

GENERAL DYNAMICS

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Dept. 413: Ship Systems Engineering

Disciplines: Mechanical Engineering, Aerospace Engineering, Marine Engineering

This department is responsible for several fluid systems on multiple classes of nuclear submarines and aircraft carriers. These include air systems, hydraulic systems, ventilation and thermal management systems for VIRGINIA, SEAWOLF and OHIO submarine classes and CVN21 (aircraft carriers). Also, some submarine mechanical systems (steering/diving and anchor handling) are under the cognizance of this department. These systems are all essential to the functionality of submarines designed, built and supported by Electric Boat Corporation. Technical work includes engineering calculations (e. g. pressure drop, flow analyses, heat loads, reports, stress analysis of fittings), piping system design, material and equipment selection, arrangement studies, problem resolution and design improvements. System engineers are responsible for integrating the system within the ship, development of the operating instructions, test forms, maintenance procedures and provisioning for fleet support. Also, project management duties (e. g. budgeting, scheduling, technical integration with other projects) and liaison with the customer, ship's force and other contractors will be required. Engineers in this department are required to provide support on-board submarines under construction and in the fleet. Some travel may be necessary. A Bachelor of Science degree in mechanical, aerospace or marine engineering and good oral and written communication skills are prerequisites for engineers in this department.

Dept. 414: Propulsion Plant Fluid System

Disciplines: Mechanical Engineering, Marine Engineering

The Propulsion Plant Fluids Systems department is responsible for reactor plant fluid systems on all submarine classes and steam plant fluid systems on VIRGINIA, SEAWOLF and OHIO Class Submarines. Department 414 provides design and planning yard support for new construction and testing activities at EB (Groton and Quonset Point facilities) and Northrop Grumman Newport News and provides consulting services and alteration products for commissioned submarines and training prototypes. Engineers routinely perform research in all facets of engineering to develop innovative solutions to solve technical problems, perform pressure drop calculations and fluid flow analyses, develop technical work documents and test procedures, revise provisioning and preventative maintenance documents, develop technical manual changes and incorporate advanced technologies into the propulsion plant. Using a design build approach and working in a team environment, engineers interface with designers, component and system engineers, operations, planning and testing organizations within the shipyard and our Navy customer. System engineers are responsible for developing and submitting technical recommendations to KAPL and NAVSEA for approval. Opportunities exist for engineers with a BS or MS in mechanical or marine engineering. Above average written and verbal communication skills are required. An experienced mentor will be assigned to each engineer and on the job training will be required.

Dept. 415: CVN21 Propulsion Plant Structures and Shielding

Disciplines: Mechanical Engineering, Aerospace Engineering, Marine Engineering

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Opportunities exist for civil, aero, ocean, and mechanical project engineers with 0-5 years experience to work on the design development of aircraft carrier propulsion plant structures and shielding, including assessments of system and component weight impacts. Using a design-build approach and working in a team environment, engineers will develop innovative solutions to incorporate advanced technology in propulsion plant structural and shielding concepts. Duties include development of state-of-the-art structural designs, performing technical reviews, interfacing and coordinating with our various customers, performing detailed structural analyses, assisting in the development of 2D drawings and coordinating shielding and weights assessments. The group also supports various advanced propulsion plant initiatives for potential military and commercial applications. Interface with hardware and technical vendors, Navy, Northrop Grumman Newport News Shipbuilding, and Electric Boat engineers/ CAD designers and manufacturing representatives may occur on a daily basis. Project engineers will support a design-build team approach to ship design and construction. In this capacity, experience in problem definition and resolution and working in a team-based environment is desirable. Some travel may be required. An experienced mentor will be assigned to each engineer, and on-the-job training will be provided.

