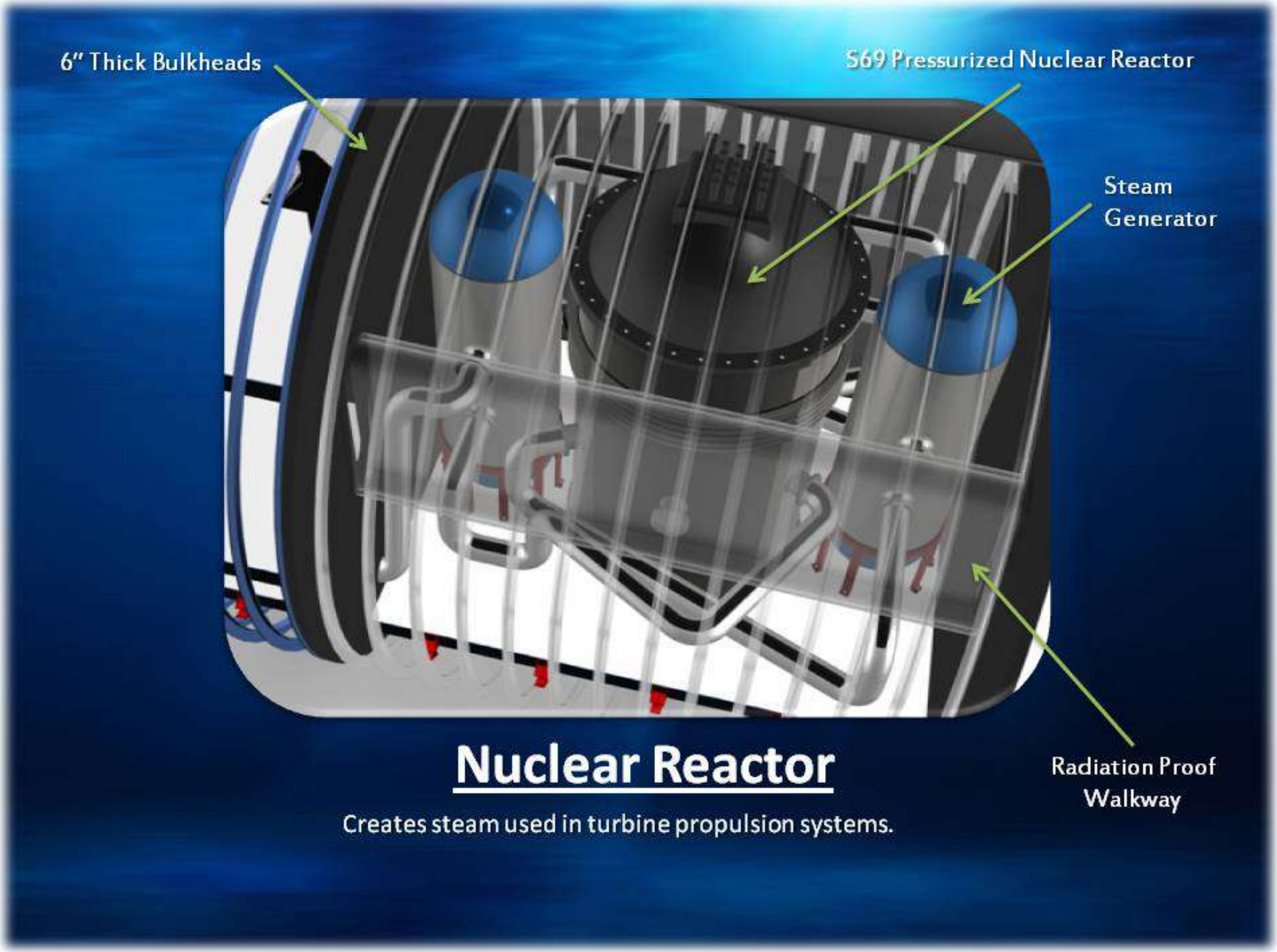


Berthing Levels



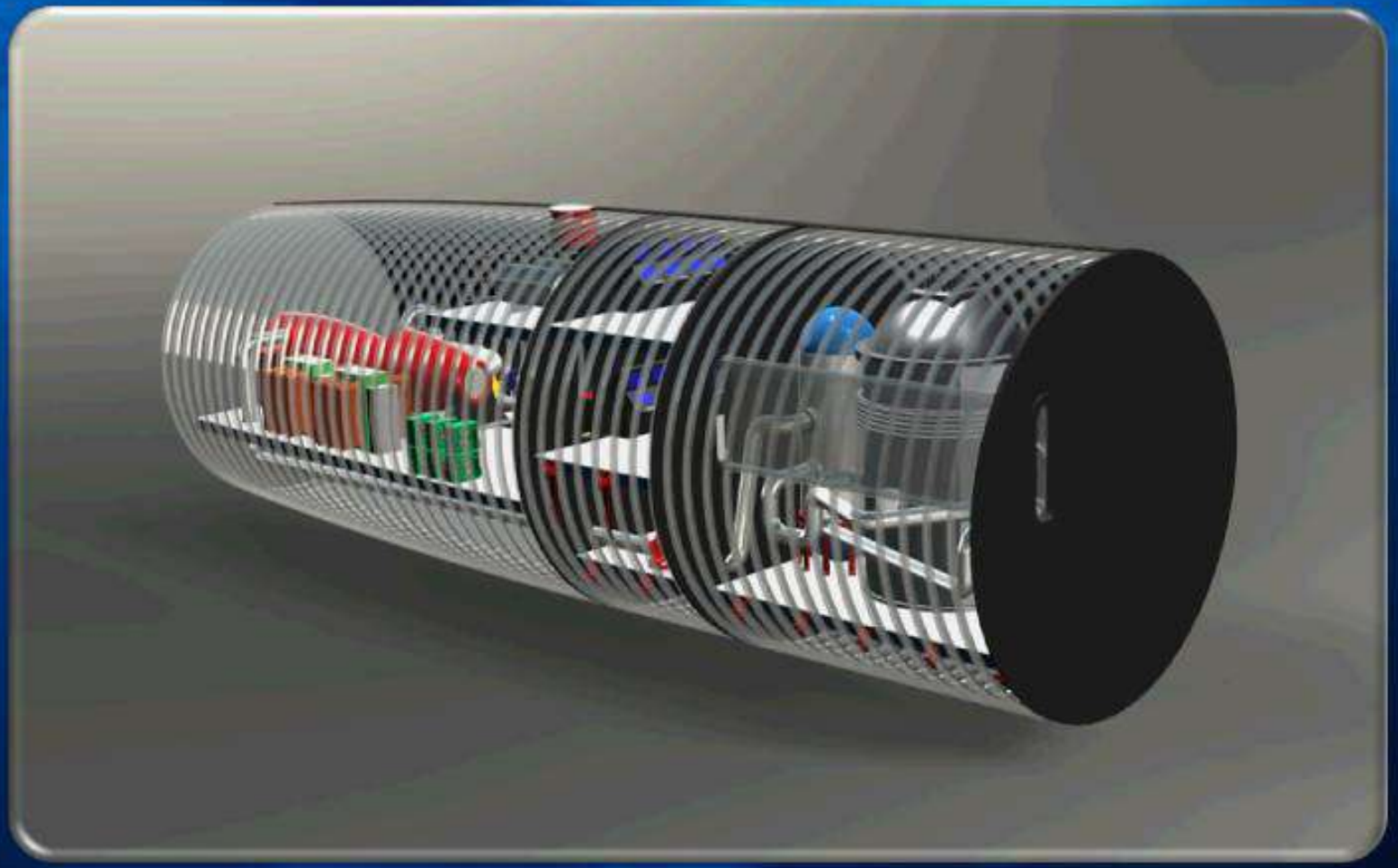
Mess

This is where the enlisted sailors eat their meals, spend their free time, watch movies, and study. Officers have their own separate area know as the ward room.



Nuclear Reactor

Creates steam used in turbine propulsion systems.

