QINETIQ

Paramarine®

Advanced Marine Design Software
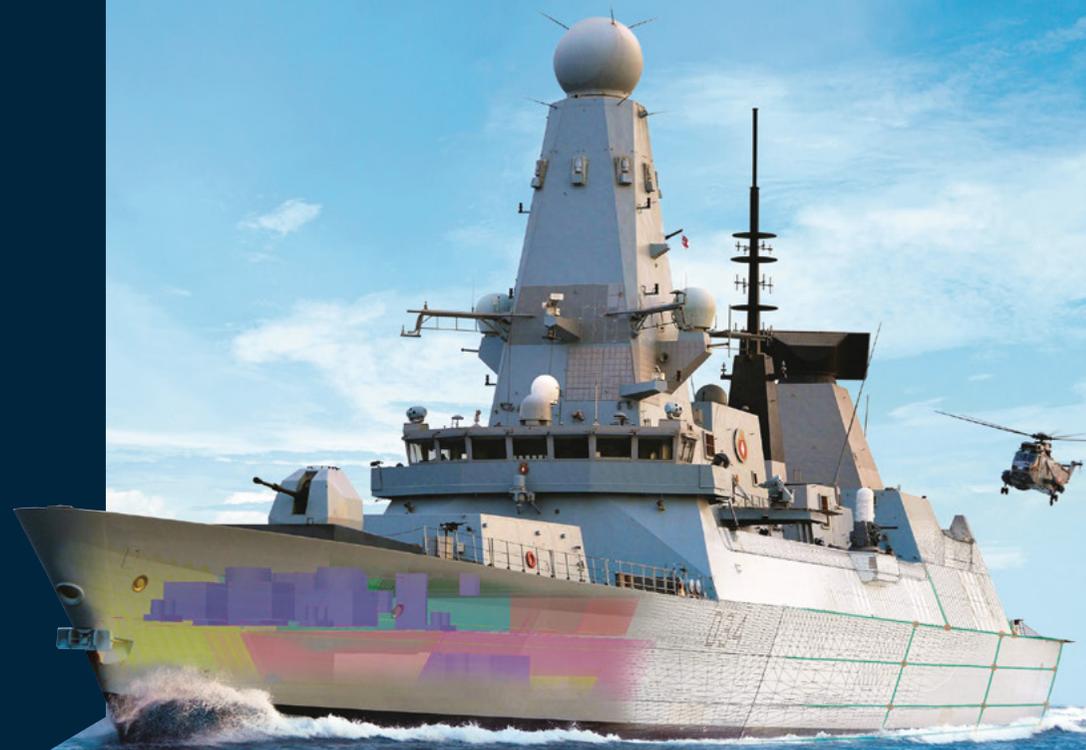
Our Customers

QINETIQ

QinetiQ is a world leading provider of solutions for submarine, naval surface and commercial ship design, analysis and support.

QinetiQ has over 25 years experience in this market. Paramarine is used by ship builders, designers, operators and owners as well as academic institutions to model and analyse a broad range of designs.

With an experienced team of both Naval Architects and software developers, product development is at the core of the business' activities. Alongside this, both consultancy projects and training courses are delivered globally to a varied customer base. The highly knowledgeable team within QinetiQ provide direct user support drawing on years of experience of working with Paramarine.

BAE SYSTEMS | BMT Defence Services | 국방과학연구소 Agency for Defense Development | National Defence | Navantia | DCNS | Keel Marine | Conceptia | PRINCESS | Sunseeker

ASC | NAVSEA NAVAL SEA SYSTEMS COMMAND | KOCKUMS | Newport News Shipbuilding | Australian Government Department of Defence | de&s | UCL | UNIVERSITÀ DEGLI STUDI DI GENOVA | JFD | DRASS

Paramarine®

Fully Integrated Tool

Paramarine is a fully integrated Naval Architecture tool, where all design and analysis work takes place within one common graphical user interface, eliminating the need for data exports to other packages.

It includes multiple analytical tools within one software package

- Concept Design
- Stability Assessment, both damaged and intact
- Manoeuvring performance
- Powering and Endurance
- Seakeeping
- Structural Analysis

Customisable reports including general arrangements, stability books and Probabilistic Damage can be easily generated using Paramarine's advanced reporting functionality. These can be opened directly within Microsoft Word for further customisation if required.

Parametric Design Approach

Paramarine's object orientated design approach allows designs to be generated and controlled with ease through input characteristics. These can be used to parametrically define the hull, which can be assessed for stability, structure and manoeuvring performance. The resulting values are always up to date, eliminating the need for the user to manually recalculate any part of the design.

Siemens Parasolid™ Technology

Based on Siemens Parasolid, Paramarine integrates seamlessly with Parasolid transmit files and also provides comprehensive interfacing through STL, STEP, DXF and IGES file types.