Dept. 416: Ship Systems - Auxiliary and Water Fluid Systems

Disciplines: Mechanical Engineering, Marine Engineering

This department is composed of the Seawater, Fresh Water and Auxiliary System Integration Teams (SITs). The Seawater and Fresh Water SITs are responsible for all non-propulsion plant water systems (For example, Trim & Drain, Shaft Seal Cooling Water, Chilled Water, and Potable Water Systems) and the Auxiliary SIT is responsible for Auxiliary Support Systems (For example, Air Conditioning, Atmospheric Control, Fire Fighting, Desalination and Diesel Systems). The responsibilities are across all platforms including submarines (VIRGINIA, SSGN, SEAWOLF and MMP) and surface ships (DDG1000 and CVN21). Candidates will be responsible for activities ranging from system concept studies through the development of final detail design, as well as construction and fleet support. The job responsibilities include system diagram development, fluid system analyses, fluid system design calculations, drawing development and approval, and system operating procedure development and approval. The candidate must also possess the skills necessary to communicate directly with the customer, develop and deliver design review presentations to the Navy, and adhere to cost and schedule requirements.

Dept. 462: Ship Signatures

Disciplines: Mechanical Engineering, Aerospace Engineering, Marine/Ocean Engineering, Civil Engineering

Signatures engineers are responsible for ensuring that the ship's components, systems and structures are designed and built to meet a submarine's challenging stealth requirements. The department's efforts are focused on technical management and control of the submarine's acoustic signature. In all of the acoustic signature areas, engineers work closely with technical counterparts in the Navy as well as the system and component engineers and program managers at Electric Boat when providing design guidance or in the

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resolution of construction problems. Signatures engineers are involved in research to extend the state-of-the-art in advanced stealth technology and analysis methods, and to develop concepts for signature control of future submarines. Within the Signatures department there are five areas of technical responsibility. These are: structural acoustics, hydro-acoustics, acoustic design of systems, advanced concepts and construction support and test.

Structural Acoustics

Structural acoustic engineers are responsible for performing detailed dynamic analyses of submarine structures using analytical, computational e.g. (finite element, boundary element, and infinite element) and statistical energy analysis techniques. These analyses are performed using state-of-the-art computer models which run on an extensive network of PC's.

Hydro-Acoustics

This area of Signatures is responsible for the prediction and control of noise generated by hydrodynamic flow in submarine and surface ship designs. Typical areas of work include advanced propulsor concept development, advanced appendage, submarine fairwater design and development, and advanced main seawater pump. Engineers in this area are involved in development and implementation of hydrodynamic noise prediction codes, making extensive use of computational fluid dynamics analysis results, and water tunnel and wind tunnel test data. Engineers work closely with research scientists at the Naval Surface Warfare Center, Applied Research Laboratory (Penn State University), Naval Undersea Warfare Center, and NAVSEA. This area also has extensive interaction with the NSWC Acoustic Research Detachment to participate in scale model flow noise tests.

Acoustic Design of Systems

This area of Signatures is responsible for the acoustic design of systems and components for advanced submarine and surface ship designs. The area's primary function is to ensure that these systems are designed to meet the radiated, platform and airborne noise requirements of the ship. Acoustic system engineers evaluate submarine systems and components and develop through analysis the optimal noise control features and allowable acoustic amplitudes for the submarine components that will ensure the ship's silencing goals are met. Laboratory and shipboard tests are performed to determine the acoustic performance of noise critical systems, noise control features and shipboard structures. Engineers in this area provide guidance and have extensive interaction with engineers responsible for the design of the ship systems and components as well as submarine equipment suppliers.

Advanced Concepts

This area is responsible for identifying technologies that can be applied to submarine quieting, assessing their maturity and creating development and insertion plans for the most promising of these technologies. Acoustic requirements for future submarine components and the overall submarine are developed in this area based on needs and missions identified by NAVSEA. This area also has the overall lead or acoustic lead responsibility in a number of on-going technology demonstration programs that involve working with outside contractors and various customers within the NAVY and DARPA. These programs require the conduct of major analytical studies and experimental verification and proof of principle tests.

