

# UNDERWATER TECHNOLOGY

## Design, construction and operation at maximum safety and reliability

When it comes to naval submerged vehicles, the safety of humans and the reliability of technology are of utmost importance. As a founding member of the Naval Ship Classification Association (NSCA) and of the International Naval Safety Association (INSA), DNV has developed a special set of rules for assurance solutions. They take national and international technical rules and standards, such as for pressure vessels under human occupancy, as well as substantial experience gained through various underwater technology projects in this industry into account for newbuilding and retrofit projects of naval submarines.

### Our solutions

Design and construction, modernization and retrofit as well as optimized maintenance intervals are highly important for naval submarines and Remotely Operated Vehicles (ROVs), Autonomous Underwater Vehicles (AUVs) and Unmanned Underwater Vehicles (UUVs).

For this reason, we provide:

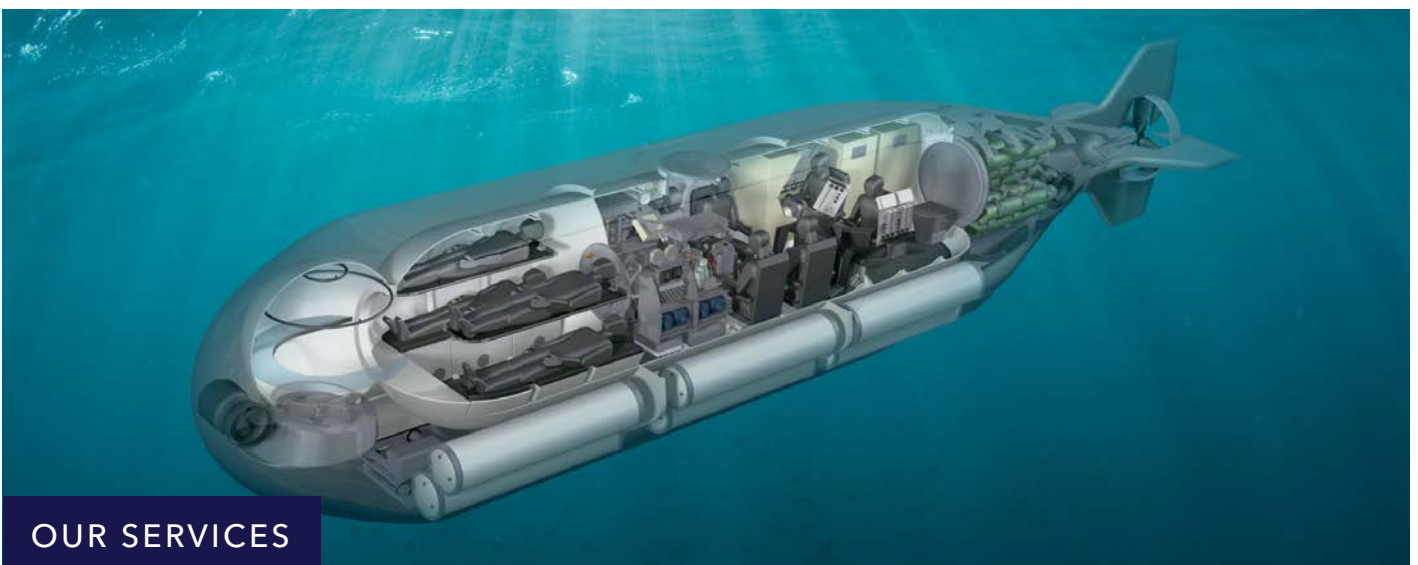
- **Comprehensive classification services** based on DNV rules for a complete submarine
- **Certification of systems, subsystems and components**, for example for naval equipment, submarine rescue systems, diver operation / diver lock-in and lock-out, fuel cells including storage of hydrogen and oxygen, batteries, etc.
- **Naval Technical Assurance solution** as an alternative and generic approach to the classification and certification process, including a more tailored and wider scope by adapting to navy-specific needs and the environment being operated in. In focus is the integration of naval and other external national regulations in a holistic process.

All of our solutions can be implemented and certified under consideration of the **Naval Submarine Code (NSubC)**. Our close involvement in the development and dissemination of the NSubC with different naval administrations offers great benefits for our customers.

We use our long-standing experience for performing construction and special duty surveys, for instance regarding newbuilding projects as well as maintenance, repairs and retrofit of vehicles in operation.

### Focus on specifications, design and pre-construction phases

As a classification society and experienced certification provider for underwater technology, we support our customers starting in the early project stages - in addition to our services for support during the manufacturing, construction and operational phases.



## OUR SERVICES



Source: Courtesy of the public relations office of the South African fleet, Simon's Town

This includes, amongst others:

- **Approval in Principle (AiP)** design review of drawings and documentation in order to ensure compliance with the requirements during an early project stage. Identification of design-critical items and availability of all required drawings and documents. This ensures an efficient and smart classification process.
- **Feasibility studies for novel technology solutions** to be implemented on submarines, e.g. new battery types, fire safety concepts, life support systems, emergency rescue systems, etc.
- **Assessment of requirements and standards** concerning suitability for submarine projects, and providing guidance for defining an applicable standards plan (including specifications)
- **Engineering support for design aspects:** DNV has experts in nearly all fields of engineering, e.g. stability, materials, welding, fire safety, electrical systems and components, pressure vessels, structural integrity (FEA), communication, navigation, mechanical systems, etc.
- **Development of a specific assurance/classification concept** incorporating requirements by the naval administration and the NSubC, and including documentation, drawings and testing requirements for safe construction
- **Risk assessments** needed to ensure safe construction and operation
- **Support in the development of tender documents** with regards to technical specifications for the invitation-to-bid process for shipyards, suppliers of materials and components, testing facilities, etc.

### DNV - your perfect partner

One of the core assets of DNV is our experts' substantial project experience and deep know-how in naval underwater technology. More than 40 years of DNV experience in the fields of submarines, manned submersibles and unmanned underwater systems, combined with continuous improvement and maximized synergies of DNV Naval Submarine Rules and DNV Underwater Technology Rules, have enabled us to develop into a very strong and reliable partner.

Quick and direct access to the core team of highly experienced DNV and underwater technology experts enables you as a customer to optimize your project's implementation.

### Your benefits

- Utilization of state-of-the-art DNV Naval Submarine Rules
- Integration of navy-specific regulations by applying the Naval Technical Assurance solution
- Maximizing the safety and reliability of naval submerged vehicles and their relevant systems

DNV as a global classification, certification, technical assurance and advisory company offers the full range of naval services.

### Contact

For further and more detailed information, please contact [DATE](mailto:DATE@dnv.com) or visit [dnv.com/navy](http://dnv.com/navy)