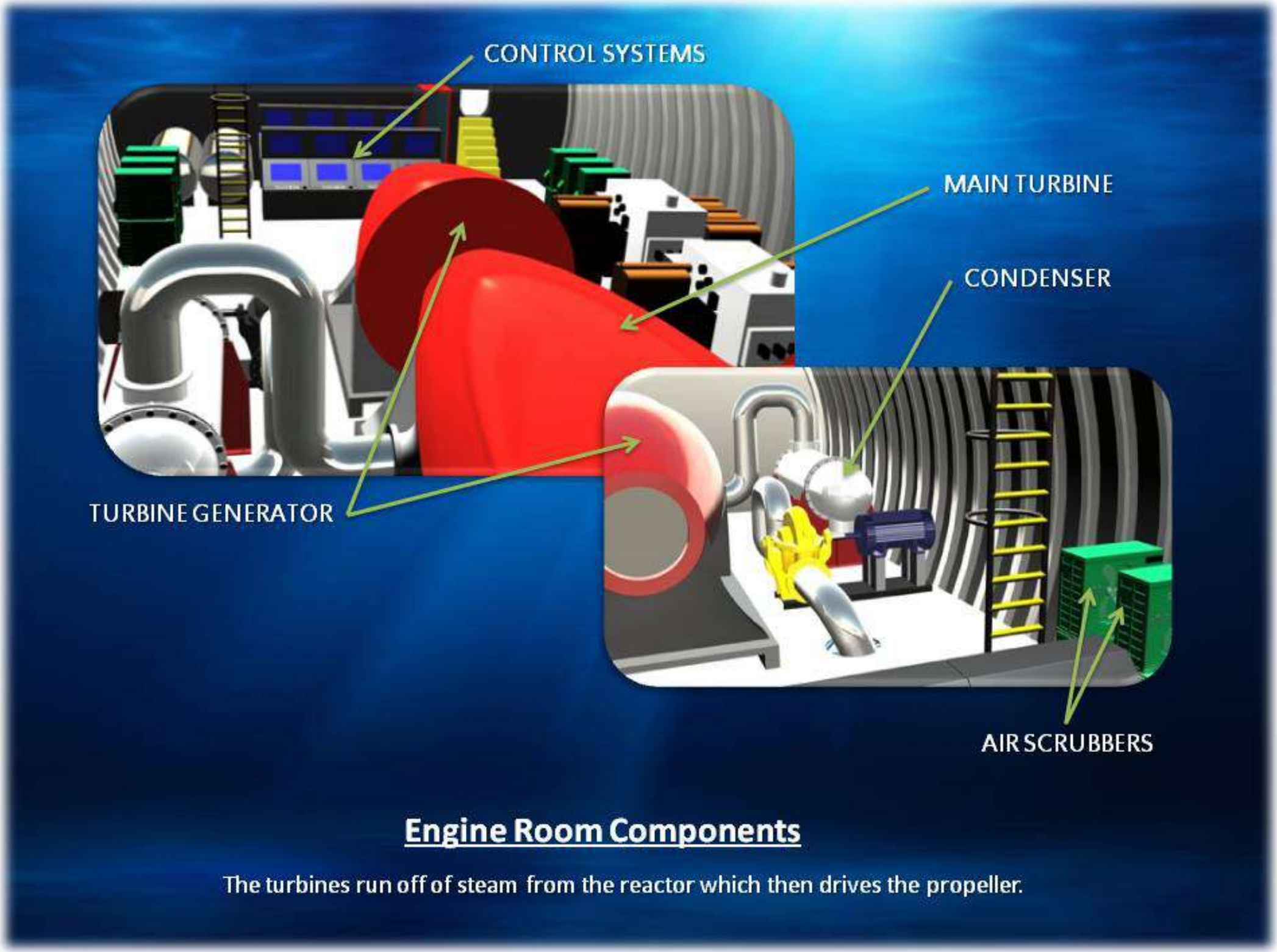


SECTIONS 4,5 & 6

Nuclear Reactor, Maneuvering Room & Engine Room Compartments

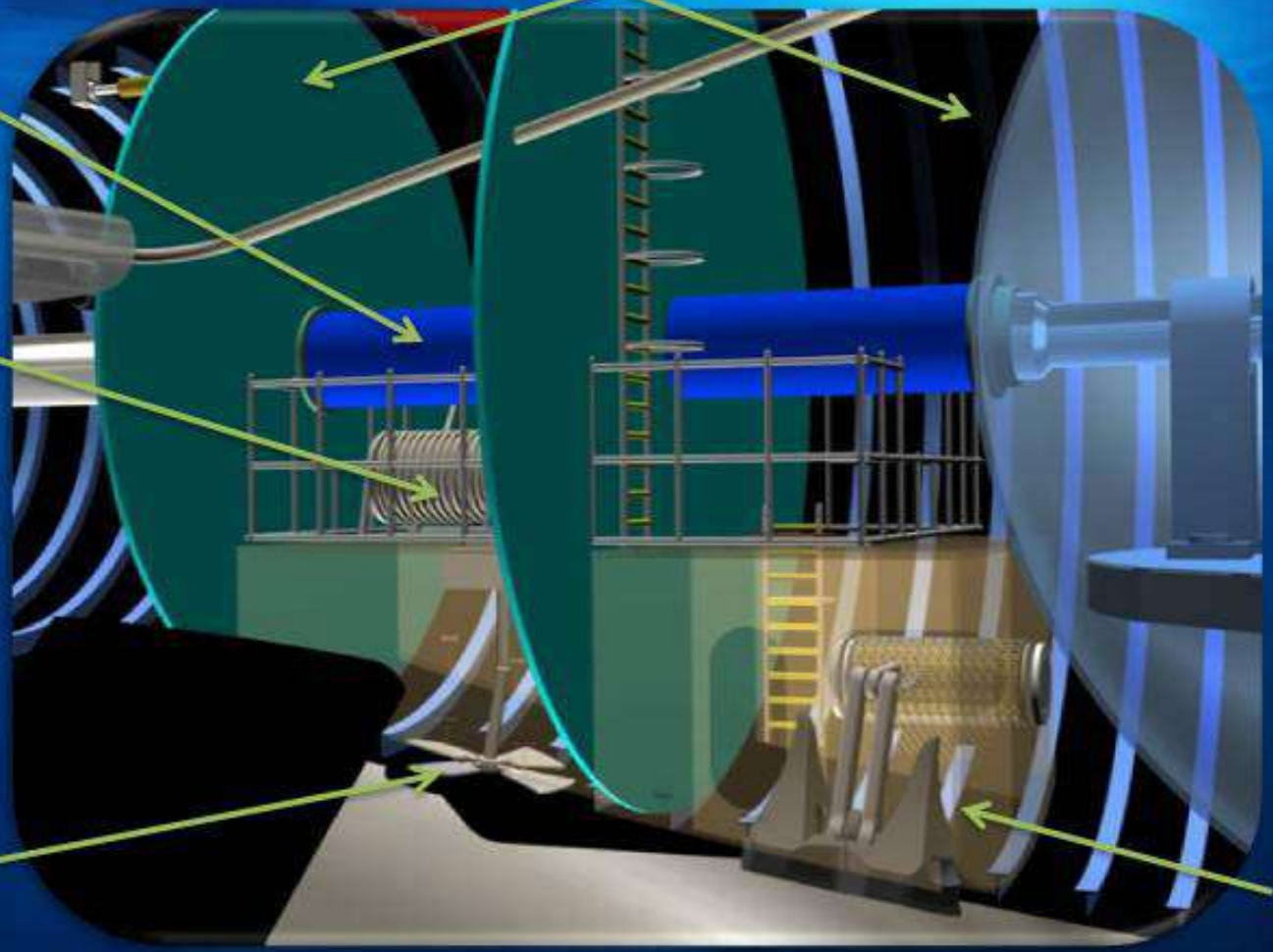
Galley

Submarines have the best chow in the Navy. This is important when you spend months below the oceans surface. The food is prepared here in a fully equipped kitchen.