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Acoustic Test Programs and NRP

This area of Signatures is responsible for acoustic test programs and resolution of acoustic problems on new construction and commissioned submarines. Work includes setup and conduct of acoustic tests, data evaluation, and reporting. Work to resolve problems identified in these tests involves a wide range of activities, including ship checks to evaluate hardware or installation deficiencies, development and conduct of additional special diagnostic tests, and development and testing of design changes or modifications. Work is done on-board ships, at Electric Boat facilities, and at equipment supplier facilities. This area is responsible for ensuring that new construction ship noise control features are correctly installed and adjusted, and for ensuring that the ship's acoustic performance is maintained through construction and delivery.

Dept. 464: Fluid Mechanics

Disciplines: Mechanical Engineering, Aerospace Engineering, Marine/Ocean Engineering, Civil Engineering

The Fluid Mechanics department is responsible for two primary areas: piping system stress analysis, and computational fluid dynamics. Pipe stress engineers support all new design work, new ship construction and operational fleet upgrades by performing detailed static and dynamic analyses of submarine piping systems through the use of state-of-the-art computer codes. These analysts provide the technical support to ensure system stress and related piping support requirements are met under a wide range of operational scenarios. Fluid dynamic engineers develop advanced software to perform internal flow (e.g. piping) and external flow (e.g. hull and appendage) analyses. Engineers are also involved in providing analytical support for advanced concepts including novel hull and control surface designs and advanced propulsion systems. Individuals within D464 are required to interact closely with Project engineers, acoustic engineers, designers, manufacturing engineers, shipyard construction trades, and Navy technical personnel. Individuals should have a strong interest in performing detailed analyses with a solid academic background in the areas of computational analysis methods (e.g., finite element), mechanics of materials, heat transfer, computational fluid dynamics, hydrodynamics, and computer programming.

Dept. 431: Shock Vehicles, Test and Evaluation Services

Disciplines: Mechanical Engineering, Aerospace Engineering, Marine/Ocean Engineering, Civil Engineering

Dept 431 Shock Vehicles, Test and Evaluation Services is a self-contained, full service department within Engineered Components that consists of three functional areas:

- Equipment Shock Qualification Program - Knowledgeable and experienced personnel responsible for all Shock Review Program (SRP) efforts; shock qualification process, maintain the shock database and providing shock reports.
- Shock Vehicle Test Program - Provides program, planning and coordination support services for component installations and shock testing on NAVSEA shock test vehicles (FSS-8, SSTV, and A/B-1).

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•Engineering Test & Evaluation Services (ET&ES) - Provides full service testing, evaluation and repair for submarine systems and components. D431 ET&ES has the manpower, services, facilities and test capabilities to meet your test requirements and perform the complete range of testing work; "Testing and Evaluation is our Business."

Engineers in this department work in one of four groups:

Shock Vehicles / Shock Test- Equipment Shock Qualification Programs

Engineers will support efforts to ensure shock resistance is designed into equipment for all classes of Submarines and the CVN21 Aircraft Carrier. Individual responsibilities will be to manage all required shock qualification activities for ship systems and components. Engineers will be expected to interface directly with various design and construction disciplines (e.g., component and system engineers, designers, Purchasing, Materials Systems, Operations, Planning, Program Office, etc.) on a daily basis. Responsibilities will include the following: performing standard stress calculations and comparisons of material properties to demonstrate shock resistance of equipment; conducting reviews of various drawings, shock test procedures and test reports; provide test support at Electric Boat, Vendor and Sub-contractor facilities.

Mechanical Lab Services - Engineering Test & Evaluation Services (ET&ES)

Engineers will be required to perform off-ship testing of submarine components, materials and systems in order to troubleshoot and repair existing designs, and qualify new designs for shipboard service. Engineers will be expected to interface with component and systems engineers to assist in the production and design process. Responsibilities may include designing test configurations, directing fabrication of test setups, and overseeing testing, which may involve detailed procedures for component overall and repair. Additional responsibilities will involve preparing test procedures, writing test reports and preparing estimates. Engineers are expected to have some knowledge of Hydraulics, HP Air Systems, Mechanical Design, Shock & Vibration and related computer skills.

