

# GENERAL DYNAMICS

## Electric Boat

### **Dept. 448: Ship Control and Monitoring Systems**

Disciplines: Electrical Engineering, Computer Engineering, Computer Science

The Ship Control System integrates fluid, mechanical, and electronic components and systems to control ship's course, depth and attitude. Ship Control engineers are combining practical experience and ingenuity with the latest research from the Software Engineering Institute (SEI) to create a cutting-edge ship control system. The new ship control station, designed by ship control engineers, combines the latest hardware and software to achieve ease-of-use not previously available on an attack submarine. In place of hundreds of hard-wired switches and gauges, the Pilot and Copilot of the NSSN will access the custom graphical user interface (GUI) via touchscreen-equipped flat panel displays and joysticks. Functions are logically grouped on the screens and the operators are able to view all the data they need with just a push of an on-screen button. Driving the ship has never been easier than with the new automatic course and depth-keeping facilities. Prefer to drive manually? Grasp the joystick and with one button-push you have complete control. Variable ballast and hovering operations can also be computer-controlled.

What does it take to create this new ship control station? Though it is a direct extension of years of R&D efforts, ship control engineers are designing the new station now. Design for the shipboard software has begun, and the physical station layout, the chairs, joysticks, and power supplies are also being finalized. Additionally, we have developed a fully working prototype station to support the Concept of Operations Exercise (COOPEX), in which the Navy officers and enlisted personnel relay to us their thoughts on the display screens.

### **Dept. 449: Combat Systems Engineering & Integration**

Disciplines: Electrical Engineering, Computer Engineering, Computer Science

Combat Systems Engineering applies highly diversified skills to produce Non-Propulsion Electronic Systems (NPES) for US Navy nuclear submarines. Leveraging the latest in state-of-the-art technologies, NPES systems are provided for Sonar, Combat Control, Ship Control, Total Ship Monitoring, Tactical and Non-Tactical Data Processing, Exterior Communications, Navigation, ESM, Radar, Imaging, Periscope, and Weapons Shipping and Handling. Engineering opportunities range from initial system design through development, hardware/software integration, test, delivery and implementation of the systems aboard nuclear submarines. After delivery to the nuclear submarines, engineering efforts extend to the analysis and resolution of fleet identified problems, assessment of obsolescence issues, and identification of components for technical refresh. Additional challenges include the design and development of simulation/stimulation systems used during the development and test of the NPES, the development of operational and maintenance trainers used to train the crews, and system and subsystem level configuration management to ensure quality, safety, and reliability standards are met throughout the life cycle of the products. Integrated Product Teams, consisting of Electric Boat and Navy representatives, are formed to ensure systems and revisions are completely and effectively planned for current and future products. Mentors are assigned to new engineers to educate them on processes and policies and to guide career development.

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### **Dept. 454/737: Tactical Software Engineering**

Disciplines: Electrical Engineering, Computer Engineering, Computer Science

Tactical Software Engineering is the Center of Excellence for Software Engineering at Electric Boat. Software engineers work with system and hardware engineers in other engineering departments to design, develop, and maintain a variety of tactical computer software systems and components for TRIDENT SSBN/SSGN, VIRGINIA, and SEAWOLF Class submarines and associated simulators and trainers. Tactical Software Engineering also provides technical leadership for engineering process improvement, software safety, software subcontract management, configuration management, and quality assurance activities within engineering departments. Software engineering development environments are comprised of multiple networks of UNIX, LINUX, and Windows workstations and state of the art software development tools. These environments are used for software engineering and development of embedded real-time computer systems used aboard all classes of nuclear submarines and associated shipboard and land-based trainers. Engineers in these departments participate in systems and software development on projects such as: Ship Control, Ship Control Operational Trainers, Deployable Towed Array, Diesel Generator Control Panel Operational Trainer, Weapons Launch Control, VIRGINIA Simulation/Stimulation, and Integrated Database Management System. Engineers in these departments are involved in: systems analysis, systems management, system test, open architectures, middleware, simulation-based product design and material acquisition, hull, mechanical and electrical systems, nuclear systems, Independent Research and Development, and training systems. Opportunities range from initial system design through development, hardware/software integration, test, delivery, and integration of shipboard systems. For delivered submarines, engineering efforts extend to the analysis and resolution of fleet identified problems, assessment of obsolescence issues, and implementation of modernization programs. Candidates must be able to work with Capability Maturity Model Integrated (CMMI) Level 3 processes. Skills in Ada, VHDL, C, C++, Java, CMS-2Y, FORTRAN, real-time operating systems, and relational and object-oriented databases are desirable. Skills developing graphics, simulations, safe code, and interfacing with electronics are preferred, and networking knowledge is highly desirable. Experienced candidates must have a familiarity with configuration management and quality assurance. Successful candidates for this group should possess the interpersonal skills necessary to energetically embrace the challenges of the disciplined application of engineering, with emphasis on scientific and mathematical principles, methods, and tools to the economical production of high quality safe software.