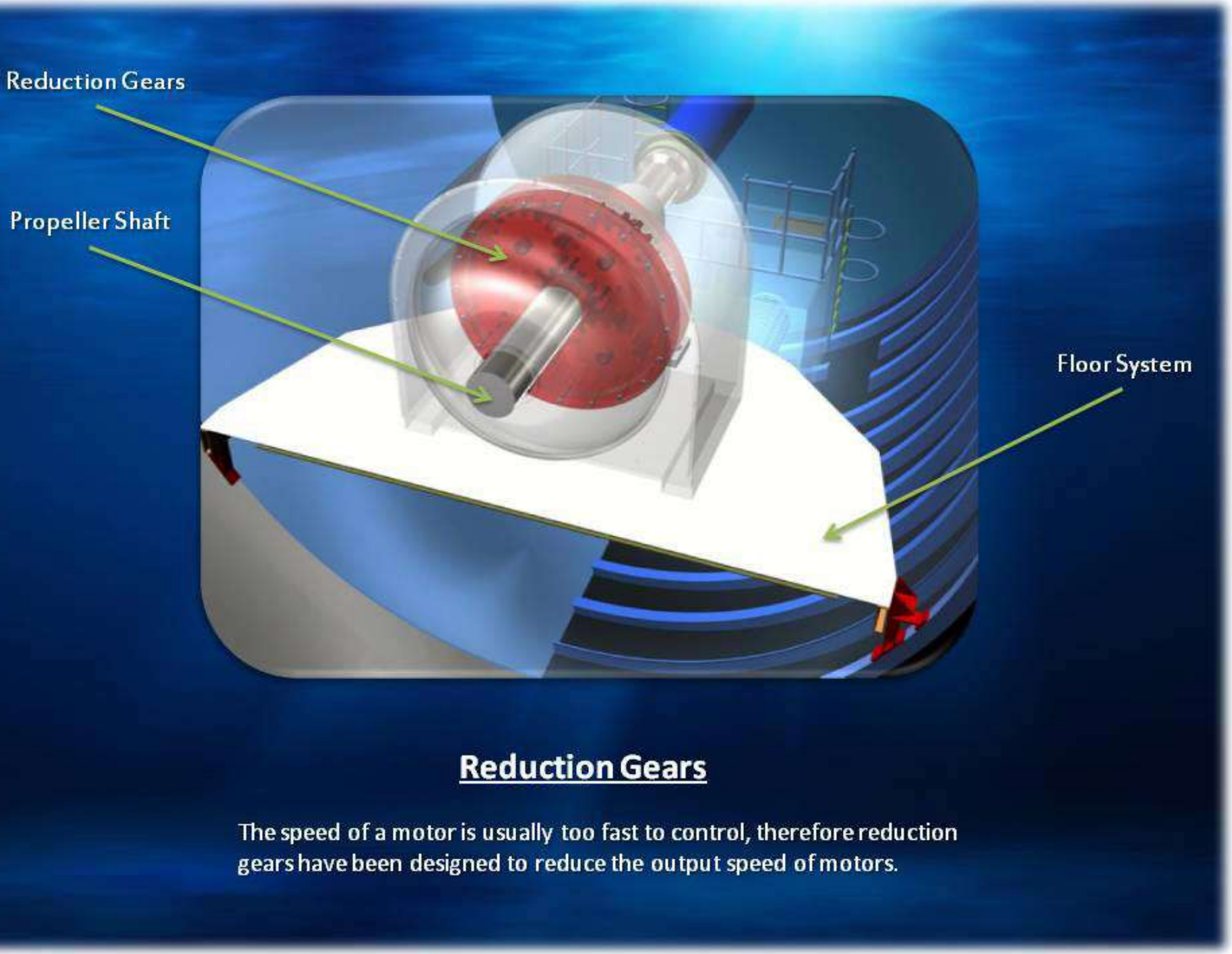
Engine Room Components

The turbines run off of steam from the reactor which then drives the propeller.



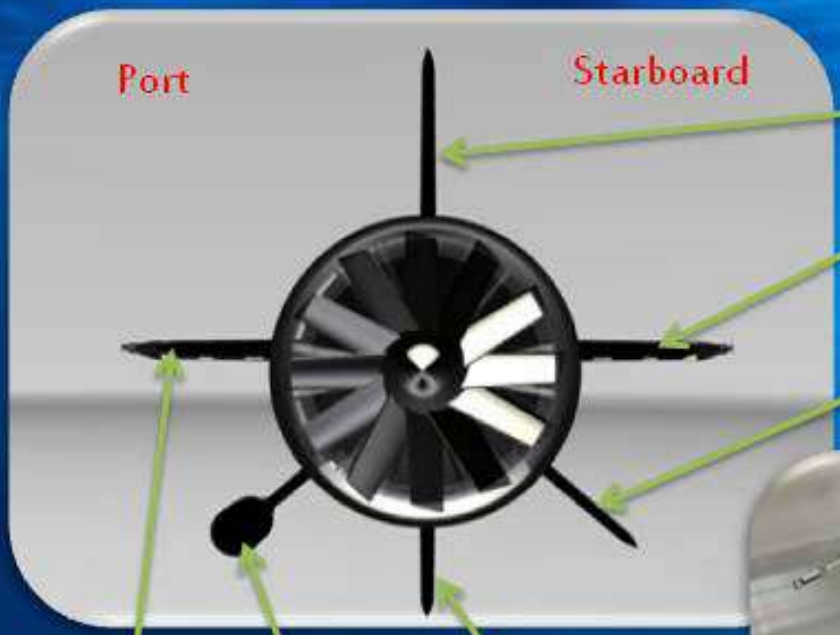
Ballast & Mud Tanks

Ballast Tanks are used to submerge & surface the submarine. When the tanks are full the sub sinks. The air is blown out with compressed air when the sub is to surface. Mud tanks house the anchor and secondary propulsion motor to keep dirt and debris from contaminating the other water.



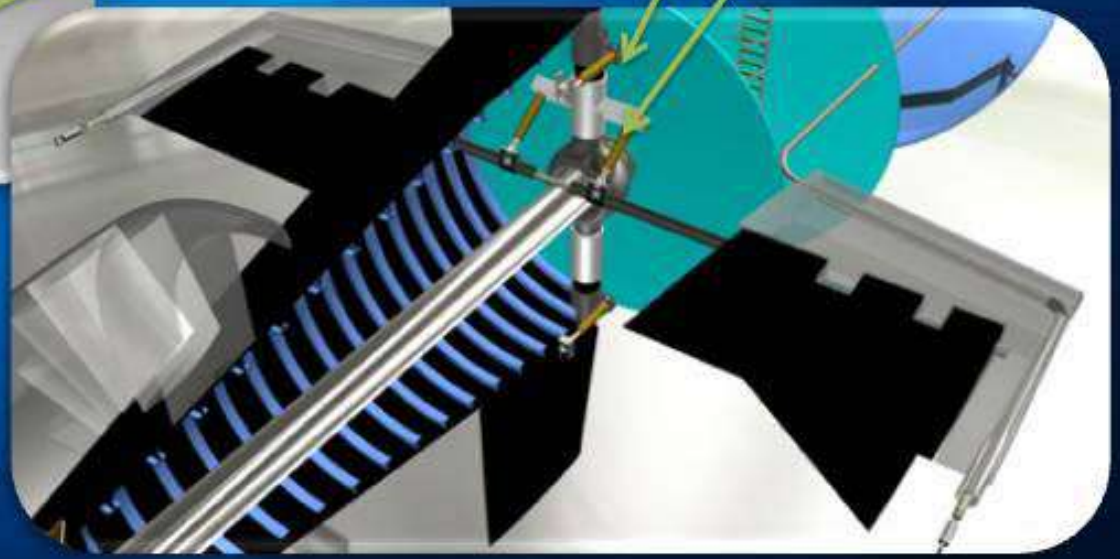
Reduction Gears

The speed of a motor is usually too fast to control, therefore reduction gears have been designed to reduce the output speed of motors.