SUBSAFE Certification Organization

Engineers will support efforts to ensure that all work done on submarines complies with Submarine Safety (SUBSAFE) requirements. Responsibilities include conducting internal audits, training, developing "Design Review Procedure" booklets, developing class and ship design reports, developing and maintaining class SUBSAFE test form certification lists, developing the class submarine sea trail certification booklet/SUBSAFE certification audit plan, reviewing the submarine safety certification boundary book, as well as monitoring SUBSAFE deviations and waivers.

Deep Submergence Systems - Scope of Certification (DSS-SOC) Organization

The Deep Submergence Systems - Scope of Certification (DSS-SOC) Program is a certification program established to ensure personnel safety of the Special Operations Forces (SOF) operators and occupants of a Deep Submergence System. The objective of the certification process is to verify that the Deep Submergence System provides acceptable levels of occupant safety throughout the specified operating range of the system when operating and maintenance procedures are followed. Engineers will be required to support DSS-SOC certification efforts on VIRGINIA Class, SSGN Class and SSN23 Submarines. Engineering responsibilities include interfacing directly with the Design Build Teams in support of

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certification products and activities such as, Certification Program Plan(s), Certification Survey Plan(s) (audit plans), DSS-SOC Notebook(s) (boundary book), DSS-SOC Non-metallic, Toxic and Flammable Materials List(s), supporting Supervisor of Shipbuilding (SUPSHIP) and NAVSEA DSS-SOC Surveys (audits), and coordinating resolution of survey findings with the applicable engineering disciplines / technical activities.

Dept. 433: Pumps, Valves, Heat Exchangers, Diesels and Air Components

Disciplines: Mechanical Engineering, Aerospace Engineering, Marine/Ocean Engineering, Civil Engineering

Engineered Component Engineers are responsible for design, development, qualification, testing and procurement of components utilizing new and existing technologies. They develop equipment for both propulsion plant and non-propulsion plant applications. Responsibilities include preparation of specifications, technical evaluation and coordination of supplier proposals, and review and coordination of design services and supplier work. They support design, manufacture and test of submarine components. The engineer assumes similar responsibilities for Electric Boat Corporation developed components. The engineer interfaces with the customer, shipyard, suppliers and CAD designers often on a daily basis. Material selection, mechanical analysis, and fluid analysis are key responsibilities of the component engineer. Opportunities are available in the areas of condensers and heat exchangers, pumps, valves, diesels, and air components.

In addition to development of new equipment, Engineered Component Engineers support existing designs and are responsible for redesign of fleet components to improve maintenance, safety, or reliability. Duties include redesign of components, modification of specifications, technical evaluation and coordination of supplier or customer proposals, and technical review and coordination of design services to design and manufacture submarine components. Interface with the customer, shipyard, and suppliers may be required on a daily basis.

Engineered Component Engineers employ a design build team approach to submarine design and construction. Newly hired engineers will be assigned to a mentor. Experience in problem solving, scheduling, and power plant engineering design and analysis is beneficial. Senior, lead engineers perform comprehensive review of technical deliverables, assisting the newly hired engineers. Component engineers may be assigned tasks in the areas of heat transfer, structural analysis, or fluid flow.

Dept. 434: Ship Systems Components, Shafting and Propulsor (434)

Disciplines: Mechanical Engineering, Aerospace Engineering, Marine/Ocean Engineering, Civil Engineering

Ship Systems Components, Shafting and Propulsor Engineers are responsible for the conceptual development, design, procurement, qualification testing, delivery and ship's integration of major submarine system components. These systems include major hydraulic components such as control valves, pumps, motors and towed array handling systems; life support system components including air conditioning, refrigeration, desalination and air revitalization; and main propulsion train systems components including main shaft, seals, waterborne and thrust bearings and propulsor. In addition, the group supports advanced

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propulsion machinery initiatives and frequently supports prototype development and testing. Ship's system components engineers become an integral part of a design build process and, as such, must possess strong technical skills and a thorough understanding of complicated system components. A strong academic background in statics, dynamics, machine design, fluids, heat transfer, materials, and stress analysis is required. In addition, ship systems component engineers frequently interact with component vendors, our customers, Navy laboratories, the shipyard and many support departments. As such, engineers must possess strong written and verbal communication skills. New engineers within the department are typically assigned to work with senior staff and are assigned tasks of increasing responsibility commensurate with acquired skills and the desire to excel. A "hands on" attitude is strongly encouraged.