### **Dept. 425: Instrumentation and Electronic Systems**

Disciplines: Electrical Engineering

Engineering personnel are responsible for the design, development and deployment of test instrumentation and data acquisition systems to support design validation and acceptance testing applications. Engineering personnel perform instrumentation system, hardware and software development work involving a diversity of disciplines including measurement applications technology, analog signal conditioning, digital interfacing, computer system networking, fiber optics, real-time software applications and data reduction programs. Projects provide an opportunity for end-to end responsibility (e.g. from functional definition of

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requirements through system integration to test conduct). Engineering personnel work closely in a team relationship with Union-Represented Instrumentation and Electronic Technicians in development, fabrication, installation and test functions. Design, Shipyard and Navy customer interfaces include NAVSEA, KAPL/Bettis/BPMI, RPCO, NRRO, SSPO, Northrop Grumman Newport News, PCU and Commissioned Vessel Ship's Force.

### **Dept 427: Power & Auxiliary Systems**

Disciplines: Electrical Engineering, Computer Science, Nuclear Engineering

Engineers are responsible for electrical system and component design, development, qualification, and procurement for new applications using existing and modified technologies. Duties include design and development of propulsion plant and non-propulsion plant systems and components including analysis, development of specifications, technical evaluation, coordination of supplier proposals, and coordination of design services and supplier work to design, manufacture, and test submarine systems and components. Interfacing with the customer, shipyard, suppliers, and Computer Aided Design designers occur on a daily basis. Material selection, circuit analysis, and component integration are key responsibilities. Opportunities are in the area of reactor plant and steam and electric plant system and components, specifically the areas of power distribution, solid state power conversion, switchboards, controllers, impressed current cathodic protection, submersible propulsion motors, and electrical hull penetrations. Engineers also support existing designs and are responsible for component redesign of existing fleet components base on improved maintenance, safety, or reliability. In addition, engineers will act as a liaison between the shipyard and engineering when problems arise during the construction and test phases of the submarine. The engineer will investigate and troubleshoot any reported discrepancies and communicate with the applicable trades, management and Government and determine the appropriate corrective action to best support construction schedules.

### **Dept. 428: Electrical Systems**

Disciplines: Electrical Engineering, Computer Science, Electromagnetics, Electro-mechanical Engineering

The D428 EHP and Auxiliary Systems Group provides ship's general illumination, security lighting, navigation lighting and receptacle power. The group is responsible for bringing the required number of electrical conductors and optic fibers through the pressure hull while meeting all applicable SUBSAFE requirements. The Secondary Propulsion System (SPS), which provides an alternate means of propulsion to the ship in the event that the main propulsion train is unavailable, is also under the cognizance of this engineering team. Other work includes HM&E systems that provide for the habitability of the ship's force onboard the submarine and also includes auxiliary systems such as hydraulics, air systems and distilling plant controls. This group is the lead for two of the three EM non-acoustic signature related systems on the VIRGINIA Class; Impressed Current Cathodic Protection (ICCP) and Active Shaft Grounding System (ASGS). ICCP provides cathodic protection of the hull and electric field reduction and ASGS modifies shaft current to minimize EM signature.