Paramarine uses the principles of facet geometry rather than curve groups to perform calculations, providing the user with results of greater accuracy. The 3D geometry allows the user to easily visualise their design and compartment definition.

Using powerful and flexible surface generation functionality allows the rapid generation of complex hull forms and subsequent compartment subdivision. This approach prevents double accounting of volume and the hierarchical nature of the subdivision ensures the consistency and integrity of the design.

Embedded Excel and Team Paramarine

Through an embedded Microsoft Excel functionality within Paramarine, users are able to easily control and define the flow of data to and from a design as well as utilising the inherent VBA macro language to undertake optimisation routines.

Multiple users are able to collaborate on a single design through the Team Paramarine functionality. This provides user access control, design auditing and the ability to check in and check out areas of the design.

Stability

Paramarine's extensive surface ship stability module provides the ability to perform analyses using both surfaced and submerged loading conditions, including all combinations and types of tanks and dry bulk cargo.

Ship Stability

There is no limit to the number of analyses or loading conditions that can be analysed, and an example of some of the analyses available inside Paramarine include:

- Intact, probabilistic and deterministic stability (including damage templates)
- Emergency response, docking and launching
- Cross flooding time based simulation
- Floodable length calculations, ultimate stability and structural loss integration
- Freeboard, downflooding and openings
- Limiting KG analysis
- Tank calibrations
- Automated Stability Information Books
- Inclining analysis

The stability core integrates fully with the extensive Paramarine naval architecture framework.

Submarine Stability

Paramarine can handle the stability analysis of all types of surfaced and submerged vehicles, including renewable energy structures and submersibles. The structure of the stability objects enables stability calculations from most scenarios to be examined.

For example it is possible to determine ballast tank blow-able capacity, trim draughts from which a submarine will submerge to neutral buoyancy and emerged buoyancy. Both intact and damaged stability conditions can be investigated, where damage may be to ballast tanks or due to pressure hull compartment flooding.

The fluid BG in transverse and longitudinal directions can be determined from a submerged attitude and an associated tank state.

Trim polygons can be generated based on the trim and compensating tanks as geometrically defined, including fluid restrictions imposed on those tanks, and a consumables polygon.

Example Stability Criteria

- DefStan 02-109 / 08-102
- DefAust 5000
- USN DDS 079-1
- DNV Ships Part 5, Chapter 1
- IMO HSC 2000 / MSC.267(85) / MSC.216(82) / MSC.218 (85) / A.266(VIII) / MSC.245(83) / MARPOL / Stockholm Agreement
- MCA LY2 / MGN280 / ISO12215
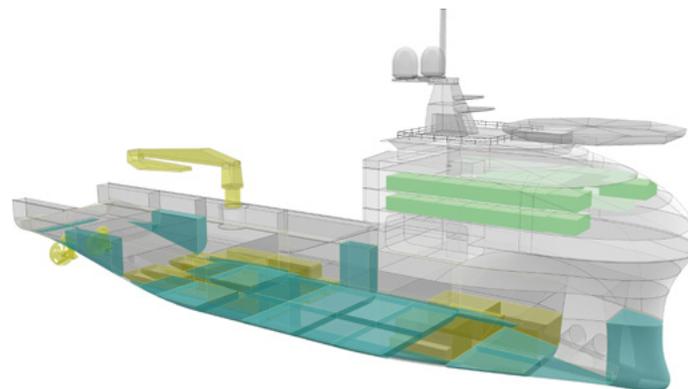
Licenses
A003: Stability Core;
A004: Warship Stability
A005: Submarine Stability;
A006: Commercial Ship Stability
A028: Probabilistic Damage;
A030: Analysis for Renewables Industry
A011 Emergency Response

Hydrodynamics

Paramarine has integrated strip theory Seakeeping, coefficient based Manoeuvring (for both surface ships and submarines) and regression based Resistance and Propulsion assessment to allow design or condition modifications to be understood fully and to de-risk designs early.

Seakeeping

Paramarine utilises QinetiQ's extensively validated strip theory code to allow a 5 DOF (fixed in surge) assessment of ship motions in a seaway.

Paramarine allows for operability assessment in the frequency domain, including conversion to time domain through random phase assessment. Able to generate RAOs in both short crested and long crested spectra, Seakeeping is able to assess against all major operability criteria.

Ship Manoeuvring

Ship Manoeuvring allows the designer to rapidly assess the manoeuvrability of a surface ship at any stage of design. The underlying calculations are developed from published data on model tests and in-house theoretical models.

Manoeuvring performance can be assessed for numerous vessel propulsion and appendage types including azipod-type drives, and vertical-axis propulsion (e.g. Voith Schneider units).