Dept. 435: Main Propulsion Machinery - Engineered Components

Disciplines: Mechanical Engineering, Marine/Ocean Engineering

Main machinery component engineers will be responsible for the design, development, procurement, qualification testing and shipboard integration/test of main propulsion units and the ship service turbine generator set for the VIRGINIA Class program. Component engineers must work extensively with component vendors, NAVSEA and internal support groups within the Corporation. The individuals must have very strong written and verbal communication skills. Component engineers must also possess a strong technical understanding of rotating machinery, turbines, bearings and generators. Component engineers will be an integral part of the design build process to ensure the component can be successfully integrated into the propulsion plant design. Interfacing with the customer, internal departments and the component vendors will occur on a daily basis to ensure the design/performance requirements are being met and that the component can be successfully integrated into the propulsion plant. In addition, component engineers will be responsible for fleet support of the SEAWOLF, TRIDENT, and 688 class main propulsion machinery. Along with the attributes noted above, the component engineer must develop trouble shooting and repair procedures, provide direction and support to repair personnel, support modernization efforts such as the installation of new equipment and resolving obsolete repair parts issues. Component engineers will interface with ship force, NAVAL repair personnel, and other NAVAL shipyard management. Some travel may be required.

Dept. 492: Weapons & Mechanical Systems

Disciplines: Mechanical Engineering, Aerospace Engineering, Marine/Ocean Engineering, Civil Engineering

Mechanical engineers will work in a Design/Build Team environment and be responsible for completion of design studies and analysis, preliminary and detail component design, system engineering, material selection and producibility reviews. Engineers will provide support for the development, installation and test of submarine systems in the area of weapons handling, weapons launch, retractable masts, steering & diving systems, ship hatches and doors, Special Operation Forces and other special studies. Responsibilities include performing detail mechanical analysis, development and review of system and component specifications, technical reviews, coordination of design services and vendors, and evaluation of design

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concepts and cost reduction ideas. Engineers will interface with engineers from all disciplines, designers, shipbuilders, trades, vendors, Navy Labs and NAVSEA customer personnel.

Dept 472: Reactor Plant Planning Yard and Moored Training Ship Support Yard

Disciplines: Mechanical Engineering, Aerospace Engineering, Marine/Ocean Engineering, Civil Engineering

Engineers provide Engineering consulting services, alteration products and provisioning support to NAVSEA, Commissioned Submarines, Moored Training ships, NR-1 Deep Submersible Research Submarine and their designated support facilities. Responsibilities include working in a team environment with Technical Writers, Design Services, Provisioning Services and other Engineering and Test Services to design new or modify existing reactor plant and propulsion plant systems. Engineers routinely perform research in all facets of Engineering to resolve technical requests, perform studies, complete calculations develop test procedures, revise provisioning technical documents, revise preventative maintenance and develop technical manual changes. Newly hired personnel are assigned a mentor for a period of 6-12 months to assist in learning the above duties. A lead Engineer oversees all technical aspects of the work produced prior to management review. Above average written and verbal communication skills are essential since the Engineer is expected to effectively communicate with NAVSEA, Prime Contractors, Shipyards and Vendors.

Dept. 463: Solid Mechanics

Disciplines: Mechanical Engineering, Aerospace Engineering, Marine/Ocean Engineering, Civil Engineering

Engineers will provide full structural engineering expertise to the submarine design organizations within Electric Boat and NAVSEA. This expertise covers many areas including structural analysis of both internal and external structures, shock qualification of components by analysis, analysis methodology development, development and maintenance of structural engineering software, and structural technology development. Candidates are also needed to support research and development in computational structural acoustics. Analyses are performed using state-of-the-art computer models that run on an extensive network of workstations and super computers. Knowledge of finite element analysis, steel design techniques, and advanced mechanics of materials are useful for these positions. Additional duties for analysis positions include preparation of technical reports and presentations, and interfacing with design, testing and fabrication departments.