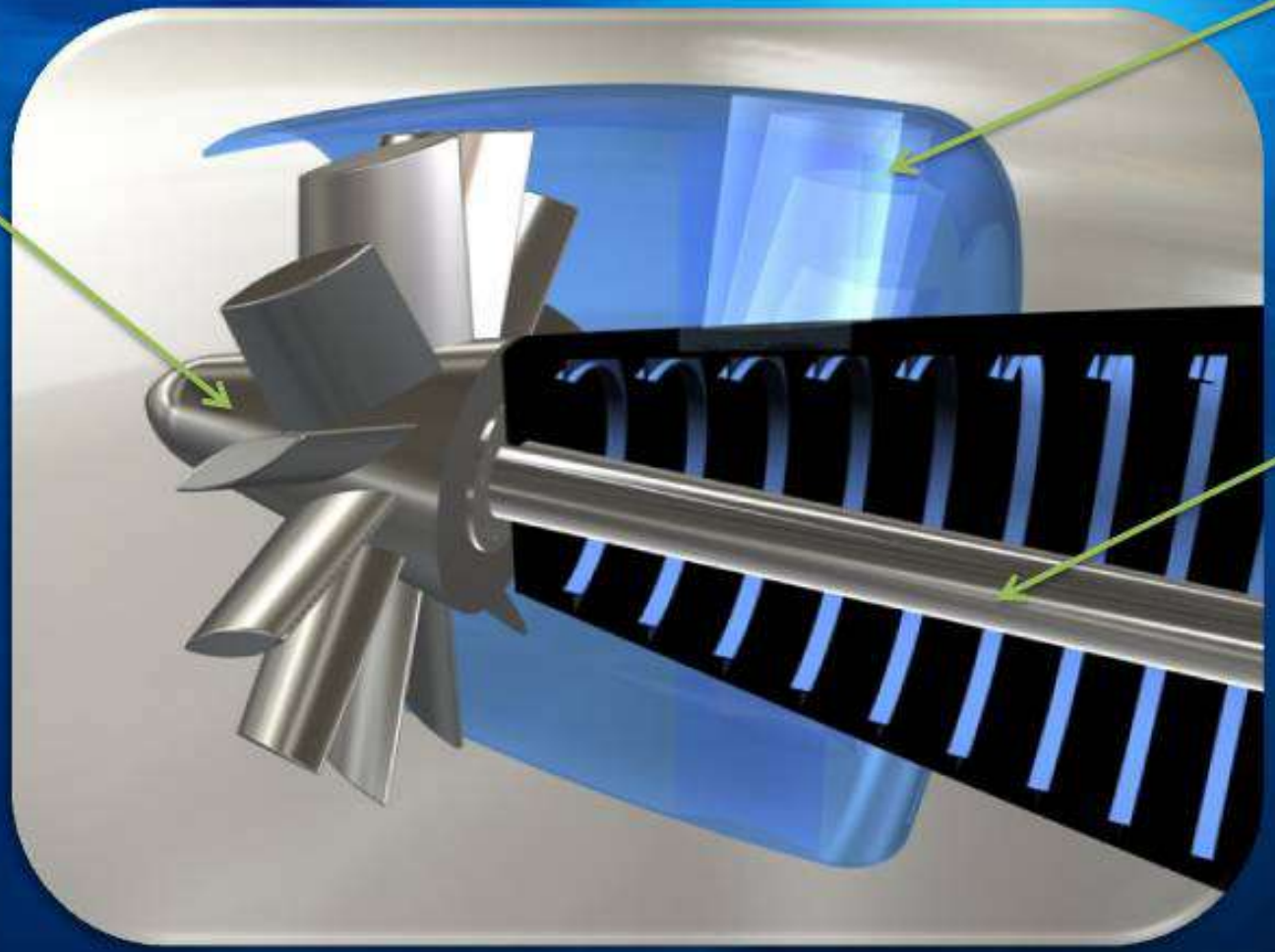
Rudders Controlled by Top & Bottom Hydraulics

Stern Plane Flaps Controlled by Port & Starboard Hydraulics



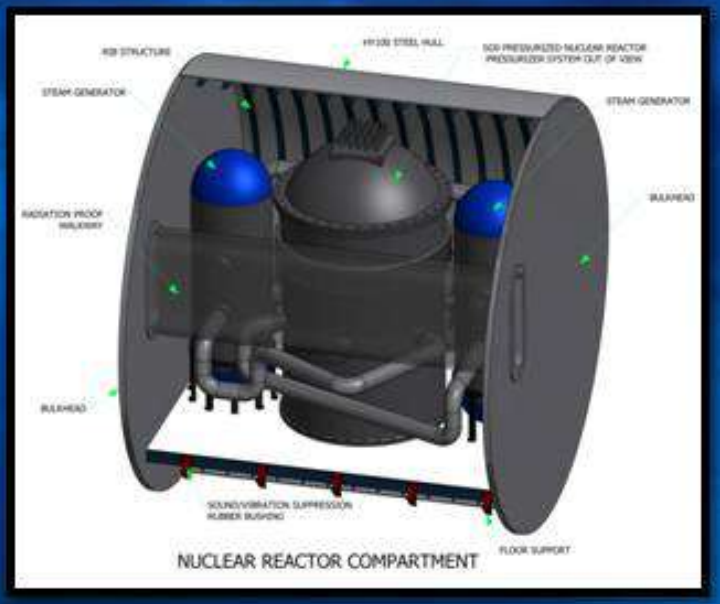
Functions of Stern Planes, Rudder, & Dihedrals