Submarine Manoeuvring

Paramarine incorporates the ability to perform dynamic simulations of submarine manoeuvres. This module can both generate a set of linear derivatives or alternatively, a coefficient set from a model experiment may be used directly. These can then be used to provide input parameters for a full nonlinear 6 (DoF) simulation.

The ability to model plane jams, flooding and shallow water effects on a manoeuvre allows parametric manoeuvring limitation diagrams to be generated quickly, and to rapidly assess design modifications on performance.

Resistance and Propulsion

With 37 validated effective power methods and the ability to assess endurance and identify propellers, analysing resistance and powering is rapid and reliable. R&P is suitable for both Surface Ships and Submarines.

Once the vessel resistance elements have been defined, Paramarine can select a suitable propeller from its built in propeller series, with constrained searches as required.

Submarine resistance can investigate both submerged and surfaced R&P, including towed array and shallow water.
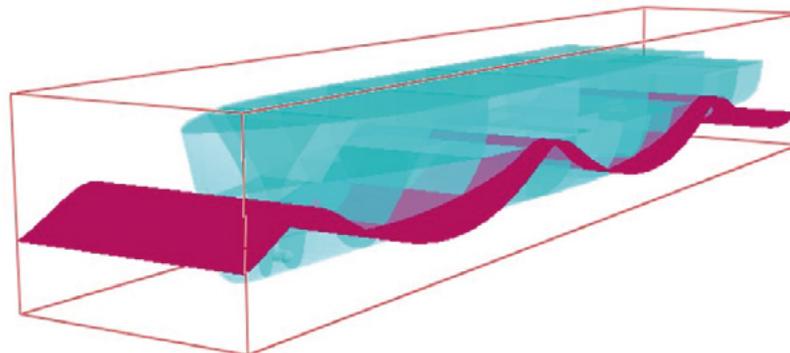
Licenses
A008: Seakeeping
A009: Resistance & Propulsion
A024: Submarine Manoeuvring
C002: Monohull Manoeuvring
C004: Trimaran Manoeuvring

Structures & Survivability

Paramarine has extensive Structural Analysis capability using BOSOR4 and NS94D. Complemented by an extensive Emergency Response suite and Radar Cross Section Analysis, Paramarine is ready to keep your assets safe.

Surface Ship Structural Analysis

Ship structures in Paramarine allows the rapid definition and analysis of scantlings. Given a subdivided hull, Paramarine can automatically generate the geometry of all of the panels and bulkheads for the vessel from defined schema.

Once defined, the structure can be assessed, Paramarine will determine bulkhead collapse loadings, calculate a ships ultimate strength using NS94D, identify critical sections and structural rankings and perform fracture analysis and propagation.

The structural definition can be linked to a weight auditor for cost and weight estimation and to longitudinal strength. When combined with damage templates, structural assessment can be performed post damage.

Submarine Structural Analysis

Paramarine's Submarine Structural Analysis capability allows direct assessment of pressure hull collapse through both classical analyses (longitudinal yield failure, elastoplastic overall collapse, stiffener tripping, dome collapse and elastic inter-frame and overall buckling collapse) in addition to assessment using the BOSOR4 collapse code.

Paramarine can also optimise stiffener and plate using classical methodologies to achieve minimum weight for a given pressure requirement.

Emergency Response

Paramarine's emergency response capability has been used by the UK Ministry of Defence for over 15 years as the tool of choice for Naval Ship support.

Incorporating lessons learnt from incidents such as the grounding of HMS Nottingham, Paramarine can perform breakout force calculations, estimation of hole areas, grounding analysis and seabed estimation. The ability to link to Admiralty Total Tide ensures you are in control throughout the emergency response scenario.

The ships hull girder response and longitudinal strength can be checked alongside seabed deflection and appendage/hullform suction forces.

Radar Cross Section Analysis

The RCS analysis gives a baseline capability for assessing the RCS of ships. SPECTRE uses a Physical Optics approach including shadowed areas through a combination of graphical and numerical results enabling a ship to be rapidly analysed from the CAD definition to identify the hotspots.