Dept. 493: Hull and External Structural Engineering

Disciplines: Mechanical Engineering, Aerospace Engineering, Marine/Ocean Engineering, Civil Engineering

Engineers in this department are responsible for the detail design of submarine hull and external structures, including pressure hull and framing, bow, stern, and fairwater structures. Responsibilities include

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engineering analysis, technical review and coordination of detail design review and coordination of detail design drawings and engineering evaluation of design concepts. Engineers will interface with CAD designers, participate in Navy design reviews, and support a design/building approach to submarine design and construction.

Dept. 496: Hydrodynamics, Hydrostatics and Weights

Disciplines: Marine/Ocean Engineering, Naval Architecture

Engineers in this department are responsible for determining the hydrostatic and hydrodynamic characteristics of submarines. This includes determination of tank volumes, ship displacement, stability, speed, power and maneuvering characteristics using traditional and computerized methods. The work also includes determining external flow characteristics for hull and appendages, hydrodynamic loading, and trade-off studies of various hull appendage combinations. Department 496 is also responsible for waterfront support activities such as blocking, docking, submarine launching, and barge transportation of major hull sections. The department provides leadership in the concept development of new and innovative submarine platforms and leadership on the design/build teams that work through design and construction issues for new designs and modifications to current platforms. Applicants should have a B.S. or M.S. degree in Naval Architecture or Ocean Engineering.

PROCESS AND MANUFACTURING ENGINEERING

Department 607: Manufacturing Engineering

Disciplines: Mechanical Engineering, Marine/Ocean Engineering, Civil Engineering

Using a design/build approach and working in a team environment, engineers will develop special tools, fixtures and other manufacturing aids required to facilitate submarine construction. Primary responsibilities will be identification and development of methods and tools required for fabricating and assembling submarine components, structures, systems and modules. Develop efficient arrangements of existing production facilities, layouts for new, expanded or upgraded facilities. Duties will include active participation in Design/Build teams; review of Class drawings for manufacturing concerns; development of concepts for tools and fixtures; preparation of Manufacturing Engineering Procedures for sequence and alignment critical installations; preparation of handling procedures for rigging submarine components and modules; and pro-active construction support. A mentor will be assigned and on-the-job training will be provided.

Dept. 670: Process Engineering:

Disciplines: Mechanical, Electrical (Power, Electronic), Civil (Structural), Ocean, Marine, Aerospace Engineering, Physics, Computer Science/Engineering, Nuclear Engineering or Naval Architecture

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The Process Engineering group is engaged with all of the functional organizations of the company in identifying and acting upon opportunities for improving our business processes, improving quality, reducing cost, and improving cycle time. Green Belts, Black Belts, Master Black Belts, Process Improvement Chiefs and the Process Engineering management team work with all levels of Electric Boat management to establish measurable metrics for specific areas of the business. The Belts work with their Process Improvement teams to analyze the metrics and identify opportunities to improve business processes through implementation of the Lean Six Sigma DMAIC methodology. Tools such as Value Stream Mapping, Process Modeling, Pareto Charts, and statistical analysis are used determine the few critical inputs to the process that most affect the process output. The Belts and the team employ tools like Design of Experiments (DOE) and Failure Modes and Effect Analysis (FMEA) to determine improvements. The Belts are expected to work in a hands-on team environment and identify and remove barriers that either slow or prevent the successful attainment of project goals. Belts will assist in the planning, organizing, and execution of processes to run the Process Engineering group. Belts will mentor and coach other Belts, employees, and management in Process Improvement methodologies. Green Belt and Black positions are internally posted. Interested applicants should have a proficiency in basic algebra and be comfortable with Microsoft Word, Excel and PowerPoint. Good interpersonal, organizational, planning, and project management skills are required. In addition, strong communication skills, written and verbal, are essential. Candidates should be self starters with an attention to details. Positions are open to all salaried and MDA represented personnel.