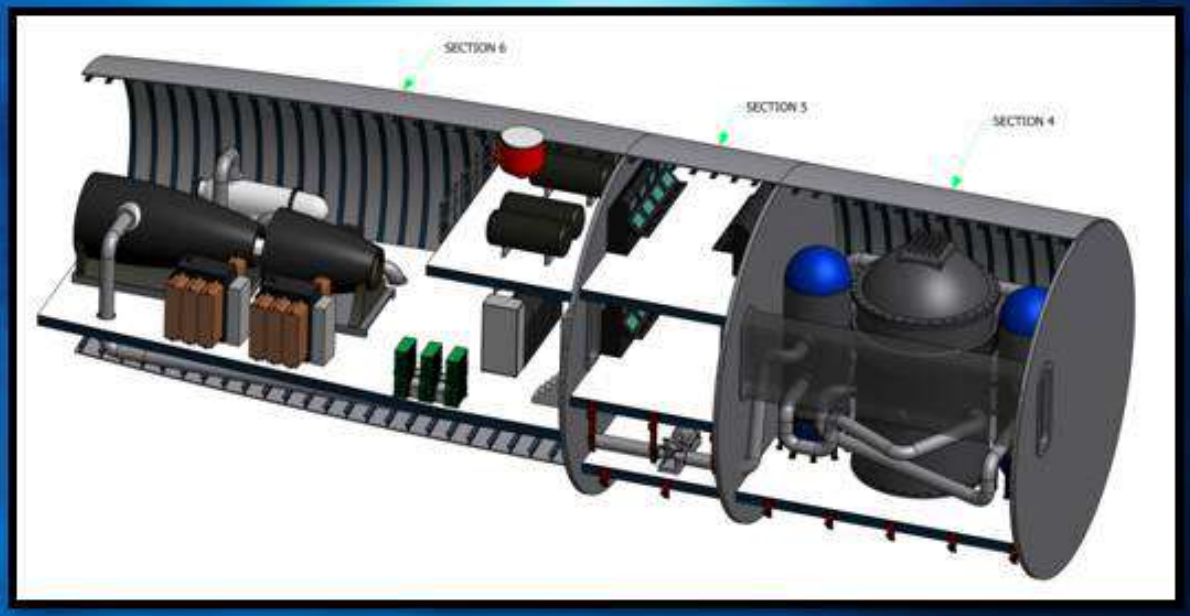
Top & Bottom Rudders are used to turn submarine left & right. Stern plane flaps are used to assist with diving or surfacing. Dihedrals are used to help with stability in the roll axis.

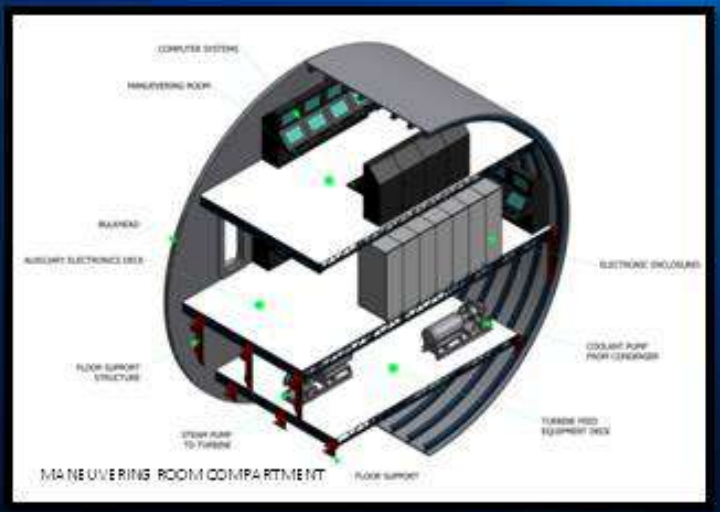


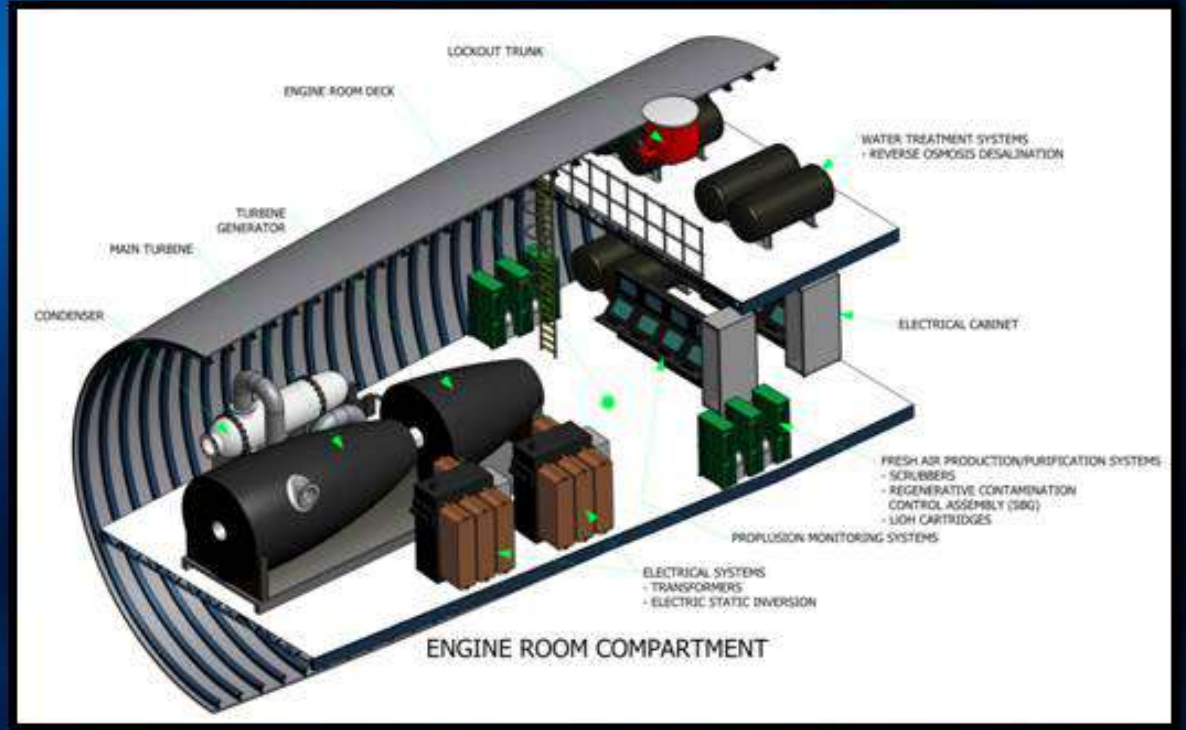
Propulsor Duct & Propeller

The Propulsor Duct is new to the Virginia; some of the advantages are; increased speed, power, and maneuverability, reduction of noise, and the propeller is protected by the duct which is safer for marine life and swimmers.