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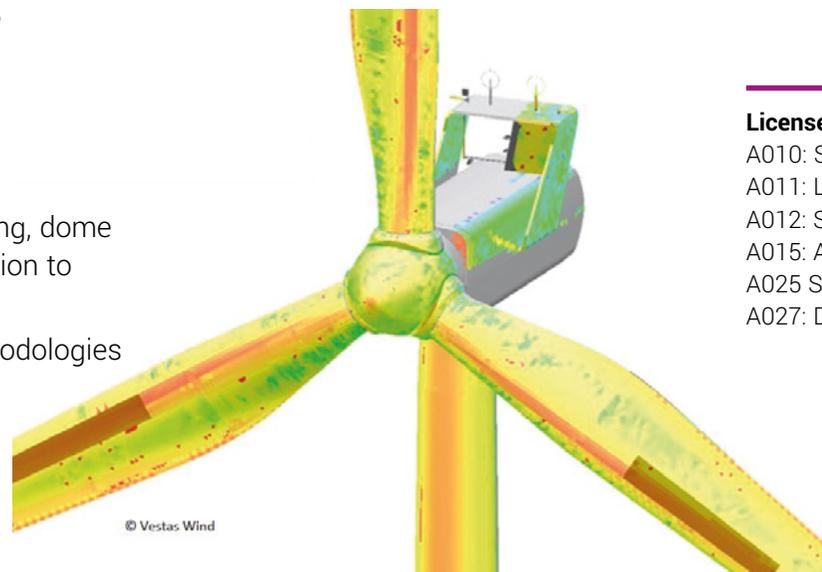
Licenses
A010: Structural Definition
A011: Longitudinal Strength
A012: Submarine Structural Analysis
A015: Above Water Vulnerability
A025 Ship Structural Analysis
A027: Desktop Structural Toolkit

Concept & Collaboration

Develop collaborative concept designs from the get-go, with Paramarine's extensive Early Stage Design capability and Team Paramarine integration.

Early Stage Design

This innovative early stage design approach is based on University College London's (UCL) Building Block methodology, collating design requirements, product model definition and analysis together to establish the form, function and layout of a design.

The design is broken down hierarchically in terms of functions (building blocks). The building block approach proceeds by refining the top-level functional headings into ever greater detail, maintaining a function-based approach throughout.

Alongside refining the functional definition, the designer can develop a 3D vessel layout and allocate the functional definitions to physical spaces in the ship.

Systems can be defined to connect equipment or building blocks together giving important weight information and allowing investigation into the influence of the system design on the overall design.

This allows the assessment of design adequacy on the basis of sufficient supply to meet demands of each characteristic, assessing the waterplane attitude and stability based on the design characteristic.
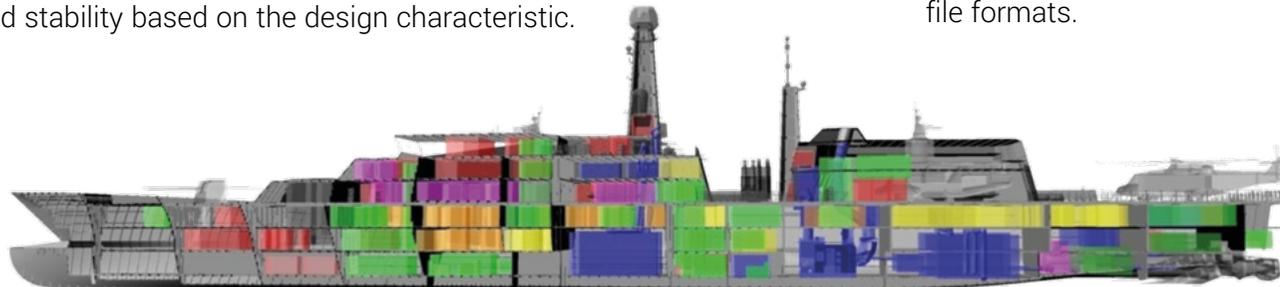
Team Paramarine

By allowing users to work on the same design at the same time, analyses can be conducted simultaneously and based on the same design definition - eliminating model version discrepancies.

Any object within Paramarine can have a bespoke audit status applied to it. Using this functionality, teams can quickly and clearly audit a design thereby mitigating risk.

Functionality includes the ability to limit the access and the level of control users have to the designs, it provides tools to manage and delete a design and allows the description of bespoke audit statuses

Data Exchange

Paramarine is able to exchange in a number of industry standard CAD formats, in addition to integrating with a number of PDM tools. QinetiQ is always expanding Paramarine's data exchange capability to ensure a seamless workflow from concept to production.

Paramarine can interface with a number of PDM and ship design tools; a prime example is Digitread's DigiHydro. The DigiHydro interface created in partnership with Digitread allows the seamless transfer of geometry and metadata into Paramarine to enable a holistic ship design process. For more information on DigiHydro visit http://digitread.com/digihydro/. Paramarine is also able to exchange information directly in IGES, STEP, DXF, XMT and STL file formats.

Licenses
A013: Surface Ship Early Stage Design
A011: Submarine Early Stage Design
A012: Team Paramarine
A015: Team Paramarine Viewer
C001: STEP Import / Export

Marine Design Software

Collaborating with QinetiQ

At QinetiQ we bring organisations and people together to provide innovative solutions to real world problems, creating customer advantage.

Working with our partners and customers, we collaborate widely, working in partnership, listening hard and thinking through what customers need. Building trusted partnerships, we are helping customers anticipate and shape future requirements adding value and future advantage.

www.Paramarine.QinetiQ.com

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