The D428 Interior Communication (IC) systems group works with signal conditioning and electrical flow paths for control, indication, monitoring, alarm, and safety circuits throughout the ship, and circuit isolation

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between the ship's service power distribution system and individual systems. A few of the IC systems developed and maintained by this group include Diesel Control, Snorkel Safety, Hatch Indication, Tank Level Indication, and Trim and Drain Flow Indication. The IC systems group also provides the on-ship voice transmission via sound-powered telephones, amplified communication circuits, submarine wire free communications, telephone services between the ship and shore, and the ship's entertainment system. This group also maintains the Electric Boat Integrated Communications System (ICS) Laboratory and Fiber Optics and Light Laboratory providing In-Service Engineering Agent (ISEA) support and cost-effective in-house test and training facilities for the VIRGINIA Class ICS. The IC group is also working on new submarine technologies related to wireless communications, local area network (LAN) services, fiber optics, and shipboard automation. Much of the work accomplished by this group supports the VIRGINIA Class fast attack submarine.

Like the IC group, the D428 Instrumentation Systems group is responsible for the operation and design of many IC Systems associated with previously delivered Fast Attack and Ballistic Fleet submarines. Along with supporting many of the IC functions previously described, this group also works on the SSGN platform and special projects associated with SEAWOLF Class platform, video processing, and other hull specific special capabilities. This group is also well recognized for its interface with Special Operating Forces (SOF) requirements. The Mold in Place (MIP) processor group within the Instrumentation group is responsible for the design and processing associated with the Special Hull Treatments (SHT) applied to modern fast attack submarines. The processing system includes an extensive use of material processing and software to drive the machinery.

The D428 Energy Storage and Electromagnetics group provides the technology and support for emergency energy for reactor plant safety and emergency power to select shipboard systems and electrochemical energy storage emerging technology assessments. The group's Electromagnetics responsibilities consist of electromagnetic analysis, electrostatic discharge (ESD) analysis, electromagnetic testing and electromagnetic signature analysis. This group operates the Electric Boat Electromagnetic Compatibility (EMC) Lab which provides a cost effective, in-house option for EMC testing. The Lab is equipped and staffed to perform EMC & DC magnetic field qualification testing and to provide expert troubleshooting. Personnel from this lab are often called to on-site submarine locations to troubleshoot and to resolve EMC-related problems.

### **Dept 429: Electromagnetic Compatibility Engineering and Energy Storage**

Disciplines: Electrical Engineering

The responsibilities of the Electric Boat Corporation Electromagnetic Compatibility (EMC) Engineering team encompass all aspects of EMC related activities for submarine electrical and electronic systems and components. EB EMC engineers gain substantial experience in a wide assortment of practical and analytical electromagnetic assessments. Mathematical analyses include magnetic and electric field coupling calculations to support compatibility assessments of cabling and electronic systems. EB EMC is also responsible for performing electromagnetic equipment testing at our new in-house EMC Lab, providing engineers exposure to the hands-on, practical aspects of electromagnetics. Department responsibilities also include submarine magnetic silencing systems and electrochemical energy storage technology applications

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for fleet submarines, submersible vehicles and other special projects. Energy storage systems also include electronic health monitoring system development for various battery installations. Individuals are exposed to the complete span of engineering activities from early specification preparation, system development, qualification/acceptance testing, shipboard installation and construction/post-construction support.

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### **Dept. 443: Instrumentation, Monitoring and Control Systems**

Disciplines: Electrical Engineering, Computer Engineering, Nuclear Engineering

The next generation Aircraft Carrier Electrical group has openings for highly motivated Engineers to work in the area of network based distributed process control, information management systems, digital controls and monitoring for the ship's steam and electric plant systems. The main duty is design/development of the monitoring and control system, and will also include: development of system diagrams, interface with fluids engineers to assure specification requirements are met, ensuring operating panel designs are compliant with the Human Factors Engineering (HFE) Guidelines, design and development of display pages used for control, design/development of the Information Level Network, Modeling/Simulation of electric plant operation/behavior and performing Manning Reduction Studies. The candidates should possess knowledge in the areas indicated above or have above average instrumentation and control background. Experience in Programmable Logic Controllers and network based control system design is a plus.

### **Dept. 670: Process Engineering:**

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

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 to 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.