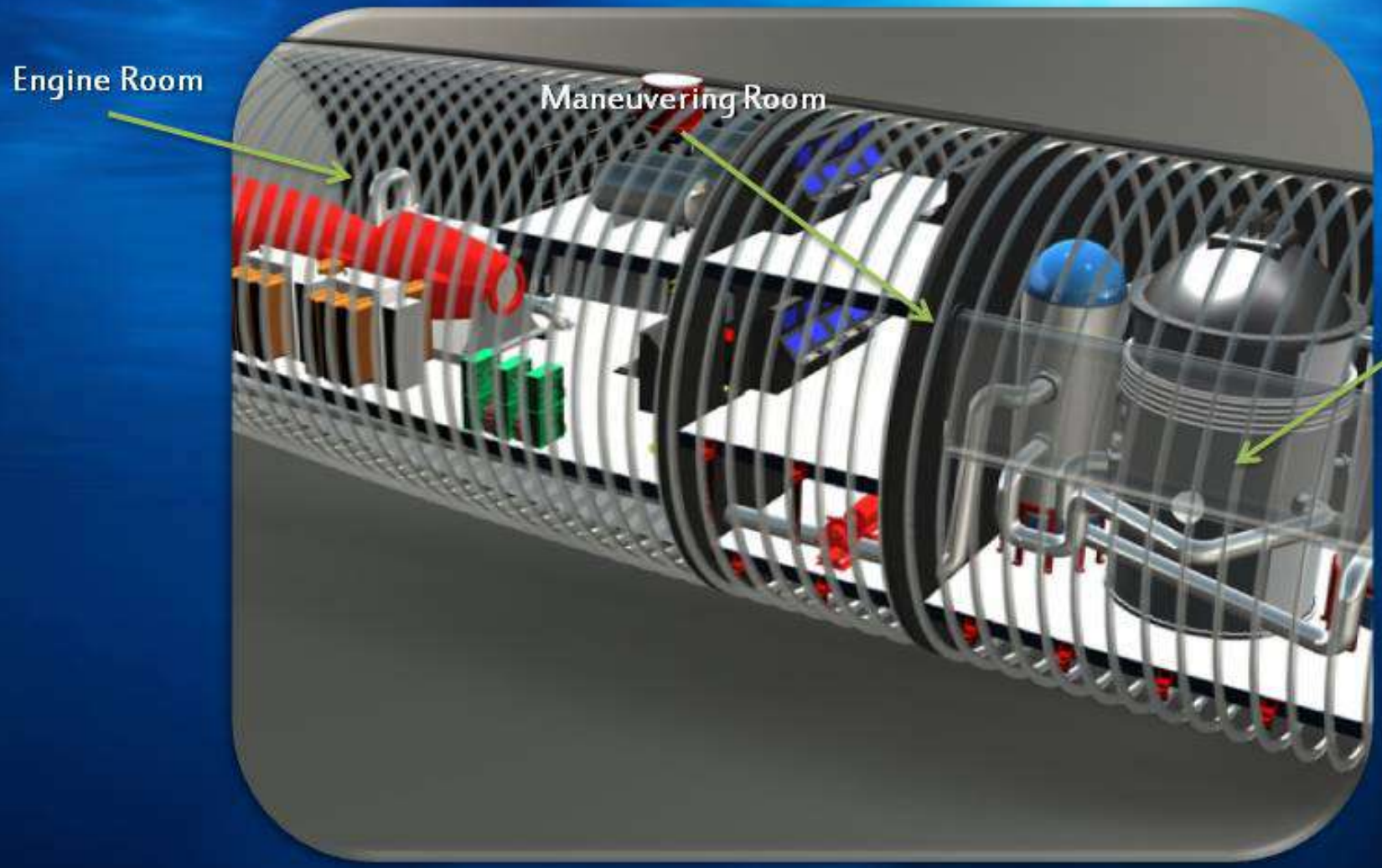






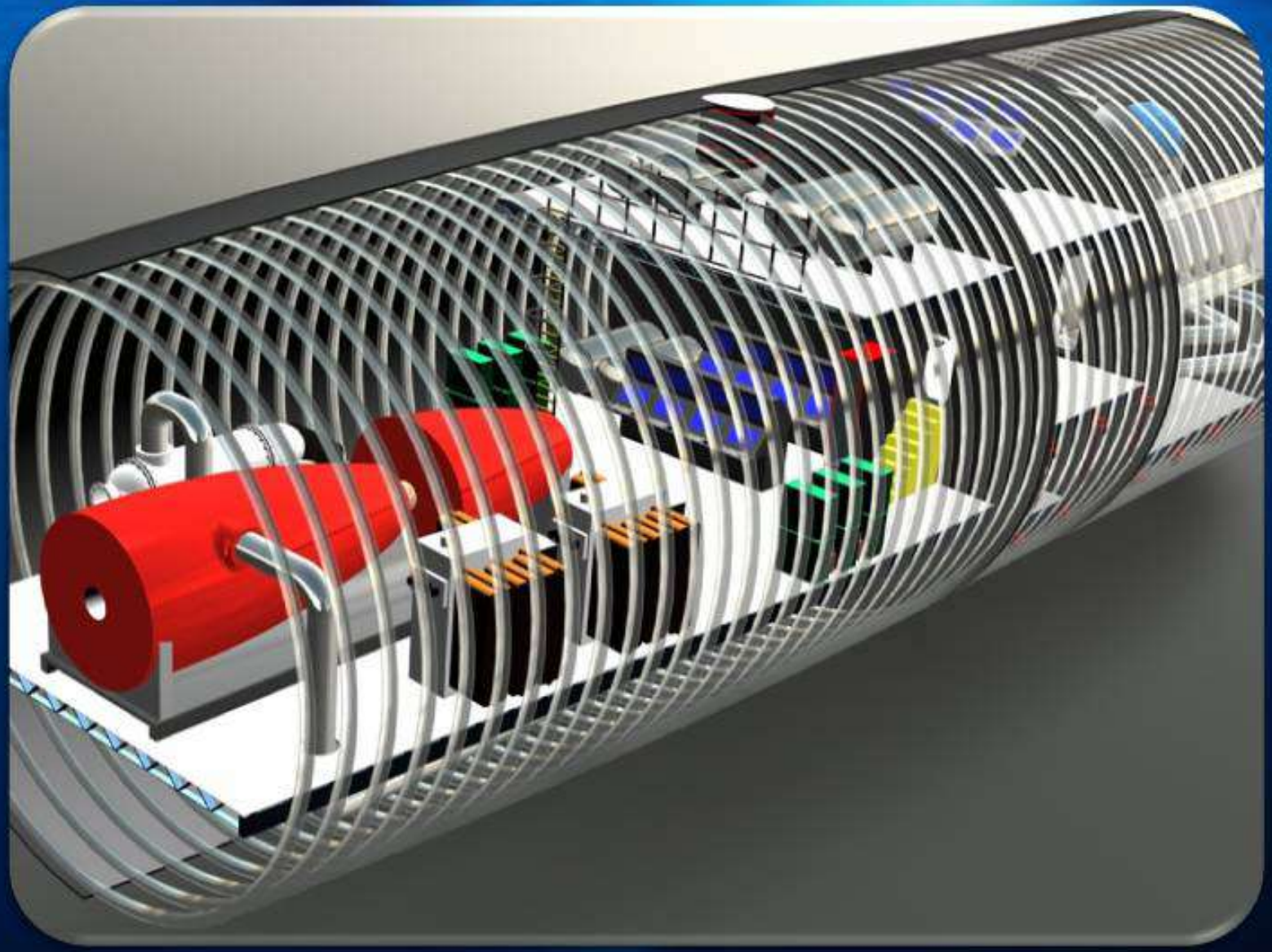


SECTIONS 4,5 & 6

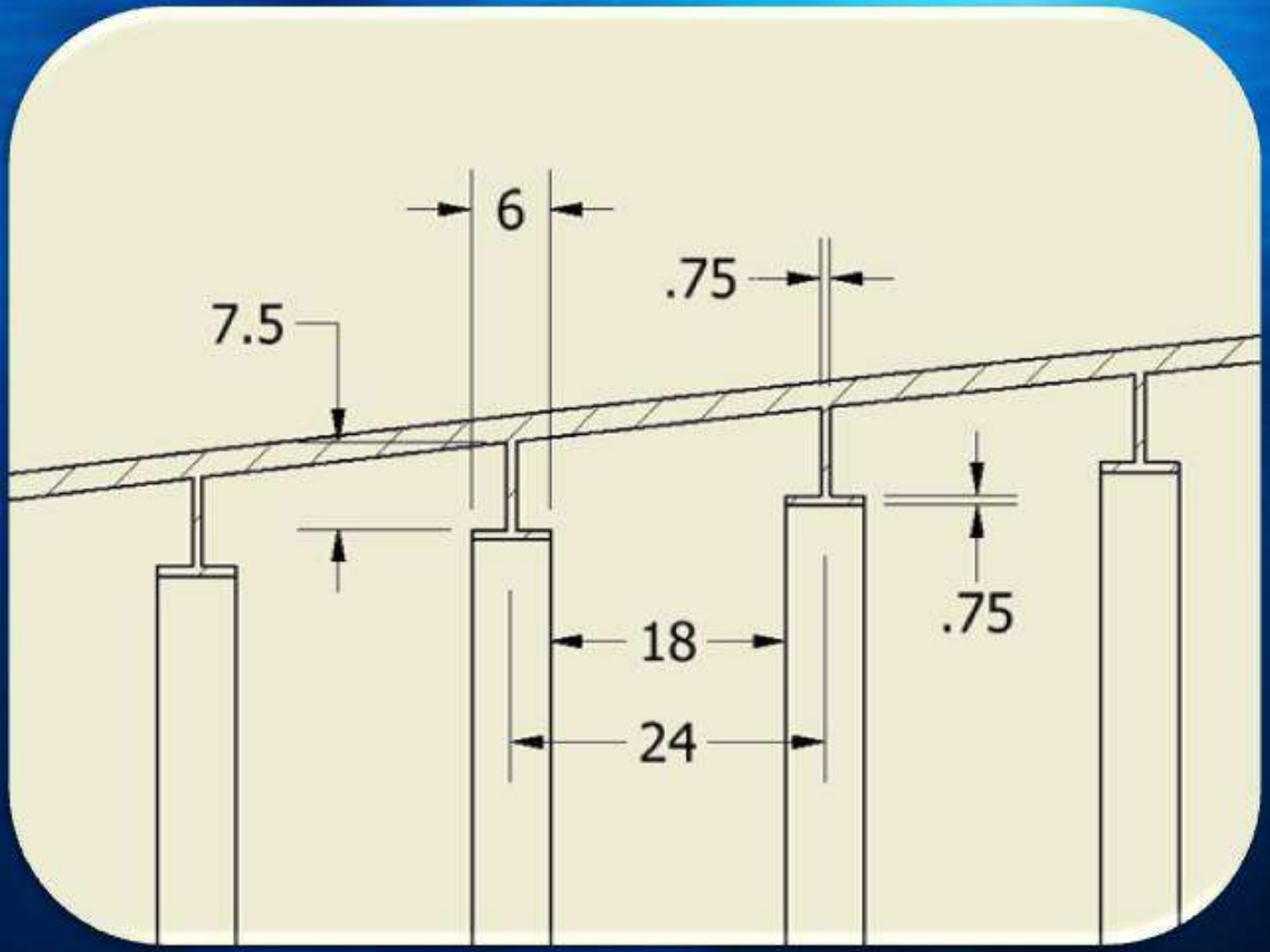


Engine Room / Maneuvering Room / Reactor Compartment

The engine room is made up of machinery that runs the submarines propulsion & hydraulics. The maneuvering room is where the turbines, reactor, and generators are controlled. The reactor compartment is where the steam that runs the sub is generated. The Virginia class submarines are powered by a single General Electric S9G nuclear reactor producing 40,000 horsepower. Propulsion is provided by two steam turbines connected to a single shaft with shrouded pumpjet propulsor.



Engine Room



Frame

Interior support beams/stiffeners are spaced 24” on center throughout the length of the submarine. These stiffeners are attached and revolved around the interior hull via welding process.